Growing Microgreens For Profit

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INTRODUCTION

For many years, microgreens were a little-known specialty food grown primarily for sale to upscale restaurants. These tiny plants are used as a garnish for main dishes like fish or pork to add color and taste, served as a mini-salad, or added to a salad of larger leaves such as spinach or arugula.

Today, microgreens have become widely known and used, not just by trendy chefs and "foodies," but by anyone who appreciates fresh, tasty food. One food writer called it the "microgreening of America." National Public Radio recently named microgreens one of the new "culinary buzzwords," and the National Restaurant Association calls microgreens one of the top five food trends.

When a food goes from unknown to a hot food trend, there is money to be made. Unlike most other specialty food crops, microgreens are easy to grow, and can be ready to sell in just ten to twenty days. They can be grown indoors or outdoors, so microgreens are a perfect crop for urban farmers who may not have access to a patch of dirt. In fact, many small growers prefer indoor growing, as it allows more control over light and temperature, so crops can be grown more efficiently, and harvests are more predictable.

Because microgreens are expensive, selling for $20 to $50 a pound, growers can produce a solid income in a very small space compared to traditional farming. For example, growing microgreens on a rack or shelving system that uses vertical space more efficiently can produce several pounds per square foot per month. Even growing microgreens on a single level bench or table can produce as much as two pounds per square foot per month. Instructions for building a basic microgreen growing module, called the "Microbox," are included in this book. This unit, although only two feet square, can produce up to 20 pounds of microgreens every month, and is ideal for learning how to grow each of the dozens of microgreen varieties.

What Are Microgreens?

Microgreens are tiny, edible greens that are older than a sprout and younger than a full-grown plant. Microgreens are harvested after their first true leaves have developed, before they develop into larger plants. They are the smallest of the salad greens and herbs, smaller than the "baby greens," and can be grown from almost any plant variety that would produce a mature plant, such as arugula, spinach, radish or basil.

What's The Difference Between Microgreens and Sprouts?

Microgreens are not sprouts. Sprouts are just germinated seeds that are eaten whole, with the seed, root and stem still attached. Because of the many illness-associated cases of food poisoning from sprouts, the FDA now has guidelines that sprout producers must follow. Sprouts are grown in water, which is a high moisture, low light environment which can encourage the growth of harmful bacteria as well.

Microgreens are not grown in water. They are produced in soil or a sterile medium such as a fiber mat. They require plenty of light, low humidity and good air circulation. The seed density is low compared to sprouting, which allows plenty of room for each tiny plant to grow and develop. At harvest, they are cut and packed without any roots.

When microgreens are harvested, their flavor is often more intense than the mature plant, like the spicy micro-radish or micro-mizuna. This intense flavor is part of their culinary appeal. The most common microgreens come from the crucifer, or cabbage, family of plants, and are packed with vitamins, minerals and phytonutrients. So not only do microgreens supply flavor, texture and color to a salad or main dish, they're also nutritious! Some of the most common microgreens are amaranth, arugula, beets, basil, cabbage, celery, chard, cilantro, cress, kale, mustard, parsley, radish and sorrel. Most commercial growers also offer microgreen mixes for a blend of tastes and colors.

In this book, you'll learn about the many varieties of microgreens being commercially grown, how to grow them and how to market them for a profit, and best of all, how to harvest a crop every few days instead of once or twice a year. But first, let's meet four commercial microgreen growers to find out more about this fascinating business.

CHAPTER ONE
Meet Four Successful Growers

Bella Verdi Farms

Darrell Joseph started growing microgreens because of his love for food. He says "Food has always been a big part of my life. I enjoy cooking and eating food. I spent 20 years in the technology industry, and eventually came to the conclusion that doing something I loved was more important than just making a lot of money."

Joseph built his greenhouse in 2003, and uses hydroponics to grow his microgreens. Rainwater is used to water the greens, and then recycled. Sanitation is rule #1 to insure food safety. He sells his microgreens to grocery stores and restaurants near his greenhouse in Texas.

Bella Verdi Farms grows a wide variety of microgreens to meet customer demand, including arugula, beets, basil, celery, cilantro, cress, radish, red cabbage, red giant mustard, red Russian kale, tatsoi and several mixes. Crops are grown on Sure To Grow™, a growing mat produced from recycled plastic bottles that is pH neutral and meets organic standards. Joseph has found STG reduces labor costs by 75% and promotes better plant health.

His microgreens are harvested just 8-10 days after being planted, and packed for retail sale in 2 oz, 4 oz and 8 oz clamshells or sold uncut in the growing tray, for chefs who prefer to cut their microgreens as needed. His mixes sell well, and include an Asian mix of kohlrabi, red giant mustard and tatsoi, a Mediterranean mix of arugula, cabbage and beet greens, and a rainbow mix that usually includes arugula, tatsoi, purple kohlrabi, red cabbage, beet greens and red giant mustard.

To take a look at the Bella Verdi Farms greenhouse operation, visit: www.bellaverdifarms.com/klru_movie.html.

CC Gardens

Charlie Crawford started growing heirloom tomatoes as a hobby in Nashville, and sold his surplus to local restaurants. He had never heard of microgreens, but one day, he read about their profit potential, and started growing them in his basement, as he had limited outdoor growing space.

Crawford took his first batch of microgreens to the Eastland Café. The chef tried them and said "I'll buy that all year long." Now he supplies 12 other restaurants in the area with fresh microgreens, growing Crimson Tide mustard, mizuna, sorrel, radish, cilantro, beets, basil, fennel and more.

He uses a sterile growing medium rather than dirt to grow microgreens, because he felt it was safer to take into a restaurant kitchen. He seeds his growing flats in the simplest way, tapping on a bowlful of seeds to distribute them over the growing medium. To speed germination, he uses a propagation mat to provide heat from below. After a day or two,

depending on the variety, the seed trays are moved under artificial lights to grow out. He uses T5 fluorescents, as they are very economical to operate, and provide plenty of light for the small microgreens.

Crawford delivers uncut microgreens, still in the growing medium, so chefs can simply snip off what they need and shelf life is increased. Chefs use his microgreens as a garnish for dishes ranging from fish to pork to salads – even as a pizza topping.

He calls his indoor garden his "recession reconstruction project," as his previous business, rehabbing houses, disappeared during the recent housing crunch. In fact, Crawford says, his microgreen business saved him from losing his own home to foreclosure! To watch a video interview with Charlie Crawford, click on this link: http://www.youtube.com/watch?v=apZ_RyAve7A.

Gro-Action Greens

Luke Callahan was a total novice when he decided to become an urban micro-farmer. Working with Curtis Stone, who operates a tiny ½ acre urban farm in Kelowna, British Columbia that produces an income of $60,000 yearly, Luke decided to grow microgreens.

Microgreens make sense for a new grower, because they are ready for harvest in a mere 2 weeks, for a quick crop rotation and income. They take up very little space, so urban farmers can produce enough of this high-value crop in a tiny space to make a good income.

Callahan uses an organic potting soil in standard 10"x20" nursery trays to grow his microgreen crops. The soil is fertilized with liquid kelp, a nutrient that is widely used by organic growers to produce healthier, more nutritious plants. Rather than use a humidity dome over the growing trays, he prefers paper towels, which help keep the seeds moist while germinating.

As the microgreen seeds germinate, the paper towels are removed, and the trays are placed under fluorescent lights, which are left on for 12-16 hours per day while the plants are growing.

When the microgreens are harvested, they are delivered that same day to restaurants in Portland, Oregon, where Callahan grows his crops. Local production means fresher greens, which is especially important for these tiny plants. His mixes include an Asia mix, with pak choi, radish, pea

shoots and sunflower shoots, and a rainbow mix, using cabbage, broccoli, swiss chard and sunflower shoots.

To learn more about urban farming the Gro-Action way, check out this fascinating video interview with Curtis Stone: http://vimeo.com/20785959.

Lucky Leaf Gardens

Kate Brun, a former real estate agent, decided it was time for a fresh start, and began growing microgreens in the sunroom of her home, using the name Lucky Leaf Gardens. As more and more chefs and local grocery stores started using her microgreens, she built a 400 square foot greenhouse in her backyard. Soon that was too small, and she built a 1,600 square foot greenhouse to handle her expanding microgreen business.

