

ROAST YOUR OWN COFFEE • GROW MICROGREENS & SPROUTS  
GROW YOUR OWN MUSHROOMS • SETUP A HOME HYDROPONICS SYSTEM • AND MORE!



# KITCHEN:DIY



PROJECTS  
FOR ANY  
SIZE SPACE!



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Living in urban and then suburban green design neighborhoods for the past 14 years means that we have always worked within smaller spaces. Small homes, small yards. Even after moving to a larger home with a bigger yard to accommodate our family, we are still under the national average of .35 acres (2013) and square footage of 2600 square feet (2014). We do this intentionally, to save resources, have less lawn, and economize on our energy and water usage. But that combined with common HOA rules means we don't have a lot of extra leeway to homestead our lives. We do grow our own fruit and herbs and vegetables - we integrate our lawn and landscaping with natives and perennial fruit and we have a community garden plot in our small outlying city. But we also bring some of the DIY inside. Whether you live in an urban apartment, a suburban home or even if you are living in the country on your lovely acres, you may want to grow microgreens inside or grow mushrooms! In these pages we show you a few things we have done to produce more of our own food and remain more environmentally sound at the same time.



It is pretty satisfying to roast your own coffee, or to cut a whole tray of microgreens when it is snowing outside. Some things can be more complicated, but there are many things we can do which are not only fun and very satisfying to accomplish, but also not too hard or time consuming. We like projects that interest our growing kids too and these are definitely fun and the whole family can participate.

Here are a few great projects to get you rolling:

Grow Your Own Mushrooms

Grill with Natural Hardwood Charcoal

Roast Your Own Coffee

Setup a Hydroponics System to Grow Culinary Herbs and Veggies

Grow Sprouts and Microgreens

Happy DIY'ing!

# 1

## grow your own mushrooms

Mushrooms are a versatile staple that no kitchen should be without.





When planning crops to make your homestead or garden more self sufficient, don't forget about mushrooms! Mushrooms are not difficult to grow, and there are many mediums and ways to grow them, no matter if you live in a city apartment, or on a few acres with a wood lot.

Mushrooms have been celebrated for centuries as a good source of nutrients. They are rich in B vitamins such as niacin, pantothenic acid, folate, riboflavin, and thiamine, and they are a vegan source of vitamin D. Mushrooms also contain potassium, copper, iron, phosphorus, and selenium. They even have antioxidant properties!

Mushrooms are a versatile staple that no kitchen should be without. They give rich flavor to sautéed vegetables, eggs, and baked casseroles. Mushrooms impart rich earthiness to soups and stews. They can even be grilled on the bbq. Mushrooms are great fresh or dried, making them a fantastic winter staple.

Growing mushrooms involves a few key pieces. The spawn is the part that carries the mycelium of the mushroom, and from where it grows – like a seed produces a plant, the mycelium produces the mushrooms. The substrate is the medium, such as logs, straw, compost blocks, spent coffee grounds, or wood chips. This me-

dium allows the mycelium to spread throughout and then grow. Mushroom spawn and equipment growing companies will offer many types of spawn and mediums, as well as kits, which have all of your supplies ready to use.

Tabletop kits are an example – they come with the mycelium in a medium ready to grow. You follow simple instructions and they grow! It is satisfying to watch a few pounds of mushrooms grow on a small box or bag. As they mature you simply harvest them as you go. And often you can get multiple harvests from one block.

For those who have a yard with some tree space you can grow mushrooms from spawn, which can come in many forms, such as plugs, sawdust, thimbles and pegs. You can grow directly into stumps, logs, or even compost, providing you with an outdoor crop as big as you need for your family, or more to sell at the farmer's market. You just need to inoculate your logs/compost/woody spot with the spawn and follow the information provided with your materials. Whether you have a woody area on your property or just a good partly shady spot for some logs, you can grow outside. Autumn is the perfect time to start outdoor mushrooms – shiitake, oysters, wine cap, lion's mane, and maitake are just a few to start in the fall.

Mushrooms also do well in any cool, moist and humid environment, meaning you can grow them inside your home all winter long, perfect for those of us who live in town, want to continue to grow food in the winter, or want the fun and convenience of growing something right on the dining room table.

Many mushroom suppliers have tabletop kits these days for those who want to grow inside or who have limited space (all of us city/suburb dwellers!). All you need is a cool spot, the kit, and a spray bottle to keep it moist.

There are many types of mushrooms that work for home tabletop systems.

Be sure to visit your local gardening center - many have grow your own mushrooms starter kits!

**Shiitake** - Shiitake mushrooms have a very intense mushroom flavor with a deep earthiness. They are delicious in soups and stews, baked or even in salads - and are great when dried.

**Oyster** - Oyster mushrooms are fast growing repeat cropping mushrooms, which are great for eating. Oysters have a mild flavor and texture, and are nice sautéed. There are many types of oyster mushrooms you can grow!

