University of Kentucky
College of Agriculture,
Food and Environment
Cooperative Extension Service

Center for Crop Diversification Crop Profile
CCD-CP-104

Microgreens

Cheryl Kaiser[1] and Matt Ernst[2]

Introduction

Microgreens are young, tender, edible crops that are harvested as seedlings. These tiny plants are grown to the first true leaf stage. They should not be confused with sprouts, which are germinated seeds lacking true leaves. Microgreens are sold as a raw product for use in salads, on sandwiches, and as a garnish.

Microgreens production requires a protected environment, such as a greenhouse or high tunnel. It is also possible to produce microgreens indoors under artificial lights. The short turnaround time and potentially high value of microgreens can seem attractive to producers; however, production is very labor-intensive.

Marketing

Although interest in microgreens has expanded since their introduction into high-end culinary establishments in the late 1990s, the main market continues to be restaurant chefs. Other direct market opportunities could include upscale or gourmet grocery stores, as well as health food stores.

Market Outlook

Microgreens, known in the past as vegetable confetti, increased in popularity after being introduced in haute cuisine around 2006. Many restaurants now routinely use microgreens as garnishes or flavorings, and consumers are more aware of microgreens as a highly nutritious food that can be grown hydroponically. Microgreens are also offered by some community supported agriculture farms and year-round farmers market vendors to extend the produce season. Some specialty grocers and health-food stores are interested in supplying microgreens to consumers, but the highly perishable nature of the crop can create substantial marketing challenges, particularly for inexperienced growers.

One possible marketing strategy for producers interested in growing microgreens is to work directly with a restaurant or chef, growing and delivering microgreens at the requests and preferences of the restaurateur. Microgreens are typically purchased and used by restaurants in small amounts, and the quick growing and harvest time may make this a more attractive crop for very small growers interested in developing nearby, high-end specialty markets for fresh produce. Regulations and food safety requirements may evolve and change for newer products like microgreens, and growers should check with state or federal agencies for any specific requirements or considerations.

Production Considerations

Crop selection

A large number of vegetable, herb and agronomic crops and crop varieties can be used for microgreen production. Lettuces may be too delicate, and are

CENTER FOR CROP DIVERSIFICATION
www.uky.edu/CCD

[1]Cheryl Kaiser is a former Extension Associate with the Center for Crop Diversification.
[2]Matt Ernst is an independent contractor with the Center for Crop Diversification.

often not considered good candidates for microgreens. Refer to Table 1, below, for a partial listing of potential crops.

Crop selection is often based on seedling color, texture, flavor and market demand. How quickly and easily the seed germinates should be another consideration for the producer. Growers may need to evaluate a number of crops, in consultation with end-user markets, before selecting the ones most suitable to their production system and market.

Table 1. Potential Microgreen Crops

Amaranth	Fennel
Arugula	Kale
Asian greens	Kohlrabi
Basil	Lemongrass
Beet	Mizuna
Broccoli	Mustard
Buckwheat	Nasturtium
Cabbage	Onion
Carrot	Parsley
Celery	Popcorn
Chives	Radish
Cilantro	Spinach
Collards	Sweet pea
Cress	Swiss chard
Dill	Tatsoi

Production site and planting

The delicate nature of microgreens requires that they be protected from rainfall and other environmental stresses; thus they need to be grown in a greenhouse, high tunnel, shade structure or indoors. These crops may be grown in conventional bench-top production or hydroponically. Growers should note that fertilizer is not needed for fast growing microgreens such as the brassicas. Fertilizer may be helpful for slower growing microgreens such as carrot, lemongrass and onion.

Plastic flats with drainage holes at the bottom are generally used for microgreen production. The trays are either lined with a sterile fiber-like seeding mat or partially filled with a peat-based soilless germinating media. Hydroponic producers may utilize aggregate culture with rockwool as the inert growing medium. Pesticide-free and highly viable seeds of the desired crop are broadcast densely over the media. Treated seeds may have elevated levels of chemical residue in the small seedlings and are discouraged. The optimum seed density is one that maximizes production space while avoiding stands so thick that stems become elongated and/or disease issues develop. Depending on the crop and production system, a light layer of growing media may be spread over the seeds. It is best to seed only one type or cultivar per flat; however, if more than one species will be seeded in the same flat, the crops should have similar germination rates so the whole flat can be harvested at the same time. Irrigation with overhead mist or an ebb and flow bench system is common. Well or county water should be used for irrigation as surface water sources, such as ponds, pose a disease and product contamination risk.