Brun now sells up to 60 pounds of microgreens every week, mostly to local restaurants and grocers, but also to Sysco, the national food distributor, who needed a local source for microgreens. Restaurants are her favorite buyers, as they use large quantities on a regular basis and are always trying creative ways to use microgreens to enhance the flavor of their meals. She says, *"As far as a chef is concerned, microgreens are like a bow on a present. You can wrap it in paper, and it'll still be good, but if you put a fancy bow on top, it becomes gorgeous."*

One of her chefs loves her microgreens because, *"I can utilize every pound or ounce I buy. It makes for a way prettier plate, and makes everything a little more polished and refined."*

Lucky Leaf Gardens offers 40 varieties of organic microgreens, from broccoli and arugula to sunflower and popcorn. In addition to her regular restaurant and grocery customers, she sells her greens at several local farmers' markets.

When asked about how she felt about starting out, Bruns said, "It's having faith in what you've got and having the courage to go do it. I never enjoyed going to work until now!"

She encourages new growers to give microgreens a try, as it appeals to those who are seeking locally grown food and "foodies," who love the taste and texture of microgreens. Another plus – it's a novelty crop, making it easier to land a spot at local farmer's markets, as opposed to traditional crops like tomatoes or lettuce.

CHAPTER TWO

Best Microgreens

Amaranth: This small, delicate microgreen can trace its roots back many centuries to the Aztecs and Mayans, who used the grains of the mature amaranth as a protein source, grown in the fields with corn and beans. When grown as a microgreen, the color is the most striking feature, ranging from magenta to purple.

Amaranth is easy to grow, but prefers heat to do well. If grown in a greenhouse, it does best in the summer. Indoors, it can be grown year-round under lights. Red Garnet is the most widely grown variety, due to its brilliant colors, which can really liven up a microgreen mix, or as a garnish.

Growing Tips:

- Use a propagation mat indoors to insure rapid germination.
- A quarter-pound of seed will fill 3-4 standard (1020) nursery trays.
- Germinates in 2-3 days – Harvest 8-12 days after germination.
- Small short plants need to be harvested at the base and rinsed well.

Arugula: Cooks will be familiar with this common salad green, but when harvested as a microgreen, it packs a peppery punch, adding a spicy flavor to salads. In Britain, arugula is often called "Rocket," and used for its medicinal qualities. In Italy, arugula is a popular pizza topping.

Arugula is easy to grow and does well in cooler weather. It can be grown in soil or on a mat and is quick to grow. When buying seed, just buy plain arugula, preferably organic.

Growing Tips:

- A quarter-pound of seed is enough for 4 standard 1020 trays.
- Germinates in 2-3 days – Harvest 8-12 days after germination.
- Can also be grown in soil for 16 days to produce baby greens.
- Use a fan for air circulation if rotting occurs.
- Use a paper towel on top of seeds while germinating to help remove seed hulls, and wash well at harvest.
- Use a mister to water, as the stems can be fragile.

Basil: This herb is widely used in most countries, especially in Italian and Thai cooking. Researchers have discovered many medicinal uses for basil, as it has antibacterial and anti-inflammatory qualities. It also contains nutritional flavonoids.

Popular varieties include Genovese, green basil and Dark Opal, purple basil. Both make a colorful addition to any microgreen mix and can also be used alone in traditional recipes, such as pesto.

Growing Tips:

- Use a propagation mat indoors to insure rapid germination.
- A quarter-pound of seed will fill 3-4 standard growing trays.
- Germinates in 3-4 days – Harvest 8-12 days after germination.
- Baby greens can be grown in soil in about 16 days.

Beet: This colorful plant has been grown for thousands of years. It originated in the Mediterranean region, where the Romans use it for medicinal purposes and food. Most of us are familiar with the beet root, but when grown as microgreens, the young plants can add a delicious earthy taste and color to almost any dish. At harvest time, the leaves are green and the stems are a rich maroon red. Bull's Blood is the reddest of all the beet microgreen varieties, but the seed is very expensive. Most commercial growers substitute the more affordable Ruby Queen or Detroit Dark Red – a heirloom variety.

Growing Tips:

- Soaking beet seeds for 24 hours is recommended to improve germination.
- Beets do best in soil, not on mats.
- A quarter-pound of seed will produce 3-4 trays of microgreens.
- Cover seeds with a damp paper towel during germination.
- Germinates in 4-6 days – Harvest in 8-12 days after germination.
- If seed hull is still attached to greens, wait another 2 days to harvest.

Broccoli: This well-known plant was brought to America by Italian immigrants, together with its parent, cauliflower. The plants, even in the microgreen stage, contain DIM, a cancer-fighting substance. Broccoli microgreens have a mild cabbage flavor and are very easy to grow. Popular microgreen varieties include DiCicco, Purple Sprouting and Waltham.

Growing Tips:

- A quarter pound of seed will fill 3-4 standard trays of microgreens.
- Germinates in 3-4 days – Harvest in 6-8 days after germination.
- Sow seeds thickly to keep young plants dense.

Cabbage: This is a very easy microgreen to grow, with most varieties yielding violet to purple stems and green leaves. The flavor is just like mature cabbage, but much milder. Cabbage is a member of the brassica family, and contains many nutritional compounds, such as sulphorophane and DIM. Popular microgreen seed varieties include Red Acre Purple and Red Rock Mammoth.

Growing Tips:

- A quarter pound of seed will fill 3-4 standard trays with microgreens.
- Germinates in 3-4 days – Harvest 6-8 days after germination.
- Baby greens can be grown in soil in about 16 days.
- Red Rock Mammoth has larger leaves than other varieties.
- Harvest as soon as possible for a sweeter flavor.

Celery: The zesty flavor of celery makes growing this microgreen a culinary must-have. It can be sold alone, but becomes very expensive, as the harvest weight per tray is less than half that of most microgreens. Celery is a staple of ayurvedic medicine, used for a wide variety of ailments. Most growers use the Utah variety, such as the Utah 52-70, available from Mountain Valley Seed.

Growing Tips:

- Requires a pH under 7 or it will stop growing or turn yellow.
- Germinates in 5-7 days – Ready to harvest about 2 weeks after germination.
- Cover with moist paper towel while germinating to help remove seed pods.

Chard: Both chard and beets have the same parent, the wild seabeet. Farmers have been breeding this plant since 400 B.C, the chard for its leaves and the beet for its roots. Chard is fairly easy to grow if you pay attention to the details.

Best microgreen varieties include Ruby Red and Rainbow Mix. Chard grows better in soil that on a mat, but either can be used. The green leaves and red stems of chard provide a splash of color. Chefs love the Rainbow Mix for a garnish.

Growing Tips:

- Produces 2-3 standard trays of microgreens per quarter-pound of seed.
- Germinates in 3-5 days – Harvest 8-12 days after germination.
- Baby greens can be grown in soil in about 2 weeks.
- Pre-soak seed for 12-24 hours to improve germination.
- Harvest after most seed hulls have fallen off the seedlings.

Cilantro: This herb, also called coriander, has been a popular spice for thousands of years around the world. Chefs love the strong aroma and flavor, so cilantro microgreens are often packaged alone, rather than in a mix. Cilantro is slow to germinate, but worth the effort.

Growing Tips:

- A quarter pound of seed will produce 2-3 trays of microgreens.
- Best grown in soil.
- For best germination, buy split seed hulls.
- Germinates in 5-10 days – Harvest 3-4 weeks after germination.
- Can be grown as baby greens in about 4-5 weeks.

Cress: Garden cress is also commonly known as peppergrass because of its peppery flavor. This has been a dietary staple for thousands of years, and it thought to have many medicinal properties. Cress is often used as a digestive aid and as an insect repellant.

The biggest challenge for a commercial grower is to keep cress looking fresh, as it does not keep as well as other microgreens. For that reason, its best not to use it in mixes unless it will be used right away. Curled or Curley cress is the most widely used variety.

Growing Tips:

- Harvest if it starts to turn yellow, as it has reached its peak.
- A quarter-pound of seed will produce 3-4 trays of microgreens.
- Germinates in 2-4 days – Harvest 8-10 days after germination.
- Grow as baby greens in about 2 weeks.
- Needs less water to germinate, so use a mister.
- A paper towel during germination helps to remove seed hulls.