**Lion's Mane** - Lions mane are big pom-pom mushrooms that have a wonderful crab like flavor and are great baked with some butter or olive oil, with pasta, or even over salads.

**Crimini and Portobello** - Crimini are baby bella mushrooms, which have the nice meaty mild flavor of a portobello with a smaller size. These mushrooms have a rich earthy taste and are fantastic in most uses, and can produce multiple crops with good-sized mushrooms.

**Reishi** – Reishi are a bit different than the others, in that it is also used to make tea. Reishi has been consumed in China for a long time, and is used like an adaptogen, helping the body regulate stressors and improve immune function. While the flavor is quite intense (to put it mildly), growing it can be fun, and you can make your own teas and tinctures from your crop!

Of course there are many more types of mushrooms - find your favorite and give it a shot!

## Preserving Mushrooms

When you grow a nice crop of mushrooms, how do you store them? They store well in the fridge in a container that keeps them cool and dry with some air circulation. Many types of mushrooms also dehydrate nicely, so that you can store and use throughout the winter.

### *How To*

Drying mushrooms is fairly simple. You want to start with clean dry mushrooms. The nice thing about many tabletop systems is that they are generally clean already when you pick them, so no need to wash. If you are growing outside or in a different loose medium, clean the mushrooms first and pat dry.

Remove any woody stems. Oysters have softer stems, but different mushrooms such as shiitake have thicker, courser stems, which become woody when dried.

Slice mushrooms into even strips. Not too small, but if you try to dry whole, it can take a lot longer and you may end up with some parts which are not safely dried.

### ***Oven Drying:***

You can place the pieces on a sheet of parchment on a cookie sheet if you are drying in an oven.

Turn the oven on to the LOWEST setting, and keep the door cracked open to allow all moisture to escape.

The aroma varies by mushroom type, so you may want a house fan on if you are oven drying a stronger type.



Turn after 30-40 minutes, and continue drying on side two.

Make sure your mushrooms are dry before cooling fully and then storing in an airtight container. Dry time can vary based on how big your mushrooms were and what type, but let go until fully dry.

### ***Dehydrator drying.*** (Preferred method)

Place your clean sliced mushrooms on your dehydrator sheets.

Dry at 110F/43C until they are full dried (4-8 hours depending on thickness and type of mushroom).

Let cool completely before storing in an airtight container.

To rehydrate dried mushrooms, pour boiling water over them in a heatproof bowl or in a canning jar. Let them soak for 20-30 minutes. You can drain them (save the liquid for soups, stews, or stock) and slice them to use as you would fresh mushrooms in your recipe.



### ***Creamy Mushroom Soup***

#### *Ingredients*

600 g mixed mushrooms (shiitake & oyster shown) sliced

3-5 cloves of garlic, diced or grated

1 onion peeled/diced

olive oil for the pan

1 tsp dried thyme

1 tsp dried sage

1 tsp turmeric powder, or fresh grated

1 Tbsp miso paste (such as brown rice)

1 liter/quart vegetable or chicken stock

sea salt

fresh black pepper

100ml/0.5 cup coconut milk (or your milk of choice)

#### *Instructions*

Drizzle a nice amount of olive oil into a large saucepan and heat.

Add your diced onion and garlic to the pan, and sweat until softened.

Add your chopped up mushrooms to the pan, stirring to get them to soften and cook with the onions and garlic.

Add your dried ground thyme, sage, and turmeric.

Stir frequently until everything has been coated and mixed with spices, oil, garlic, and onion.

Add your stock and miso paste to the pot and bring up almost to a boil.

Immediately lower heat and simmer for 20-30 minutes.

Stir a few times.

Use an immersion or tall blender to whiz the soup until smooth.

Pour back into pan if you used a standing blender, and add salt & freshly ground pepper to taste.

Add in the coconut milk (or your “milk” of choice) and stir.

Serve warm with a drizzle of fresh olive oil and some freshly ground black pepper.

Mushrooms are a fantastic addition to your winter crops. You can grow a great variety right in your own home (or in your yard the rest of the year!), adding a nutrient rich, flavorful food to your pantry!



# 2

## grill with hardwood

Besides being environmentally friendly and making your grilled food taste brilliant, natural hardwood charcoal can be made locally, so it's a great option to support your local economy!





Spring through fall is the time for grilling and for many, this means filling gas tanks or the smell of lighter fluid. But, it doesn't have to be all that. For all the supposed convenience of modern day grilling, it can be easier and more enjoyable to go back to basics, and help the planet as well. Thanks to likeminded individuals and companies, it's never been easier!