Pest management

The microgreen high density cropping system provides the ideal environment for the development of seedling diseases. These young tender plants are particularly vulnerable to Pythium and Phytophthora damping-off; however, Botrytis, Sclerotinia and Rhizoctonia diseases may pose a problem on some hosts. Sanitation, proper plant density for good air circulation, and good cultural practices will be necessary to prevent these diseases from gaining a foothold. In addition, the use of a sterile soilless media, which is required for success, should reduce any potential disease problems. Potential insect problems include aphids and thrips.

Harvest and storage

The time from seed to harvest varies between crop species; however, many seedlings will be ready for harvest in seven to 14 days. Microgreens are harvested at the first true-leaf stage; seedlings will be approximately 1½ to 2 inches tall. Only the stems with leaves attached are harvested; roots are left behind. Whether grown in a bench-top system or hydroponically, stems should be cut high enough above the growing media to prevent contamination of the harvested crop. Plants grown in soilless media are cut by hand just above the soil line using scissors. An electric knife or trimmer can be used to harvest microgreens grown on seeding mats. Mats are held vertically while the crop is “shaved” from the mat into a clean container.

Microgreens are highly perishable and need to be washed and cooled as soon after harvest as possible.

Food safety good handling practices should be followed. Microgreens are packaged into plastic clamshell containers for grocers. Often the entire tray is sent intact to a restaurant where the chef harvests the microgreens as needed. However, only those microgreens grown in a rockwool slab or growing mat (or something similar) could be marketed to restaurants in this manner since any sort of loose growing media would not be permitted in the food preparation area.

Labor requirements

Microgreen production is a highly labor-intensive endeavor. Labor will be needed for preparing growing trays, seeding and harvest. Because of the short crop turnaround and necessity of a continuous succession of plantings, labor needs will also be continuous. Labor requirements will vary considerably between production scale and systems. Harvest and handling are the most labor-intensive parts of microgreen production.

Economic Considerations

Initial investments include greenhouse or high tunnel construction, installation of an irrigation system, plus equipment purchases. Additional start-up costs include purchase of seed, flats, growing media and other inputs. Seed purchase costs may be significant for this enterprise.

Establishment costs for high tunnels and greenhouses can greatly vary and may be especially impacted by site preparation and equipment purchases. Establishing a high tunnel can cost around $1.50 per square foot, plus labor costs. Greenhouse establishment can range from $8 to $30 per square foot.

Harvest labor for microgreens will be greater than leaf lettuces grown under shelter due to more intensive harvest operations.

Because of the significant variations between microgreen market prices and production systems, a producer should estimate potential production costs based on their individual situation. Production budget templates for lettuce may be modified to individual microgreen production situations. Template budgets for high tunnel and greenhouse production are listed in the resources, below.

Producers able to market high-quality microgreens at $25 to $50 per pound are likely to generate positive economic returns from this crop under both high tunnel and greenhouse production systems.

Selected Resources

- High Tunnel Sample budgets and Spreadsheets (Cornell University) http://blogs.cornell.edu/hightunnels/economics/sample-budgets-spreadsheets/
- Hydroponic Crop Program Budgets (Ohio State University) http://u.osu.edu/greenhouse/hydroponic-crop-program-economic-budgets/
- Microgreens: A New Specialty Crop (University of Florida, 2016) http://edis.ifas.ufl.edu/hs1164

Suggested Citation:

Kaiser, C. and M. Ernst. (2018). *Microgreens*. CCD-CP-104. Lexington, KY: Center for Crop Diversification, University of Kentucky College of Agriculture, Food and Environment. Available: http://www.uky.edu/ccd/sites/www.uky.edu.ccd/files/microgreens.pdf

Reviewed by Rick Durham, UK Extension Specialist, and Shari Dutton, UK Horticulturalist
Photos courtesy of USDA
May 2018