Endive: This salad green has a tangy, somewhat bitter flavor that adds a new dimension to many mixes. Also known as chicory or escarole, the plant is often found in the wild. It is easy to grow as a microgreen. Best microgreen varieties include Green Curled Ruffec and Broadleaf Batavia.

Growing Tips:

- A quarter-pound of seed will produce 3-4 trays of microgreens.
- Germinates in 3-4 days – Harvest 8-14 days after germination.
- Baby endive greens can be grown in soil in about 16-18 days.
- Harvest close to soil, as the stems are short.
- Good winter microgreen that grows well in cooler weather.

Kale: This hardy plant is a popular and easy to grow microgreen. With a mild spinach flavor and green or purple leaves, it is a popular baby green as well. It's a member of the brassica family, so each leaf is packed with phytonutrients such as carotene and vitamin K. Popular kale microgreen varieties include Blue Curled and Red Russian.

Growing Tips:

- A quarter-pound of seed will produce 3-4 trays of microgreens.
- Germinates in 3-4 days – Harvest 8-12 days after germination.
- Can be grown as baby greens in soil — Harvest 2 weeks after germination.
- Excellent winter microgreen which grows well in cooler weather.

Mustard: This colorful spicy microgreen has been grown for a zesty addition to salads and sandwiches for many years. It is ideal for beginning growers, as it is almost foolproof. Colors range from green to purple, with both rounded leaves (Garnet Red & Red Giant) and serrated leaves (Mizuna, Crimson Tide).

Growing Tips:

- A quarter pound of seed will produce 3-4 trays of microgreens.
- Germinates in 2-4 days – Harvest 6-10 days after germination.
- Baby mustard greens can be grown in soil in about 2 weeks.

Pac Choi: This Asian green is also known as Bok Choi or Chinese Cabbage, and has been grown in China for thousands of years. It's an easy microgreen to grow. Most growers use the common pac choi seeds, as they are more affordable, but it's also available as a red variety called Red Choi.

Growing Tips:

- A quarter-pound of seed will produce 3-4 trays of microgreens.
- Germinates in 2-3 days – Harvest 7-10 days after germination.
- Grow as baby greens in soil, with harvest in 2 weeks.
- Harvest one inch above soil.

Radish: These spicy greens are a staple crop for all microgreen growers, as they have a tangy taste that compliments the more bland greens in a mix, plus they are easy and fast to grow, just as are radishes in the garden. The popular purple varieties are Crimson Giant, Hong Vit and Sango, while the best green varieties are China Rose and Champion.

Growing Tips:

- A quarter-pound of seed will produce 2-3 trays of microgreens.
- Germinates in 2-3 days – Harvest 6-8 days after germination.
- Harvest low on stem to capture color.
- Don't wait too long to harvest, as stems can rapidly become tough.

These are the most widely grown microgreens. As you develop your growing skills and start selling to restaurant chefs, they may request other greens, like fennel, sorrel, tatsoi, turnips and Tokyo Bekana, a variety of cabbage. Seeds for these and all the varieties listed in this chapter are available from the seed sources listed in the resource chapter.

Microgreen Mixes

Retail customers, such as those at grocery stores and farmer's markets, and even many restaurant chefs, often prefer the microgreen mixes rather than individual microgreen varieties. It's an easier buying decision for many, especially those who may just be starting to explore microgreens for the first time.

Quite a few of the larger growers have dozens of custom microgreen mixes, some they have developed themselves, others requested by chefs. Keep in mind that its okay to make substitutions, based on what greens you have ready to harvest. Here are a few of the many popular mixes you can blend:

Basic Salad: Arugula, broccoli, kale, kohlrabi, Red Acre cabbage, cauliflower.

Spicy Salad: Arugula, broccoli, kale, Red cabbage, mustard.

Asian Mix: Cabbage or Tokyo Bekana, pac choi, radish, arugula.

Spicy Mix: Radish, mustard, arugula.

The seed companies are also blending their own microgreen mixes, so you can simply plant, grow and harvest. Johnny's Seeds has two mixes, a mild micro mix, with mizuna, cabbage, kale and kohlrabi, and a spicy micro mix, with a blend of red and green mustard.

Sunshine Cove Farm, a microgreen grower, has a standard mix that uses whatever is ready to harvest, containing several of these microgreens: pac

choi, tatsoi, amaranth, kale, sorrel, beets, broccoli, mizuna, radish, kohlrabi, Red Giant mustard, Red cabbage and chard.

Another grower, Mizuna Gardens, uses a mix that contains several of these varieties, depending on what's ready to cut: amaranth, arugula, beets, broccoli, cress, kale, kohlrabi, mizuna, pac choi, China Rose radish and Ruby Swiss chard.

As you can see, there is no "ideal" blend, and most growers try for a balance of color, texture and taste that will please the taste buds of their customers.

Baby Greens

Many growers have found that baby greens are a profitable sideline to their microgreens business. Baby greens are young plants that have reached about 3 inches in height, and can be used in salads. Because they weigh more than microgreens, the price per pound is more affordable, which is an important consideration for most chefs who do have to live within a budget just like the rest of us.

Baby greens can be cut, washed and packaged, or sold in the growing tray with their roots on for longer life. Chefs love being able to serve a just-picked salad by simply harvesting from the tray. The most common baby greens are arugula, beet greens, red mustard, green romaine, mache, mizuna, rainbow chard, red amaranth, tatsoi and cress.

CHAPTER 3

Growing Microgreens

Unlike conventional gardening, growing microgreens requires just a few supplies, such as growing trays, potting soil, pure water and seeds. Of course, if your microgreen business prospers, you'll probably expand to a greenhouse operation to allow more growing space and more control over the growing process.

There are several hydroponic suppliers, listed in the resource chapter, who offer "turn-key" microgreen systems, with racks and extra-wide growing channels that use either a burlap or Sure-to-Grow™ mat to provide a bed for the seeds. There is a learning curve for growing microgreens, and I recommend you start small and avoid the temptation to spend thousands of dollars on a system until you have mastered the growing skills on a smaller scale.

Further on in this book, you'll learn how to build a simple "microbox" to grow microgreens indoors, so you can start any time of the year, even in Minnesota! The box uses just one sheet of ¾" plywood, simple fluorescent lighting and a few "off-the-shelf" items you can pick up at Home Depot or your local hardware store. The unit shown in this book cost under $200, took about 4 hours to build, and can produce up to 20 pounds of microgreens a month. With the price of microgreens averaging $25 a pound in most areas, the microbox can pay for itself very quickly, as well as giving you the skills you'll need before you expand your growing operation.

Microgreen Seed Selection

As the popularity of microgreens has grown, more and more seed suppliers have begun offering bulk seed for microgreen growers. Here's what you need to know:

- Germination rate should be at least 85%.
- Buy small quantities at first, until you have grown several trays of that variety, to make sure the seed and variety is working for you.
- Always compare prices for each seed variety among suppliers, as there are wide variations in price.
- Buying in bulk is more cost-effective. For example, you can often buy one pound for twice the price of just a quarter pound, even from the same supplier. After all, the labor and overhead costs for processing an order are about the same, regardless of the packet size.
- Keep your seed cool and dry.
- Use a transparent storage container for seed, so you can see the remaining quantity at a glance. This will allow you to do a quick visual inventory when ordering more seed.
- Keep notes of germination and harvest times for each variety to allow better planning of crops in the future.

- In addition to the suppliers listed in the resource chapter, do an occasional internet search for "bulk microgreen seeds" to find new suppliers.
- Use organic seed whenever possible and affordable.
- Avoid treated seeds as the fungicides used pose a health risk.
- No one has developed a perfect seed spreader yet, so many growers simply use a small lightweight bowl to do the job. Another option is a "medicine spoon," available at any drugstore for a dollar or two. Using the spoon, it's easy to scoop up seeds, and then distribute them over the soil by just tapping the spoon as you move it.

Microgreen Growing Equipment

Growers who are producing large quantities of microgreens may want to consider a hydroponic approach to automate their production. The focus of this book, however, is small-scale production, and a simple tray growing system is the best and most affordable way to accomplish that. Here's what you'll need to get started:

Trays: Standard plastic nursery trays, also called flats. These trays are commonly referred to as 1020 trays because of their inside size of 10" by 20". They are the growing container of choice for microgreen growers. These can often be had for free from nurseries, or purchased new from several of the suppliers listed in the resource chapter for around a dollar each in quantity.