First, let's think about size. How big is your grill? Do you ever hesitate to light it up because it's too much work? Not worth the effort? You might have too much grill. When nearly every fair weather day is a good day to grill, you'll soon find that only a small number of those times involve entertaining a large crowd. So do yourself a favor

this summer and grab a small grill, call it your 'daily grill'! These table top grills use less fuel, require less cleaning and maintenance, and make your food taste just as delicious! Be sure to find one with ventilation holes in the bottom or sides.

Next, let's talk about fuel. Charcoal has long been the fuel of choice for grilling enthusiasts because of the flavor it imparts on the grilled food. Unfortunately, starting briquettes can be frustrating without using starter fluid or other chemical additives in the charcoal and this often ruins the grill flavor you were hoping for to begin with.

Thanks to some basic ingenuity, we don't need to fuss about anymore to get a natural charcoal flavor. All you need is a starter chimney. These come in a variety of sizes, most often for large/regular-sized grills, but hunt around and you'll find one for a tabletop grill, often where tabletop grills are sold.

### ***Working with hardwood charcoal.***

1. Fill the bottom of the chimney with crumpled up paper (repurpose old newspapers or junk mail!). You can use old cardboard boxes and create cylinders of cardboard to jam in the holes between the bottom and top of the chimney, the paper below lights the charcoal easily, which burns longer and lights the charcoal without fail!
2. Fill the top of the chimney with natural lump charcoal
3. Remove top grill (cooking surface), set chimney inside
4. Light paper at bottom
5. Charcoal is ready to dump into grill basin when top chunks are ash grey in color.
6. Carefully dump chimney into grill basin and place top grill over.
7. Wait a couple minutes for grill surface to get piping hot for the best grill marks

Your choice of charcoal matters! These days, standard charcoal briquettes are manufactured with compounds and materials that are cheap and often impact the food's taste. In recent years, many companies have started offering all natural hardwood charcoal - quite literally, what charcoal was meant to be. This charcoal lights easily in your chimney and imparts no flavors other than that of burning charcoal.



***Besides being environmentally friendly and making your grilled food taste brilliant, natural hardwood charcoal can be made locally, so it's a great option to support your local economy!***

Right size your grill for daily enjoyment, grab your chimney and hardwood charcoal, and enjoy the smoky flavors with everything from veg to kabobs to fish and more. And don't think grilling is only for summer - depending on your climate (and sense of adventure) you can grill most of the year, even with a bit of snow on the ground. Let your imagination run, there isn't much that won't taste better with grill marks.

# 3

## roast your own coffee

Roasting coffee isn't hard, and it's an activity you can spend years enjoying





For many, the morning's first sip of coffee is enough to mark the beginning of a fantastic day. For some, the first sip is a milestone from a previous day's work, both uplifting and gratifying. You don't have to be a coffee snob to enjoy good coffee, and roasting your own coffee isn't an activity reserved for some quirky coffee clique. Roasting coffee isn't hard, and it's an activity you can spend years enjoying. Finding fair trade, delicious green coffee beans, last touched by proud farmers and families in Ethiopia, Costa Rica, Guatemala, Columbia, and others is gratifying and helps support the burgeoning economies in these often ill-served areas.

## Roasting Coffee

You'll be roasting whole bean coffee, so you'll need some non-roasting related gear to make your coffee: a coffee grinder & your coffee maker of choice.

No matter what kind of coffee drinker you are, roasting a batch of your own coffee can be a fun and rewarding adventure. Maybe you'll just do it once, maybe you'll love the experience and delicious outcome that you'll want to do it again. Either way, all coffee roasting starts from the same place: green coffee beans. Here's some brief coffee history. Native to the region in and around Ethiopia, coffee grows as a fruit, similar to a cherry. A fair amount of processing is completed before it leaves the area where it's grown. This processing yields the green coffee bean that we use to roast our coffee. In Ethiopia, there are over 1,000 varieties of the coffee plant, each yielding different types of beans that express different characteristics in the final coffee. Throughout the world, however, there are many fewer varieties grown, customized to the climate and soil of the region. As near as we know, all coffee varieties originated in the area of Ethiopia. For buying

beans to roast, the two families that dominate the coffee varieties are Arabica and Robusta. Of these, the majority of coffee you've probably had is of the Arabica variety, and this is the type of green coffee bean you'll be acquiring as well.

## Taking Notes

No matter the roasting method you choose, keep notes of your roast variables. Here are some things to track every time you roast:

Green coffee bean mass (in grams)

First crack time (minutes:seconds)

Time pulled from oven (minutes:seconds or seconds after first crack)

Cool time until beans reach warm temperature (minutes:seconds)

Roasted coffee bean mass (in grams)

If you roast to second crack, take note of when second crack started as well.

Your degree of roast correlates closely to the percentage of mass lost, from green to finished roast. If you don't lose too many beans while cooling, subtract the finished mass from the initial mass and divide that by the beginning mass.

$$\frac{m_{start} - m_{end}}{m_{start}}$$

For example:

$$\frac{150g - 130.5g}{150g} = 0.13 \Rightarrow 13\%$$

If you want to track as many variables as you can, take note of the ambient temperature and humidity when you roast as well, as this impacts the state of the green coffee beans when your roast begins as well as various factors through the roasting process. Roasting ocean-side with ample humidity versus in an arid desert with minimal humidity will yield different results when following the same roasting profile.

