



# Romaine Lettuce

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## Introduction

Romaine (*Lactuca sativa*), also known as cos, is a lettuce that produces elongated heads. Romaine is considered more nutritious and has more volume than iceberg. Because it is slower to bolt than other head lettuces, romaine can be grown commercially in Kentucky.

## Marketing

There are opportunities for romaine lettuce sales at all direct farm markets for vegetables, including farmers markets, on-farm markets, roadside stands and community supported agriculture (CSA). Kentucky restaurants and grocers show interest in sourcing locally grown romaine lettuce. Additional local and regional marketing opportunities may be available for bagged salad and lettuce mixes, especially if they are certified organically grown.

Romaine lettuce is a well-established category in the wholesale grocery and foodservice trade. Growers here could explore market potential for producing spring and fall-grown romaine lettuce. High-volume production plus post-harvest cooling, food safety protocol and transportation are important for success in the commercial romaine market.

## Market Outlook

Romaine lettuce consumption in the U.S. doubled during the 1990s and early 2000s as consumer preferences continued the shift from less nutritious head (iceberg) lettuce to leaf lettuce. Per capita consumption of romaine ranged from 10.8 pounds to 12 pounds per person from 2010 to 2015. The popularity of salad bars and



bagged salad greens, as well as its greater use in the foodservice industry, has sustained consumer demand for romaine.

Commercial romaine lettuce production is focused in California and Arizona, which accounted for 97 percent of U.S. romaine acreage in 2012. Romaine production

for local markets has increased nationwide, as consumers show interest in locally grown produce. Romaine is also a viable crop for greenhouse and protected horticultural systems, and extended season production of romaine



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and other leaf lettuces is feasible in Kentucky. Larger-scale wholesale production is also possible, as Eastern salad processors may be interested in saving costs by sourcing romaine lettuce grown east of the Mississippi. Growers wishing to tap into the wholesale market must be able to compete on a delivered price and quality level. Volume production plus proper handling and food safety certification are necessary to succeed in a high-volume wholesale lettuce market.

## **Production considerations**

### *Cultivar selection*

Most of the romaine currently sold to wholesale salad companies consists of varieties that have been bred for western and southwestern U.S. climates. One important key to wholesale production in Kentucky will be selecting varieties adapted to our local climate. Recommendations are available from the University of Kentucky for cultivars with more desirable variety, yield and quality characteristics for Kentucky conditions. Desirable head characteristics for processed lettuce include large framed heads with a high density and a savoyed texture. Stripped heads should yield about 1½ pounds each.

Varieties suitable for processed romaine may not be suitable for growers selling to local fresh retail markets and other wholesale markets. For example, the head size required for processed lettuce is too large for farmers market sales. Other varietal characteristics, such as color and earliness, should be considered for these other markets.

### *Site selection and planting*

Romaine is a cool-season crop that is planted in early spring or late summer/fall. High tunnels and similar structures can be used to extend the season. Soils should be well-drained and rich in organic matter. Uniform soil types are important to obtaining uniformity at harvest. Lettuce is very sensitive to herbicides, such as triazines, and should not be planted where carryover could be a problem.

Traditionally, greens have been grown as row crops with wide spacing. Today, many Kentucky growers are planting at higher densities using raised beds with multiple rows per bed and drip irrigation. 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 variety and between-row spacing, two to three rows can be used per bed. Researchers in the UK Department of Horticulture have examined various cultural practices, including plant spacing, to determine the best production methods for Kentucky romaine.

Romaine can be direct-seeded into either bare ground or plastic mulch. Pelleted seed is normally used for direct seeding with a simple 'Planter Junior' type seeder or vacuum seeder. Seed can be primed to enhance emergence uniformity and to prevent germination failure when soils are too warm (above 80° F).

Most Kentucky growers use transplants that have been seeded into cell plug trays in the greenhouse about four weeks prior to going to the field. 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. Competition from weeds is also reduced. Transplants can be set by hand or with a waterwheel setter onto raised beds. The number of rows can be increased to three or four per bed by making a special wheel for the waterwheel setter. Precision planting, plant population and seedling depth are very important in obtaining the necessary quality and yields for wholesale processing.

Irrigation is necessary to provide continuous moisture for maximum yields and quality. Romaine is shallow-rooted, making drip irrigation, rather than overhead, more effective in delivering water directly to the roots. Romaine's poorly developed root system also means that nutrients need to be placed near the roots for more efficient uptake. Several sidedressings with nitrogen may be required; however, excess use can result in undesirable puffy heads.

### *Plasticulture vs. bare-ground production*

Black plastic mulch has been used for spring plantings of a number of greens, including romaine. White mulch is an option for late summer plantings. Plasticulture of romaine produces a cleaner crop with fewer weeds. In addition, soils warm up more quickly with black plastic; however, black plastic may result in excessive heat toward harvest.