To prevent problems with excess water, be sure to use the trays with slits or holes in the bottom to allow drainage. If you plan to grow indoors and need to prevent drips, nest a slitted tray inside a solid tray, with a quarter-inch space between the two to allow room for drainage water.

Tray Racks: If your growing space is limited, you can grow vertical, with shelving that will allow four racks of microgreen trays. Stores such as Walmart have economical plastic shelving that can be used, while Costco has food-grade chrome-plated shelving that work well, and is easier to clean. Whatever you choose, remember that it has to be waterproof, as it will get wet from repeated watering.

Lighting: If you are fortunate enough to live in a temperate climate, you can grow microgreens outdoors. For most of us though, some form of climate control is required. A greenhouse or hoop house is ideal, as the lighting is free, courtesy of the sun, and the interior temperature can be controlled to provide the ideal range for germination and plant growth.

If you plan to grow indoors, you can use economical fluorescent lights, as the microgreens do not need the high intensity lighting required by other indoor crops. Older fluorescent bulbs, such as the T12 and T8 bulbs, waste lots of electricity, compared to the newer T5 units. T5 fluorescent lights are commonly used by indoor microgreen growers, with 6500K (also referred to as "full-spectrum") high-output bulbs for the best plant growth.

T5 fluorescent bulbs can last 20,000 hours, and use very little electricity. A single or double T5 fixture, with reflector, can be attached to indoor growing racks and controlled with a timer to provide 14-16 hours of daily light.

Plants need to sleep too, and a 16 hour light cycle will give them 8 hours of rest. Be sure to order light fixtures with a built-in reflector, which can supply up to 3X more light to the greens. Here's how to calculate the number of lights you will need:

Type Of Light	Watts	Growing Area	Heat Output	Height Above Plants
24" T5 single	24	1' x 2'	Very Low	3" to 12"
24" T5-2 bulb	48	1.5' x 2.5'	Low	3" to 18"
24 T5-4 bulb	96	2' x 3'	Low	6" to 18"
48" T5 single	54	1' x 4'	Very Low	3" to 12"
48" T5-4 bulb	216	2.5' x 5'	Low	6" to 24"
48" T5-8 bulb	432	4' x 6'	Low	12" to 36"

Soil: Although many growers prefer the Sure to Grow™ mats for microgreen production, a high quality potting soil can produce a better, healthier crop with higher yields. I've done comparison tests on dozens of microgreen varieties, and soil is almost always the winner. In addition, soil is essential if you plan to also grow baby greens to sell.

My favorite ready mix potting soil is Fox Farm Ocean Forest, which one grower has called "The caviar of potting soils." It is widely available, but be sure to pick it up at a local hydroponic store, as shipping the bags from an online store is quite expensive. It contains all the nutrients necessary to grow healthy greens. In addition, I add liquid kelp fertilizer to water, at a

ratio of one teaspoon per gallon of water, and use a mister to provide foliar feeding after the plants have germinated. An inexpensive pump sprayer works well for this.

Soil Press: You can make a simple soil press to compact the soil in the trays by cutting a piece of 3/8" plywood to fit the inside of your growing trays, with knobs or handles attached on both ends.

Water: Growing healthy microgreens requires high quality water that is the proper pH – not too acid, not too alkaline. If the water is too acid or alkaline, it can lock up nutrients in the soil and prevent them from reaching the microgreens. A neutral pH of 6.5 to 7 is best for microgreens. You can test your water with test strips (be sure to get the strips designed to test water – my favorite is the AlkaZone™ brand, available from www.Vitacost.com or www.Amazon.com. For repeated testing, a pH meter is more economical and accurate. You can find these at www.Amazon.com as well.

If your water is not quite neutral, you can use lemon juice to lower the pH or baking soda to raise it. In addition to the pH, water purity is important. An inexpensive carbon water filter can be used if needed to filter out chemicals, such as the chlorine added to municipal water supplies, and other impurities.

If you're watering outdoors with a hose, use a high quality spray nozzle, such as a Dramm™, to gently shower the microgreen. The closer you can get to a natural, gentle rain, the better your plants will like it. The same is

true indoors, so choose a watering can or mister that can provide a gentle watering that will not knock over or damage the fragile young plants.

Germination Aids: To speed up the germination of your microgreen seeds, use a propagation mat to provide heat from below. Hydrofarm makes an inexpensive rugged unit that uses very little electricity – about 17 watts for the smallest size, which is just right for a single 1020 tray.

To keep the seeds moist during germination, use a lid to cover the tray. Some growers simply flip another tray upside-down over the growing tray, while others prefer a clear plastic "humidity dome" to do the job. Humidity domes are very inexpensive in bulk, and can be purchased from several of the suppliers in the resource chapter.

Harvest Equipment: Some microgreen growers insist a sharp knife is the best tool for harvesting microgreens, but an equal number will swear by scissors. My current favorites came from Costco, and have a titanium coating to stay sharp longer. For the occasional sharpening, I use a manual diamond scissors sharpener, called the Chef's Choice Model 490, available at www.sharpeningsupplies.com.

Once the greens are harvested, they should be washed to remove seed hulls and dirt. A single rinse in the washtub is sufficient for most varieties, but having a second tub handy will help ensure the cleanest finished product. A conventional salad spinner is too rough for the delicate microgreens, so letting them drip dry on a screen above the washtub works well. Turning on a circulating fan will speed up the process.

You will need a very accurate scale to weigh the microgreens after harvest before packaging. Look for one that is calibrated in $1/10^{th}$ ounce increments, to ensure more accuracy.

You will need containers for your harvested microgreens that have space for your label. Hard plastic containers, such as plastic clamshells, are better than soft plastic bags, as the delicate greens can be crushed or damaged if not handled properly. They should be transparent to allow customers to see the greens without opening the packaging.

Each container should have an attractive label. You can order labels from one of the many internet suppliers, or design and print your own, using the free online program at www.avery.com.

CHAPTER FOUR

Three Steps To A Perfect Microgreen Crop

Step 1: Planting Time – Open up a bag of potting soil and fill the trays about 2/3rd full. If you plan to grow baby greens, fill the tray full. Next, level the soil in each tray. It's also a good idea to use a scoop that is just the right size to fill the tray so you don't have to measure each time you fill.

Using the soil press, lightly compact the soil before you seed to make sure those tiny seeds don't get buried too deep. Next, spread seeds evenly around the tray. Over time you'll learn the best seed density for healthy plants and a good harvest weight. A small bowl can be used to hold the seeds while spreading, or a medicine spoon, available at any drugstore for a dollar or two.

After sowing the seed, use the soil press again to seat the seeds in the soil for better germination, and gently water. At this point, you can cover the seeds with a paper towel, and then water the towel. This helps keep the seed moist and improves germination. Keep the towel moist during the germination process to prevent the seed hulls from sticking to it.

When the seedlings are pushing the towel up, it's time to remove the towel. Many growers simply cover the seed flat with a humidity dome or upside-down tray instead of using paper towels. The goal, regardless of the method, is to never let the seeds dry out.

While the seeds are germinating, water once or twice a day. Some seeds will form a white fuzz. Not to worry – it's not mold, and will disappear.

Step 2: Growing Greens – Once the microgreens have sprouted, it's time to remove the cover, whether paper towels or humidity domes, and let the light in. If you're growing outdoors, be sure your microgreens receive enough sunlight – ideally at least 12 hours per day. If you are growing in a hot climate, provide partial shade during the hottest period of the day, usually from 11 a.m. to 4 p.m.

Indoor growers should provide 14-16 hours of light every day with fluorescent fixtures. Be sure to use the 6500K bulbs for best growth. If you are using a rack system, experiment with the shelf spacing to see if a closer spacing of the light to

the growing trays will improve plant growth. In general, a distance of 10" to 16" works well.

Water your microgreens twice daily, ideally in early morning and early evening, and be sure to check soil moisture to make sure you're not just wetting the surface. Your finger makes the best moisture gauge! If the soil is drying out between the twice-daily watering, water more often to prevent plant stress.