## **Finishing**

When you've finished your roast and cooled your beans, the beans need to breathe before making coffee.

Depending on how dark you roast, coffee will need a minimum of 4-6 hours, up to a day to release gases developed during roasting. You will need to store them in an airtight container, preferably with a release valve. The valve allows the gases escaping from the roasted beans to leave the bag, but prevents any air from entering the bag. Any place that sells green coffee beans will have suitable coffee bags, and some will carry glass containers as well.

We'll cover three types of roasting: oven roasting, pan roasting, and automatic roasting. Find one that suits you and try it!

### ***Oven Roasting***

***Level: beginner***

***Time: 20-30 minutes***

Easily the most accessible way to roast coffee, oven roasting requires only things you already have.

Preheat oven to 260°C/Gas Mark 10/500°F

Open a window and turn on the exhaust fan near your oven to provide adequate ventilation - roasting the beans

will produce some smoke and without effective ventilation you'll set your smoke alarm off.

150g (1 cup) fair trade green coffee beans

Baking sheet (perforated is best)

1-2 medium or large sieves

Stopwatch or timer (the timer app on your smart phone works great!)

For the most reliable, reproducible results, use an oven thermometer to ensure your oven temperature is accurate. Be sure to wait for your oven to finish preheating to your target temperature before proceeding. Have your sieves on hand - when it comes time to finish your roast, you won't want to be digging around for your sieves, you'll overshoot your desired roast, the end of the roast proceeds very quickly.

Place your beans on the baking sheet in a single layer, and keeping the beans away from the edge of the sheet where they will roast unevenly.

Once your oven is at temperature, sieves are ready, and stopwatch is at hand, it's time to start the roast.

Slide your baking sheet into the oven and start your stopwatch. If you have a clear window, keep an eye on your beans through the window instead of opening the door. Your roast should progress roughly as follows:

2 - 3½ minutes, beans will start to change color, no action

3½ - 4 minutes, beans will start to turn yellow, agitate pan, and bring outer beans to center for even roasting

5½ minutes, beans should start looking light brown, agitate again, if outer beans are getting darker

7 - 8 minutes, listen for first crack, this sounds like popcorn popping (note time)

20 - 30 seconds after first crack, agitate pan around 9 minutes, beans should be popping rapidly, pull just before coffee is as dark as you like (note time)

Just like a steak that finishes cooking while it rests, after you remove it from the grill, the beans will continue cooking by virtue of their thermal mass.

Once you have removed the beans from the oven, MOVE OUTSIDE and transfer them to a sieve and pour from one sieve to another if you have two. If you only have one, agitate the beans in the sieve to cool them, try to flip them in the air if you can manage, to allow the chaff to separate from the beans. Be careful to not lose too many beans, but move quickly to allow the beans to cool.

As soon as the beans are cool, measure the final mass of the beans and record it in your notebook.

### ***Grill roasting***

***Level: beginner***

***Time: 20-30 minutes, plus time to fire the grill***

Who doesn't need another excuse to fire up the grill in the summer? Roasting coffee on the grill is convenient because your roasting space is naturally ventilated and you can multi-purpose your grill time! Setup the grill, roast your coffee, and throw on the steaks!

Start your grill, if using charcoal, setup for hot grilling; if using gas, turn burners to hot.



Prepare your supplies:

150g (1 cup) fair trade green coffee beans

Roasting pan, I use a popcorn popper with an agitator

1-2 medium or large sieves

Stopwatch or timer (the timer app on your smart phone works great!)

Place your green coffee beans in the roasting pan and place on your hot grill. Agitate gently at first, but prepare to agitate more vigorously as the roast progresses. This is why I like the popcorn maker - it's a lot easier on the arm. The roast will progress similarly to above, with different timings, depending on the heat of your grill, the thermal mass of your roasting pan, and other factors such as outdoor temperature and humidity.

Listen for first crack (note time) and start watching the color of the coffee beans closely, pulling from the heat once you're just shy of the darkness you're shooting for (note time). If you're aiming for second crack, be sure to agitate the beans vigorously to avoid burning them. If your roast is progressing too quickly, lift the pan from the



grill slightly, providing more air space between your grill and the pan.

Once you're ready to sieve, pour the beans into the sieve and pass the coffee beans between two sieves to allow the chaff to escape.

As soon as the beans are cool, measure the final mass of the beans and record it in your notebook.