Bare-ground production is less expensive than plasticulture and allows for the higher plant populations required by wholesale salad companies. However, weed control with hand/mechanical cultivation or herbicides becomes critical without plastic. Past research at UK included a study of plastic mulch and drip irrigation for romaine production.

### *Temperature*

Young romaine plants can be hardy down to 22° F, but susceptibility to cold injury increases as plants mature. Plants prefer temperatures between 60° F and 65° F; however, romaine will grow well as long as the sum of the daytime and nighttime maximum temperatures does not exceed 150 degrees.

### *Pest Management*

The main threats to stand establishment are the fungi *Sclerotinia* and *Rhizoctonia*. Romaine is also 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. Other potential disease threats include bottom rot and drop, *Botrytis* gray mold, and viruses.

The main physiological problem affecting lettuce is bolting (premature flower stalk production), which can occur during persistently hot weather and long days. While romaine is more heat tolerant than head lettuce, bolting can still be a problem. Other physiological concerns include tip burn, brown rib, bitterness and puffy head.

Potential insect problems include cutworms, armyworms, wireworms, aphids, flea beetles, leafminers and leafhoppers. Scouting to monitor populations can help the grower determine when and how often insecticides should be applied.

### *Harvest and Storage*

Romaine is hand-harvested as whole plants (once over harvest) for fresh market or salad processing. Growers selling bagged greens may choose to harvest the crop as individual leaves (multiple harvests).

Romaine heads are harvested just as they start to close; waiting too long can result in bolting. Salad companies want 12-inch-tall heads with as small of a core as possible, generally, 3½ inches or less. Heads

for wholesale markets must be uniform and free of tipburn.

Field packing romaine avoids having to handle the delicate crop twice, thus reducing the potential for damage. Field-packed lettuce harvested for the fresh market is generally packed into 24-count (head) cartons. It is then transported to either a vacuum or a forced air cooling facility to remove the field heat.

Following good food safety practices is essential, regardless of the market. Companies processing romaine for salad will advise or require specific field packing practices and equipment. Generally, processed lettuce is packed in plastic bins or paper bin boxes. Romaine should be cooled to 32° F as soon as possible. While vacuum cooling is the standard, forced air is being used with some success. Stored at the proper temperature and relative humidity, romaine has a storage life of two to three weeks. Wholesale buyers may require food safety certification for their growers.

### *Labor requirements*

Labor needed to produce a crop of romaine lettuce will vary based on weed control techniques, harvest techniques and yield. Field preparation, planting and crop care are estimated at 25 hours per acre. If herbicides or black plastic are not used for weed control, then up to 80 hours per acre of weeding labor may be required. More labor may be required in some production systems, including certified organic acreage. Harvest labor requirements will depend on how the crop is packaged for market.

## **Economic considerations**

Initial investments for start-up may include specialized bed shapers, plastic layers, precision planters, transplanters, bed cultivators and irrigation equipment. A conveyor type harvest aid, and post-harvest washing/cooling equipment, will be required for high-volume commercial production. Growers considering volume production of lettuce for wholesale markets need to address the post-harvest cooling and handling requirements for the crop, according to buyer specifications.

There are few published large-scale romaine lettuce production budget estimates, and published estimates vary greatly on production and harvest assumptions,

depending on region. Published university estimates from California, Arizona and North Carolina put the total costs of large-scale romaine production between \$5,000 and \$10,000 per acre. Large-scale romaine lettuce profitability is often determined by proximity to processors, production efficiency, labor costs, yields and price.

Small growers can profitably grow romaine lettuce for direct markets in Kentucky. Production costs will vary greatly, depending on planting and weed control practices. The key costs for small-scale production are seed or transplant costs, weed control and marketing. Growers that are able to keep variable costs, including all labor, within the \$100 range for a 100-foot bed could realize potential profits at the prices obtained in typical direct market situations.

## Selected Resources

- Vegetable Production Guide for Commercial Growers, ID-36 (University of Kentucky) <http://www.ca.uky.edu/agc/pubs/id/id36/id36.htm>
- Romaine Lettuce Cultivar Trial, in 2008 Fruit and Vegetable Research Report (PR-572), page 37 (University of Kentucky) <http://www2.ca.uky.edu/agcomm/pubs/pr/pr572/pr572.pdf>
- Romaine Lettuce Spacing Study, in 2008 Fruit and Vegetable Research Report (PR-572), page 37 (University of Kentucky) <http://www2.ca.uky.edu/agcomm/pubs/pr/pr572/pr572.pdf>

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*Reviewed by Brent Rowell, UK Extension Professor, International & Sustainable Agriculture*  
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