To ensure healthy plants and vigorous growth, be sure to regularly test your water for pH. If the pH is around 7 consistently, just check once a month. A booster shot of diluted liquid kelp will supply valuable micro-nutrients when used as a foliar mist every day or two.

Sanitary Best Practices: To reduce the risk of pathogens, such as e.coli, salmonella and coliform, follow these best practices, as developed and recommended by the California Leafy Green Growers (www.caleafygreens.ca.gov) as part of the U.S.D.A Food Safety Action Plan.

- **Water**. Use only water that is safe for human consumption, such as from a municipal water supplier or well water that is tested for pathogens regularly. This applies both to water used to irrigate the greens and the water used to rinse the greens at harvest time.
- **Fertilizer**. Growers who use soil to grow their crops should never use incompletely composted animal manure or any soil amendments that contain animal manure. In addition, other fertilizers, such as compost tea,

fish emulsion, fish meal and other "bio-fertilizers" should not contain any animal manure.

- **Personal hygiene**. Wash hands before handling any greens, harvested or not. Anyone with an infectious disease or open cuts should not handle greens.
- **Growing area sanitation**. Harvested greens should be washed or rinsed at least twice to insure cleanliness. All equipment, such as trays, knifes and scissors should be wiped down with a 10% bleach solution. Workers should wear vinyl disposable gloves during harvest to minimize contamination risk.

Step 3: Harvest Time – The hardest lesson for most growers is learning when to harvest the young microgreens. Too soon, and the weight will be low, reducing your profits. Too long, and your greens could show signs of stress from overcrowding, like yellowing or weak stems. With so many variables, like the variety, the soil depth, the seed density and the amount of fertilizer, the question of when to harvest is as much intuition as it is science. After you've grown each variety a few times, you will get a feel for the best time to start snipping.

Microgreens can be harvested when the first set of leaves, called cotyledons, are fully formed, or after the next set, called true leaves, are appearing. At this point, the young microgreens are about 2" to 4" tall. Using your scissors, cut about an inch above the soil to keep the greens as clean as possible. After cutting a bunch, use the scissors to brush the

stems. This will knock off loose soil and help reduce the need for multiple rinses.

After cutting, rinse the microgreens in a tub and spread them out on a screen above a tub to drip dry. Using a fan to keep the air circulating, and turning the pile regularly, will speed up the drying process. Avoid harvesting more than you plan to sell in 24 hours to keep your crop as fresh as possible.

When the microgreens are reasonably dry, place them on a scale to weigh before packaging in containers. Most growers use an assortment of packaging sizes, typically 2 ounce, 4 ounce and 8 ounce, to accommodate customer preferences. If you're just starting out and on a budget, stick to the 4 ounce size to simplify your inventory and costs.

Your package label should contain your business name, address, phone number, web address. Leave a space to write in the name of the plant and variety and the harvest date with a permanent marker. If there is room on the label, remind customers that microgreens should be refrigerated and used within 3-5 days.

After harvest, be sure to store the greens in a refrigerator until delivery. To ensure freshness and optimum storage life, most growers use a wheeled camping cooler to protect microgreens from extreme temperatures during delivery.

Production Problems & Solutions

Low or no germination:

- Check seed package to verify date packed and germination rate.
- Not enough moisture – water more frequently.
- Temperature could be too hot or cold. Best range is 55 to 75 degrees F.

Rotting microgreens:

- Too much moisture – plants are drowning – don't overwater.
- Not enough light – water less or provide more light.
- Chlorine in water – use carbon drinking water filter on water supply.

Tall "leggy" microgreens:

- Too little light – move into better sunlight or closer to indoor light.

Yellow, stunted microgreens:

- Cheap potting soil that contains few nutrients – add liquid fertilizer.
- Check pH of water – should be 6.5 to 7.0.
- If not, add lemon juice to lower pH or baking soda to raise pH.

Burnt leaves:

- Strong sun – discard burnt greens and provide partial shade for next batch.
- Water in A.M. and P.M. but not during mid-day.

Insects are attacking my plants:

- Probably aphids, which are attracted to microgreens. Yellow sticky traps are best and safest control.

Deer & rabbits are eating my microgreen crop:

- Another good reason to have a greenhouse or grow indoors!

CHAPTER 5

Marketing Your Microgreens

When you have mastered the growing process for microgreens and are ready to start commercial production, it's time to consider the three primary markets for your greens, grocery stores, individuals and restaurants.

Grocery Stores: The best stores for microgreen growers are locally owned grocers who are already selling to upscale customers who can afford microgreens. Don't bother with the national chain grocers, as they prefer suppliers that can deliver large volumes of product at low prices.

Buying fresh/buying local is a trend that continues to grow every year and shows no sign of slowing down. Reasons include consumer awareness of the problems caused by industrial agriculture and long distance food transportation and the desire to support local farmers.

Because of the rapid growth of farmer's markets, retailers such as grocery stores, food co-ops and food service departments in schools and hospitals are adding more local products to their grocery store aisles and menus.

Because of this, small growers of crops such as microgreens can now count on regular sales to local grocers, school and hospital cafeterias and other local food venues.

Before jumping into this market, newer growers should have some experience with selling their microgreens directly to the public. One of the best ways to gain that experience is by selling at farmer's markets for one or more seasons. This allows time to fine-tune your growing and marketing skills before you take it to the next level.

Sales to small independent grocers are generally best when starting out. Access to buyers is better and it is easier to build a long-term relationship with the store. Grocers, co-ops and food service departments at local schools and hospitals, just like restaurants, expect high quality produce or food products, as well as dependable deliveries.

Start by making an appointment with buyers to find out what they need. Be sure to bring samples whenever possible, as well as a list of what you expect to grow and harvest during the current season. Ask about their packaging and labeling preferences and product codes.

Most grocery store cash register technology requires either a PLU (Product Lookup Number) or a UPC (Universal Product Code) on products. The PLU numbers are more common for fresh products sold in the produce department, while UPC numbers are used for packaged products. You can find a complete list of PLU codes at www.plucodes.com, under "produce coding."

Most grocery stores, co-ops and food service departments are on a monthly billing cycle, so be sure to submit invoices in time for their payment cycle. In addition, it's always a good idea to have the receiving clerk to sign for the products when you deliver them.

To increase sales at local stores, create signage that promotes your farm with pictures. A colorful logo helps tie it all together. To get an inexpensive logo, do a web search for "logo design." Talk to the produce manager at grocery stores about sampling, as in-store demos can increase sales substantially.

If you're seeking a larger market for your crops, consider becoming part of the booming "buy local" movement. It's an opportunity you can't afford to miss!

Farmer's Markets: For most small microgreen growers, the local farmer's market is the best place to sell your microgreens to individuals, as they have both the money and the curiosity to try new products. Best of all, selling direct at the market allows you to cut out the middleman and receive full retail prices for your microgreens. Here are a few tips for successful selling at the market:

If you are just getting started and have a limited selection of items to sell, such as just a few varieties of microgreens or one or two microgreen mixes, partner up with another vendor who sells non-competing products.

Talk with customers. Shoppers at the farmer's market want to know the people behind the crops, so it's important to get to know your customers.

Display easy-to-read signs. Customers want to know what you have for sale and how much it costs. Many prospects will not stop to look closer if there are no posted prices, or they are hard to read.

Keep it simple. Your goal is to focus a customer's attention on your products, so minimize distractions.

Charge fair prices. By doing so you can ensure your customers will be satisfied that they received good value for their money, and will be back to buy more.

Have a signup sheet. To get customer's email addresses, so you can stay in touch. This allows you to let them know about special sales or new products.

Keep your money safe. A farmer's market is a friendly place, but all that cash might attract a thief looking for an easy score. Keep your cash box secure, and never leave anything larger than a $10 bill in the box. If it's bigger than a ten, put it in your pocket or other safe place.

Boost your sales by accepting debit and credit cards. With the growing number of mini-terminals you can attach to a smart phone, it's never been easier to accept plastic. Sure, you'll pay a small fee on each sale, but surveys have shown accepting debit and credit cards can boost the average sale by a whopping 25-30%! That's especially true with microgreens, as they are not essentials, like potatoes and broccoli, but impulse purchases.