### ***Automatic Roasting***

***Level: intermediate***

***Time: 10-15 minutes***

Automatic roasting involves using a coffee-roasting appliance. While roasting coffee with an automatic roaster isn't difficult and takes less time than the methods above, it requires the investment in a roaster. You should roast coffee manually a few times to make sure this is an activity you enjoy, and especially, that you enjoy drinking coffee you've roasted!

If you're looking for an automatic roaster, you might ask around and see if any of your friends or neighbors has one. Roasters start around \$150US/100£ and go up from there. Pretty much in the price range of a nice birthday gift, one that maybe didn't hit the mark and your neighbor has had it in his closet ever since, being the tea drinker he is. Or maybe you'll find a friend that's been roasting coffee for the past year or two and is ready to move up to a different model roaster that has more options.

Roasters are about as varied as blenders or bread makers and have a variety of options to suit different needs. At it's

most basic, an automatic roaster will have a speed control of some sort (fan or agitator) to control how long the beans are in contact with the heating surface, and heat control to control your roasting temperature. Most will also catch your chaff and then the options go on from there. Check out Fresh Roast, Nesco, Gene Cafe, and Behmor for some of the top brands in home coffee roasting.

When you're starting out with an automatic roaster, follow the roasting directions included before trying anything different - this will give you a feeling for the particular characteristics of your roaster. From there, you can adjust for a darker roast, or varying the temperature profile and duration of your roast to achieve different flavors. One example is below.

Start with 113g (4oz) fair trade green coffee beans.

2½ minutes / high fan / low temp

3 minutes / ½ fan / high temp

2.5 minutes / ¼ fan / high temp

2 minutes / low fan / high temp

auto-cool

This is a 10 minute roast and was the first roast I did at the recommendation of a work colleague, who gave me his automatic roaster to try since he was getting a newer one with more options!

## Cooking with Coffee

No matter how you roast your coffee, there's only so much coffee most of us can drink in a day without driving everyone around us crazy! But, there has to be more to do with coffee, and there is.

### *Coffee Rub*

*{makes enough for 2 steaks}*

#### *Ingredients*

1/8 tsp smoked chipotle

1/4 tsp cumin

1/8 tsp cinnamon

1/2 tsp smoked paprika

1/2 tsp sea salt

1/2 tsp cocoa powder

2 Tbsp finely ground coffee (fresh!)

Large pinch of ground pepper

#### *Instructions*

Blend your entire rub together, and sprinkle generously over 2 DRY steaks. Be sure to get all sides of the meat. Let sit at room temperature with the rub as your charcoal heats up. Place on a hot grill and cook to medium rare, or whatever your preference for steak is. This rub works great with chicken as well!

### *Kitchen Hand Scrub*

Whether you have been digging in the garden, working in the garage, or cutting onions, this hand scrub helps clean hands, removes odors, and provides very rich nourishing moisture. Your hands will feel amazing and soft after using this scrub!



#### *Ingredients*

90mL (3 ounces) coconut oil, melted

1/2 cup spent coffee grounds

1/2 cup sugar

1 tsp vitamin E oil

10 drops mandarin or sweet orange essential oil

8 drops cedar wood essential oil

#### *Instructions*

Mix the blend together very thoroughly. Spoon into a small canning jar or tin that has an airtight lid.

To use: scoop small amount on your hands. Rub all over your hands being sure to get around nails and cuticles. Rinse well with warm water. Feel how soft your hands are!

Roasting your own fair trade coffee will give you an understanding of how your coffee is made. Whether you choose to roast only on special occasions or make it part of your routine, roasting coffee will be an adventure you won't regret starting!

### Acquiring Coffee

One reason roasting coffee is so exciting is the possible variety you have. Never mind how many different ways you can roast the same type of bean, there are an incredible variety of beans available on the market, and they're all very reasonably priced. Quite literally, you can try a new type of coffee every time you buy green coffee beans and not run out of varieties for years. Or keep buying the same or similar variety and try different roasting methods and experiment and tweak for years. It's as varied as knitting and as rewarding as well!

Find a local vendor of green coffee beans if you can, otherwise order online. If ordering online, read the reviews from other home roasters to determine which type of bean best fits the type of coffee you like to drink. Bright and fruity, rich and dark, or somewhere in between? For your first purchase, buy the smallest package of green coffee beans - it should run you around US \$5/lb. / 7-8£/kg. You can always buy more, but you don't want to be stuck with five pounds of beans that you don't really like.

### Household Tips Using Coffee

It is widely known that coffee has odor absorbing and odor displacement properties. After all, who wouldn't want to smell coffee instead of .. well, a lot of things!

You can place roasted coffee beans or even spent grounds in a bowl in your refrigerator to absorb any unwanted smells that have set up.

Coffee grounds work well in your garbage disposal, as well, taking care of any nasty odors there. Mix the grounds with Epsom salts, baking soda, and essential oils of your choosing for even more punch.

Sprinkle coffee grounds in your garden for fertilizer. You can either supplement your compost or use it directly around acid-loving plants. The grounds are nitrogen rich, which will make plants grow big, but acidic, so they'll inhibit flower/fruit growth, unless the plant needs that. So this works great for herbs and acid loving bushes and shrubs.

The strong smell of brewed coffee grounds will keep ants at bay, indoors and out! Spray with a little water once grounds have dried out to reactivate, or keep spreading freshly brewed grounds every day.

The possibilities are nearly endless. Almost every day you can read of new ways that people have found to use coffee beans, grounds, or spent grounds!

# 4

## setup an ebb and flow hydroponics system

Peas grown at home in an ebb and flow system. Ready to eat!





{Above: Hydroponic Microgreens. On left, seeds on Sure To Grow mat, on right, ready to harvest.}

Growing fresh greens in the winter is a fun and easy way to get started with hydroponics. You've probably seen hydroponic setups online or in stores, always wondering, "How hard is it?" - well, we're happy to report, not very! There are many different reasons people get into hydroponics.

For some, using traditional soil-based growing mediums present health challenges. For example, if you or a family member is allergic to peanuts or tree nuts, the shells of these are often used to add volume to potting soil mixes.

In that case, you would need to be exceedingly careful in what you are buying, and it's very difficult to get information on what exactly is in a potting soil mix. Many of us also live in urban or suburban areas where we don't have a lot of space, and an outdoor garden may be restricted by home owners association rules. Hydroponics is great for all of that!

Of course you might just be curious about hydroponics, wondering as you walk through aisles of hydroponics gear at your garden center. Children are similarly intrigued and think of hydroponics as a science experiment!

These aren't the only reasons to grow hydroponics, of course. Paradoxically, growing hydroponically uses about 10-15% the water that growing traditionally does. In a world with a burgeoning population and diminishing fresh water supply, hydroponics is one answer to an ever-larger problem. Growing your own fresh greens is, of course, exceptionally healthy and imminently local.

There are a variety of different techniques in hydroponics, but all are universally soil-free. The difference is in how the water reaches the roots of the plants, and each technique has its pros and cons. We will describe the most popular hydroponics technique for starters in detail, ebb & flow. Other techniques we'll describe briefly include wick based, nutrient film technique (NFT), deep water culture, recirculating drip, and aeroponics.

Before we jump in, a bit of advice to first-time hydroponics enthusiasts: start small. Even if you're ready to jump in with both feet, you've thought about it, you've set aside room for the hydroponics system of your imagining: start small. Start with a very simple system, at least for one or two harvest cycles, so you truly understand the basics. Once armed with that knowledge - you are ready!

### **Ebb & Flow**

The most basic hydroponics system and the easiest to understand is the basic ebb & flow system. To start, you need only a few things.

- Ebb & flow tray, with drainage channels
- Grow light (more on this later)
- Water reservoir
- Water pump + hose kit

- Programmable on/off timer for pump (optional, but recommended)
- pH meter
- pH down solution (commonly phosphoric acid)
- Plant food
- Seed mat
- Seeds



{Above: Ebb & Flow Basic Supplies}

You can easily start out with a system that, in total, costs less than \$120 (about £70). The most expensive parts will be the pH meter (starts at \$30/£18, can be a lot more!) and the ebb and flow tray itself (about \$60/£35). Trays come in various sizes, some more square than rectangular and the price varies greatly based on material and size. When



picking your tray & water reservoir, remember you are going to have gallons of water being held - if it fails structurally, you're going to have a big clean-up on your hands. Plan accordingly!

Plan in hand, head to your local hydroponics garden center. Everyone's local area is different, and hydroponics aren't as common as hanging flower baskets, but you'll really want to look around for a store in your area.

Because of their large size, things like hydroponic trays and such may be difficult to find online or expensive to ship. Finding an expert on hydroponics at a local store will help with any questions you may have in the future.

The pictured ebb and flow tray fits two standard seed tray flats and uses two 5 gallon (20L) buckets, both to serve as the support for the tray as well as the water reservoir. If your tray is designed for hydroponics, it will typically have two pre-drilled holes or an indication of where to drill your holes. The holes will be where the water flows into the tray via the pump and where the water drains back out when the pump turns off. Some trays, straight off the shelf, will not have pre-drilled holes, if you've found a good garden center, ask them to drill them for for you so you can verify you have the right size fittings for the water hose/screen and drain.

So, once your supplies trip is complete, what's left to do? Assemble, add water, and plug it in! In broad strokes, that's about it.

Assembly consists of setting up your ebb & flow tray where you can conveniently hang a grow light over it. Setup your buckets so that the pump & drain holes are squarely over the bucket to avoid leaks. Attach your pump hose (on end goes to the pump, the other to the in-flow fitting on the tray) and place your pump in the bottom of bucket - most pumps have suction cups to hold them firmly in place. That's it; you've done the hardest part!