Liability insurance. Most farmer's markets spell out their requirements for vendor insurance. Check with the manager of your local market or some of the vendors to find out what is required and who they recommend, as it's a specialized area that most regular insurance agents do not handle.

Farmer's markets are perfect for new growers, as they bring the grower together with prospective customers who are ready to spend money, teach you how to interact with people, and bring cash sales that you can spend now.

The Magic of Free Samples: One of the most successful marketing companies in the world is Proctor & Gamble. We've all used their products many times, often several in the same day! We get up in the morning and brush our teeth with Crest toothpaste, shower with Pantene shampoo, shave with a Gillette razor. Then toss a Bounce sheet in the dryer, add Cheer or Tide to the washer, feed the dog Iams or Eukanuba kibbles before leaving for work. When stress on the job upsets your stomach, we take Pepto-Bismol or Prilosec OTC.

Last year, Proctor & Gamble sold over 80 billion dollars worth of personal care, home care and pet products, and they use free samples to introduce their products to new consumers. They know that if a product is good, a free sample is the best way to convey that to prospective users. Proctor & Gamble spends a fortune giving away free samples. Why? Because it works – part of the reason most of their products are best-sellers in their categories.

Giving away free samples works for Proctor & Gamble and it can work for you too, whether you grow specialty crops or make value-added products from your crops. When you give samples away, consider it a marketing expense that is proven to produce future sales.

Consider downsizing your product when giving away samples. Proctor & Gamble does it with tiny tubes of toothpaste and lotion, or mini-packets of laundry detergent. You can do the same. One of the most successful vendors at our local Saturday market bakes two sizes of cookies – a tiny sample size and a large for-sale size. Another uses a mini-clamshell to give away free samples of her micro greens, holding just 1 ounce, and sells the product in 4 and 8 ounce clamshells.

Another grower started doing product demos of his oyster mushrooms every Friday afternoon (a busy shopping day) at the local grocery store, sautéing them in butter with a hint of garlic, and handing the samples out to passing shoppers. In just three months of Friday demos, his in-store sales tripled!

One flower grower has a sign at her farmer's market booth offering a free flower to anyone born in that month. Her sales are up substantially from that simple freebie. Why? Because it's human nature to be more inclined to buy if you feel an "obligation" to someone - such as a flower vendor who just gave you a free flower.

If you produce high-quality microgreens, offering a free sample to prospects is just about the most cost-effective way to prove it. If it's good enough for Proctor & Gamble, it's good enough for you too!

Restaurant Sales: Local restaurants can be one of the best markets for growers who sell high-quality fresh produce such as salad greens, micro greens and herbs. Chefs are willing to pay a premium price if the quality is there.

That's a lesson learned by Dean Okimoto, owner of Nalo Farms in Hawaii. He sells salad greens and herbs to restaurants and hotels, and his premium salad blend, "Nalo Greens," is even featured on the menu at

several top restaurants in the Honolulu area. Dean claims there are only 3 secrets to successfully selling to restaurants and hotels: Top quality, consistency and customer service.

At Nalo Farms, salad greens are cut in the morning, packed mid-day, delivered in the afternoon and on the customer's plate that same night. Dean says, *"Our Nalo Greens may cost twice as much as other mixes, but being same-day fresh, when you plate it up, it will come out to the same price. Ours is fresher, so it has more "fluff." You don't have to use as much. Then when they taste it, it sells itself."*

When you're starting out, your first step should be to locate the restaurants within your "delivery zone" that may be prospects for your fresh grown food. As most restaurant chefs need deliveries two or three times a week, you must consider how far you are willing to drive to handle those orders. You should also remember that a single restaurant will not need as much produce as a grocery store or a farmer's market stand, so factor in your time and overhead to make sure you can make money at the prices you've set.

Ideally, your goal should be a "mini-route" of restaurants, so when you make your delivery rounds, there are several stops that will cut down the overall delivery time to each restaurant. Look for hotels that also have a restaurant, and upscale restaurants. Don't bother with the national chain restaurants, as they are almost always required to purchase through a centralized purchasing department.

After you've made a list of all the possible restaurants in your area, it's time to contact the chef. Call the restaurant and ask who the chef is and the best time to reach him or her. For most chefs, the best time to call is between 9 A.M. and 10:30 A.M. or from 2 P.M. and 3:30 P.M. During the busy lunch and dinner times, chefs will be "on the line" preparing meals and too busy to chat.

Explain to each chef that you are a microgreen grower, and would like to bring in samples of your microgreens. Most chefs will say yes, but some will say they are too busy or not interested. Put those on a follow-up list to contact in a month or two. At that time, mention that chef ABC, at ABC restaurant, has been happy with your microgreens and service, and offer free samples again. Most chefs will say yes the second time around.

When you talk to the chefs, be sure to mention the following important points:

- Your microgreens are fresh-picked, and delivered within XX hours of picking.
- Growing organic? That's a positive you should mention as well.
- Competitive prices.
- High quality local produce, in any quantity he or she needs.

After you've talked to the chef, ask for his or her business! If he says no, ask what it would take to start using your produce on a trial basis. This allows you to address objections, such as pricing or delivery.

A recent report found that produce from mega-farms, which grow 80% of the produce in the U.S, travels 1,500 miles on average from farm to point-of-sale, while locally grown produce travels only 56 miles. Rather than fund the mega-corporations that control the bulk of the food industry, we should be buying local. The "Buy Local" movement is growing like wildfire, and you can participate as a grower simply by selling your fresh microgreens direct to local chefs, who are overwhelmingly supportive of the movement. They too can taste the difference between fresh-picked and "tired" produce, and guess which produce they prefer!

Communication is the key to successful restaurant sales. Growers need to tell chefs well in advance what they have, or expect to harvest, how much it costs and the quantities they can supply.

Chefs expect frequent deliveries, often 2-3 times a week, and count on their suppliers to show up on time with the quantity and quality promised. As one grower said, *"Surprises are for birthday parties."* You may have to fit the deliveries to the restaurant's schedule, showing up before 10 a.m. or in mid-afternoon, when they are less busy.

Ask the chef you work with what they prefer in quantities, varieties, post-harvest preference and how they prefer to place orders. Some chefs like to phone, so they can check what's available, others prefer to email or text message their orders.

In the beginning, discuss payment terms with the responsible person at the restaurant. You may deliver a bill with each order, but most restaurants prefer to pay every 2 weeks or monthly. If you're just getting

started and cash flow is a problem, explain that to the chef or restaurant owner. Most are understanding and will pay on delivery to help out.

If you can deliver fresh, high quality products produced locally, restaurant chefs could be an ideal market for you. They use large quantities of greens, and appreciate growers who take pride in what they grow.

For more marketing ideas to boost your crop sales, read *Sell Your Harvest*, which lists 50 ways to market your microgreens on a micro-budget.

CHAPTER 6

Resources For Microgreen Growers

Growing microgreens is a simple business with low startup costs, yet it is possible to "scale-up" rapidly to meet increased demand from customers. Unlike traditional seasonal farm crops, which require advance planning, acres of land, and expensive tractors and other equipment, just a few hundred dollars worth of equipment and supplies can produce a crop, often in just a few weeks.

Many microgreen growers started out supplying just one restaurant and expanded their production tenfold in less than a year. Because the equipment required is inexpensive, expansion costs can often be covered by current profits.

In this chapter, you'll learn about the best resources to help you learn more about the business, as well as all the essential suppliers. Most of the suppliers listed here offer wholesale/bulk pricing for the equipment and supplies needed by microgreen growers.

Videos

There is an abundance of videos on YouTube™ to show you the basics of growing microgreens. Here's a list of my favorites:

1. Westhaven Farm, a CSA in New York, grows microgreen salad mixes for its members. This video is a wonderful introduction to the world of medium-scale microgreen growing, covering seeding, growing and harvesting. http://www.youtube.com/watch?v=JA8p5IT91H8.

2. Charlie Crawford operates CC Gardens, an indoor microgreen growing business in the Nashville, Tennessee area, supplying 13 area restaurants with fresh microgreens. Here he talks about what it takes to grow indoors. http://www.youtube.com/watch?v=apZ_RyAve7A.

3. University of Florida researcher Bob Hochmuth explores microgreen trends. http://www.youtube.com/watch?v=qP3JFREeULg&feature=plcp.