Adding water is about as simple as it sounds, but with two additional steps. First, you'll need to add plant food to your water. Note: you only need water in the bucket with the pump - the other bucket is just for support. Fill your water reservoir to within 2-3 inches (5-7cm) of the top and add the recommended amount of plant food, following the instructions on the bottle.

Second, you'll need to adjust the pH - don't fret, even if you never liked Chemistry class, you'll have no problem with this. If you bought a brand-new pH meter, you'll need to make sure it's calibrated. Often, your pH meter will come with a calibrating solution (having a neutral pH of exactly 7.0), if not, you can buy the solution where you bought your meter. The pH meter will provide

instructions on how to calibrate, each meter is slightly different, but the process is universally very quick and simple.

Once you have a calibrated pH meter, you'll need to measure the pH of the water/plant food mixture in your water reservoir. The ideal pH for starting out is 5.8 to 6.0. The first time you measure, you'll probably be at or above a pH of 7.0 - use your pH-Down solution and a dropper to adjust your pH to between 5.8 and 6.0.

Note: your pH will typically “bounce back” after a day. Depending on the type of pH-Down solution you use, this will vary. Many find that when they measure it the day after starting with fresh water & plant food, they have to adjust the pH down again, but then it will be stable for about a week at a time. The general advice is to get in the habit of measuring your pH daily, even if you expect you won't need to adjust it - just make it part of your morning routine, like doing the laundry! This also helps keep the pH meter elements moist, which is important for your meter to function correctly.

Safety Note: your pH-Down solution is typically a VERY STRONG ACID. It is corrosive and can burn skin it comes in contact with. Use a dropper to avoid accidental contact and make sure there are no drips that will come in contact with a corrodible surface (like your counter top!!).

The last step is the most gratifying: turning your system on. A standard programmable outlet timer will do the trick, set to a simple 15x4 pattern - on for 15 minutes, 4 times a day (every six hours). On the traditional dial based outlet timers, you'll make an X with the setting pins. Pick whatever times work best for you - the ebb & flow of the water will make *some* noise, so depending on where your setup is (for example in your dining room

or kitchen!), you may not want it running at certain times. Plug your water pump into the outlet timer. Turn on the timer and you're done!

One thing we haven't covered yet is your grow light, for a couple reasons. First, it isn't strictly speaking exclusive to hydroponics. If you grow anything indoors (seed starting, etc.) you'll need a grow light to replace the sunlight you would get outdoors.

Second, the type of lights you'll need depends largely on what you're growing. If you're growing microgreens and baby lettuces, the type of lights you use really doesn't matter much - you may have used fluorescent shop lights for indoor growing for years - switching to hydroponics doesn't change this. If you start hydroponically growing more hungry plants indoors, like tomatoes, peppers, or





even corn - you'll need far more powerful lights to satisfy their needs.

Finally, the type/size of light fixture you use depends on the size of your tray and what your options are for hanging the light. To start, find a spot to hang a standard-sized two-bulb shop light on adjustable chains so you can raise and lower the light as the greens start growing.

Once you've gotten your setup running, it's time to grow! The mediums you can use to start microgreens seeds or starting other types of plants varies, but don't be intimidated. They're all straightforward and they generally work the same way. Each medium has its ardent supporters, mostly because they work well for what that individual specifically enjoys growing. When you're starting out, just about anything will perform equally well.

Tip: your seed trays will float in your hydroponics tray when the water level rises - even though there are holes in your seed tray. Weigh down the tray so the water can penetrate and soak the seeds. When starting microgreens, don't try to fully submerge the seeds - you'll find they float quite well!

The ebb and flow is the easiest setup for a small home setup and the beginner grower. If you are interested in other systems, here is a brief overview of some other systems that might work for your needs!

### **Wick Based**

The wick based hydroponics system is a passive system. A wicking material is partially submerged in the reservoir, wicking the water across the material and staying in touch with the root systems of the plants. This is a very, very

simple system and is especially suited to microgreens. Once plants reach a certain size, though, the wick based system won't be able to provide enough moisture and nutrients to sustain growth.

### **Nutrient Film Technique**

This method of hydroponics relies on constant (24/7) circulation of water to expose the roots to nutrients. This method uses no media or very little media. Many NFT approaches are more DIY in nature than first-timers are ready for, and when you're gluing together your own piping, it can take a while to track down all the leaks!

### **Deep Water Culture**

The deep water culture technique is maybe more what many people imagine for hydroponics. In this technique, the roots are fully submerged, all the time. Instead of relying on a water pump to circulate water, an air pump aerates the water around the roots using an air stone bubbler (commonly found in aquariums). Deep water culture works well for large plants. It is an easy, self-contained system for starters, but isn't as conducive to small plantings such as microgreens or baby greens.