4. Another University of Florida researcher, Wanda Laughlin, shows how to grow and process microgreens, and how to pick the best growing medium. http://www.youtube.com/watch?v=dQU-Cep5af0&feature=plcp.

5. Restaurant chef Jonathon Stranger visits grower Galt Ormiston, who grows microgreens and popcorn sprouts in a modest greenhouse built in the backyard of his suburban Oklahoma City home. http://www.youtube.com/watch?v=Kbl2n8lmVuE.

6. In South Africa, the Ubuntu Living Show produced this video on growing sunflower microgreens, which can be up to 30 times more nutritious than other greens, and are often called a "superfood." http://www.youtube.com/watch?v=d7HoEBM9Tbs.

7. Matt Greschke, with Sure to Grow, shows how to grow microgreens using STG pads, which are used by hydroponic and soil-less growers. http://www.youtube.com/watch?v=RsgXEtHMZTk.

8. GrowingMicrogreens has several excellent microgreen growing videos, ranging from hydroponic growing to pH balancing your growing water. http://www.growingmicrogreens.com/instructional-videos.

Seeds

One of the biggest expenses for commercial microgreen growers is seed. Unlike the expensive seeds found in garden seed packets, there are commercial seed specialists, who supply traditional growers with seed. You'll find the price per-pound drops as the size of your order increases.

For example, Eden Brothers sells the popular China Rose radish seeds for $2.99 an ounce or $6.99 for a 4 ounce package, but when you buy a full pound, the price is only $14.99, and a 5 pound sack is only $11.99 per pound. Here is a list of several microgreen seed suppliers. Most of these companies also sell a full range of seeds, from vegetables to flowers, so be sure to look for specific microgreen varieties at their web site.

- Condor Seed (www.condorseed.com) is a large producer of seed, and sells only through selected distributors worldwide. Here's how to order their microgreen seeds. First, visit their web site, and review their list of microgreen seeds. Next, contact their distributor, Corona Seeds Worldwide (www.coronaseed.com) for a price quote or a current price list of microgreen seeds.

  One of the most interesting Condor blends is the Calico Mix, a unique blend of green, white, red, gold and magenta Swiss chards. Two other hard-to-find varieties are the Golden Sunrise Swiss Chard, with golden yellow stems, and Magenta Sunset Swiss Chard.

- Eden Brothers Seed (www.edenbrothers.com) stocks a wide variety of microgreen seeds, including many heirloom varieties that are hard to find.

- Growing Microgreens (www.growingmicrogreens.com) is a great resource for new growers, as the growing instructions and instructional videos are helpful in learning the basics. They sell over 40 microgreen seed varieties in 4 ounce sampler packages, so new growers can experiment with new varieties without spending a lot on seed.

- High Mowing Seeds is an organic seed specialist, and offers a variety of microgreens, including many hard-to-find and unique varieties. http://www.highmowingseeds.com/organic-micro-greens.html.

- Johnny's Seed is the closest thing to one-stop shopping for small growers online, with a wide range of seeds, equipment, tools, videos and more. They carry almost 50 microgreen seed varieties, including two of their own blends, the Mild Micro Mix and the Spicy Micro Mix. http://www.johnnyseeds.com.

- Mountain Valley Seeds stocks all the major microgreen seeds and is adding new ones all the time. They have both organic and non-organic seeds, so you can compare pricing. This is sometimes an eye-opener, with some organic seeds costing double their non-organic cousins. They have grouped their seeds into beginner, intermediate and advanced, based on growing difficulty, which is helpful for new growers. http://mvseeds.com/store/categories/Microgreens.

- Todd's Seeds sells bulk organic vegetable seeds at wholesale prices, and has an excellent selection of varieties suitable for growing microgreens. The current online catalog does not have a separate sections for microgreens, so you'll need have a list of the specific seeds you want. http://seeds.toddsseeds.com/bulkvegetableseeds.

Microgreen Growing Equipment Trays

- A.M. Leonard has been selling nursery supplies since 1885, and carries the standard nursery flats in both no-hole and hole versions, at prices far below most of the other online suppliers. To get the wholesale prices, you must buy in wholesale quantities of 100 trays/flats. If you just need a few, check with a local nursery or grower's solution, the next listing. http://www.amleo.com/to-plastics-standard-flat-with-holes/p/710245/.

- Grower's Solution carries the standard 1020 nursery trays as well, selling them in any quantity you need. In addition, they sell the Perma-Nest trays and humidity domes, a heavy-duty plant tray that will last for decades. http://www.growerssolution.com/page/GS/PROD/PermaNest.

- If you are growing small batches of microgreen varieties for custom orders, such as a particular chef's blend, keep a few "half-trays" around. They are 11" x 11" and two fit in a standard tray. They are hard to find, but Seed & Garden has them in stock, as well as Home Harvest Supply. http://www.seedandgarden.com/shop/categories/plastic-trays/ http://www.homeharvest.com/jiffyr-half-flat.html.

Soil-Less Pads

Many growers, especially those who use a hydroponic system for microgreens, use heavy-duty untreated burlap, cut to the width of the growing channel, for their grow pads. Two sources for that:

1. http://www.onlinefabricstore.net/landscape-and-garden/landscape-garden-and-nursery/burlap-and-burlap-bags.htm?N=7531.
2. http://www.amleo.com/plain-burlap-liners/p/VP-BL-UR/.

Sure To Grow™ is a product made from recycled plastics which can be used as a substitute for soil or burlap in microgreen trays or hydroponic production units. Its wicking ability allows it to hold an amazing amount of water, which can help keep microgreens well hydrated while they are growing. The folks at STG have almost 50 videos about their products and how to build simple hydroponic systems. Here's a link to their YouTube channel: http://www.youtube.com/user/SureToGrowers/videos?view=0.

Grow Lights

Hydrofarm makes a light/stand combination called the "Jump Start" system, (JSV4) using a single T5 grow light. It can be used for two flats of microgreens or other plants, and has a height adjustment for the light. This is a perfect unit for anyone wanting to try growing microgreens indoors without spending a lot of money. You'll find it discounted at www.Amazon.com and at most retail hydroponic stores.

Hydrofarm also makes a series of T5 fluorescent fixtures, designed for indoor growers, called "Envirogro," which are ideal for microgreen production. The combination of energy efficient, high-output T5 bulbs and aluminum reflectors produces which double the output of normal fluorescent lights.
http://www.hydrofarm.com/catalog.php?category=19&selbrand=243.

You'll also find the Envirogro lights discounted at www.Amazon.com.
http://www.amazon.com/s/ref=bl_sr_lawn-garden?_encoding=UTF8&field-brandtextbin=EnviroGro&node=2972638011.

Propagation Mat

To speed up the germination of your microgreen seeds, use a propagation mat to provide heat from below. Hydrofarm makes an inexpensive rugged unit that uses very little electricity – about 17 watts for the smallest size, which is just right for a single 1020 tray. When your production needs grow, you can use the larger propagation mats, capable of handling several trays. Although I've included the Hydrofarm link below, you may find the same item, discounted, from a hydroponic store or at www.Amazon.com.
http://www.hydrofarm.com/product.php?itemid=3347.

Fertilizer

Liquid seaweed is the fertilizer used by most microgreen growers. The kelp seaweed contains an abundance of minerals, trace elements, amino acids, vitamins and plant growth hormones. By using kelp fertilizer, microgreens will be healthier, more vigorous and less susceptible to disease, drought and insects.

Spraying the microgreens, commonly called foliar feeding is the most effective way to use any seaweed fertilizer. My favorite kelp fertilizer is SeaCom-PGR, from Saltwater Farms. It is a liquid concentrate that is much more concentrated than most, so you only need to use 1 teaspoon per gallon of water. http://saltwaterseaweed.com/store/.

Scales & Scissors

When you are spending time every day cutting and weighing microgreens, you simply have to have quality equipment. For cutting microgreens, my favorite scissor brand is Fiskars, for quality and durability. Here's a link to the Amazon page for their stainless steel razor-edge scissors, an affordable choice for growers. In addition, Fiskars makes two very affordable sharpeners for their scissors. http://www.amazon.com/Fiskars-175800-1002-Razor-Edge-Softgrip-Scissors/dp/B00168A08C/ref=pd_bxgy_ac_text_y.

An accurate scale is essential for weighing microgreens before packaging. A scale that weighs in tenths of an ounce (0.1oz) is best, as microgreens are often sold in one to four ounce packages and a larger calibration than tenths won't provide the necessary accuracy.

Kitchen Scales, an online seller of scales, carries hundreds of different scales, including several that measure in tenths of an ounce. The American Weigh HB-11 Kitchen Bowl, at their web site, is ideal for weighing microgreens, and is quite affordable. In many areas, a *Legal For Trade* scale is required, so be sure to check local requirements before purchasing a scale. Kitchen Scales also has hundreds of those, although the prices are much higher.
http://www.kitchenscales.com/product_info.php?cPath=50&products_id=635.

When it's time to package your microgreens, clear plastic containers are the best for displaying those fresh picked, appetizing little plants. I've located a source for plant-based clear plastic containers that are both renewable and compostable. The manufacturer uses 100% recycled materials to make the containers.
http://www.ecoproductsstore.com/portion_cups.html.

In small quantities, it is more economical if you print your own labels for the microgreen containers. Fortunately Avery, the label people, have a web site that allows you to design your labels online, then save the design so you can print labels on your computer printer anytime you want. http://www.avery.com/avery/en_us/.

If you don't have a color printer, or need a larger quantity of labels, you'll find dozens of online print shops happy to print your labels. Just do a web search for "printed labels."

Hydroponic Microgreen Systems

As the popularity of microgreens has grown, several companies have developed small-scale commercial growing units to produce microgreens more efficiently, and in larger quantities than are possible using individual trays and soil.

CropKing™ sells a simple rack system that stacks growing channels to allow more production in less floor space. It can be used without supplemental lighting if there is adequate sunlight, or grow-lights can be added for indoor growing. To learn more, contact CropKing.™ http://www.cropking.com/onerack.

American Hydroponics also sells an 11 tray table system that provides 30 square feet of growing area. It uses a hydroponic flood & drain setup, and can also be used indoors or outdoors. http://store.amhydro.com/412-812-Propagation-Systems-p/ad94033.htm.

If you prefer to build your own hydroponic microgreen system, you can purchase the extra-wide channels (80mm x 225mm in several lengths from CropKing, or FarmTek: http://www.farmtek.com/farm/supplies/cat1;ft1_fodder_systems;ft1_nft_channel_systems_5.html.

CHAPTER 7

How To Build The "Microbox"

One of the biggest challenges facing new microgreen growers is how to master growing techniques on a large enough scale to make some money while learning the essentials of commercial growing. Some newbies, who are blessed with more money than sense, rush out and spend thousands on equipment they don't know how to use, without any customers for the greens they hope to produce.

Most of us can't afford a large, complicated setup, but still need to learn how to grow at least the popular microgreens, and find that all-important first paying customer. To help with that challenge, I designed and built the "microbox."

With the microbox, you can grow almost anywhere, anytime, as it is an indoor unit that takes just four square feet of floor space, costs around $200, yet can produce as much as 20 pounds of microgreens a month.

With microgreen prices over $20 a pound, the unit can pay for itself quite quickly.

You can assemble the microbox with simple hand tools, or speed up the process with just an electric driver/drill. Not counting paint drying time, mine took about four hours to build. Here's how to build yours:

The microbox uses just one sheet of ¾" exterior plywood, either AC or BC grade will work fine. The exterior plywood uses waterproof glue, so the moisture from your growing greens will not cause it to delaminate. As most growers do not have a table saw, buy your plywood from either Home Depot, Lowes or a full-service lumber yard that has a panel saw for ripping plywood.

Have the person in charge of cutting rip the plywood in half lengthwise, into 2 – 24" x 96" pieces. Next, rip one of those long pieces into 2 – 24" x 48" pieces, which will be used for the sides of the microbox. Next, rip the other long piece into 4 smaller pieces – 2 each 24" x 24" and 1 each 25-1/2" x 24." The 25 -1/2" piece will be used for the top, and the 24" x 24" pieces will be used for shelves. There will be 1 leftover piece, which will be used as a stiffener for the back of the microbox.

While you're at the lumberyard, pick up a gallon of white latex exterior paint (for one primer coat and one finish coat) and a pound of exterior grade 2" wood screws. Either #7 or #8 diameter will work well. If you are using nails rather than screws to assemble the box, use 7d galvanized nails, and glue the joints. Also, grab an emergency/survival blanket, which Home Depot stocks. You can also find them at any sports store, such Cabelas or REI.

Start the assembly flat on the floor, attaching the two 48" sides to the 25-1/2" top. Next, attach the shelves, spacing them 16" apart. Finally, attach the "leftover" piece to the rear, tight against the lowest shelf. This will leave a gap at the bottom, and stiffen the entire unit to prevent swaying.

Tip the entire microbox upright on top of a sheet of plastic or painting tarp, in preparation for painting. Using a brush or roller, apply two coats of paint to the entire box, allowing drying time between coats. The surfaces will be smoother if you lightly sand between coats with a 120X sanding sponge to remove the burrs.

After the second coat has dried, lightly sand the edges to remove any burrs. Then, cut the emergency blanket to the same size as the back of the microbox, about 26" by 48." Staple the mylar to the back at the top and the bottom only, so you can thread electrical cords through at the sides. I use push pins, to make it easier to install.

Some growers have used the leftover mylar to make a matching reflective cover for the front of the microbox, but I've found it gets in the way, and does not make a noticeable difference in germination or growth rates. If your microbox is in an unheated space where the temperatures got below 45 degrees, try covering the front to retain heat.

The aluminized mylar used for the survival blanket does a great job of reflecting light and heat, which improves the efficiency of the lights in the microbox.

Next, move the microbox close to its final location. Is there an electrical outlet nearby that can be used to power the lights and the propagation mat? It's always best to avoid using an extension cord, but if you need to, be sure to use an extension cord rated above the amperage of the equipment you plan to use it for.

We're almost done! Time to install the fluorescent lights for the microbox. I have used both the Envirogro 2 – bulb units (FLT22) and 4 – bulb units (FLT24) from Hydrofarm with success. Because more heat is generated from the 4 – bulb unit, it should be mounted tight against the top of the upper growing chamber. I used 2 – 2"x2", screwed into the sidewalls of the box and low enough for the light unit to simply slide in place. If you use the 2 – bulb unit, you can use the hanging wires supplied with the unit.

When starting out, I recommend you use the lower of the two growing chambers for starting seeds, which does not require a light, just a propagation mat. When the seeds have germinated, move them to the upper growing chamber, where the light is mounted.

When you are ready to boost production, seeds can be propagated on the lowest/floor level of the microbox. Adding a second light, so you have fluorescent fixtures in both growing chambers, allows you to double your production. For even more production, add a hanging light above the top,

which allows you to add 2 more trays of microgreens, for a total of 6 trays for growing.

A basic mechanical or digital timer, plugged into the wall outlet you use for your lights, allows you to set the light cycle for optimum growth, typically 14 to 16 hours per day.

Plan on watering your microgreens twice daily. As they are delicate plants, a pump-up sprayer bottle is best to avoid knocking them down when spraying. Here's a link to several affordable sprayers:

http://www.greners.com/i/pumps-irrigation/sprayer-bottles.html.

The space under the two growing chambers can be used to store supplies, such as extra trays, humidity domes, fertilizer, potting soil and seeds.

It is very helpful to keep a small notebook handy to record notes about your microgreens. For example, I note the date a variety was planted, the date it germinates, and the date it is ready to harvest. This varies from variety to variety and from season to season, so this information is valuable for future planning.

Microbox Materials List

- 1 sheet ¾" AC or BC exterior plywood (Not OSB).
- I pound 2" exterior wood screws (or 7d galvanized nails).
- 1 gallon white latex exterior paint.
- 1 reflective mylar emergency/survival blanket.
- 1 or 2 24" T5 fluorescent lights – Envirogro FLT22/FLT24 or equal.
- 1 plug-in digital or mechanical timer for lights.
- 1 Hydrofarm 9" x 19 ½" propagation mat.
- 1 pump-up misting sprayer.
- Trays and potting soil.

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