### **Recirculating Drip**

This technique is conceptually the opposite of an ebb & flow system. Instead of pumping the water and flooding the roots, then letting the water drain away, the recirculating drip pumps water to a ring that drips water down from above, working its way to the roots and eventually the water reservoir. Most commonly used with clay pellets, this technique is good for large plantings that require a deeper root system with structural support for



of a higher possibility of failure (clogged nozzles, power outage) and once roots aren't being sprayed any longer, the plant will quickly die, within hours even.

Hydroponics is a fantastic way to grow your own food, no matter what your situation is. Whether you have severe/long winters that make year-round food production difficult or you live in arid climates with restrictions on water usage that make outdoor gardening a challenge.

Hydroponics can also be a great solution to having less space in urban areas, or just wanting to garden on auto-pilot. While you might not be able to step away from your outdoor garden for weeks at a time without weeding and watering, an ebb & flow hydroponics setup can usually care for itself for weeks at a time without suffering any ill effects. Eat local, eat healthy, eat sustainably and have fun!

the plant. Of course, you can adapt it for nearly use beyond that!

### **Aeroponics**

Arguably a field independent of hydroponics, aeroponics is considered the highest level or most advanced of the hydroponics techniques. In this method, water is continually sprayed through fine nozzles against the roots of the plant. It is often used for cloning, but not exclusively. Aeroponics requires close attention because

If you are wondering what foods you can grow as microgreens, up next - grow your own microgreens in soil or hydroponics.

# 5

## grow sprouts & microgreens

*An easy way to start the garden early is to grow microgreens and sprouts indoors.*





One of the most satisfying flavors in spring is found in crispy greens, which might not be abundant yet in the garden or at local markets. An easy way to start the garden early is to grow sprouts indoors. And, if you are not quite ready to jump into the hydroponics system, you can also grow your own microgreens in soil. Both sprouts and microgreens offer dense nutrition, crispy freshness, and a fantastic burst of flavor. Neither need a lot of space to grow!

### **Microgreens**

Microgreens are a fantastic crop to start on your hydroponics journey, or, you can grow them on counter.

To start growing microgreens, you simply need a medium (soil or grow mat), a container with a lid, and seeds. One of the easiest microgreens to grow is sunflower shoots. The crunchy nutty sunflower seed flavor combines with the crunch of a green shoot, which is amazing on salads, sandwiches or atop spring soup.

### ***Sunflower Shoot Microgreens***

#### *Equipment*

Potting container with a lid. You can get the small seed starting trays at your local garden center, or even use a clear plastic salad bar to-go container (clean!!!)

Organic black sunflower seeds (be sure they are organic so the seeds are untreated)

Seed starting potting soil or grow mat

Organic liquid kelp fertilizer (not needed with soil, helpful with a mat - see hydroponics)

### *Instructions*

To start, pre-sprout your sunflower seeds. This is simple – start by soaking them overnight.

Rinse and drain WELL (a sprouting container is great for this). 10-12 hours later rinse and drain well again. Do this rinse/drain cycle a few times until you get a tiny little sprouted tip.

At this point start your container. Add about an inch of clean seed starting potting soil in your tray. If you are using a growing mat, cut to fit in the bottom.

Spread your sunflower seeds in a dense single layer over the top.

Cover very lightly with soil (with a mat, skip this step).

Water your seeds evenly, using a bit of liquid kelp fertilizer if you are using the mat (an ebb and flow hydroponics system will water for you on a timer), otherwise filtered water is OK.

Put the lid on the container and put into a warm place out of direct sunlight - a bright kitchen counter is fine (not dark, just not in direct sunshine all day where the seeds would dry out too quickly).

Check daily and keep moist, but not soggy. The bigger they get, the more water they will need.



The micro greens are ready to harvest when the seedlings have pushed up a few inches and have two fat leaves. Harvest before any additional leaves grow.

To harvest, simply snip the seedlings at the soil/base level, and rinse well in cool water in a bowl, removing any seed husks that might remain on the top, and then whiz in a salad spinner, or drain well in a colander.

Eat within a few days!

***Try other microgreens such as pea shoots, beets, radishes, mustard, dill, scallions, kale, swiss chard, or broccoli! Many seed companies now even package their own blends of microgreen seeds so you can just sprinkle from the packet and have a nice variety in one container.***



## **Sprouts**

Sprouts are another way to easily grow fresh food in the home, no matter the weather outside. You can sprout many kinds of seeds. A few favorites are fenugreek, radish, mustard, lentil, cress, dill, mizuna, mung bean, broccoli, and onion. Many health food shops will have sprouting seeds, which mainly means they are untreated. Be sure to use organic seeds packaged for sprouting.

Two of the easiest sprouts to grow are lentil and radish. Lentils are packed with protein, calcium, and iron, and their mild sweet flavor is delicious. Red lentils in particular are a great sprouting variety. Radishes are also full of vitamins, minerals and protein and have a peppery radish bite in a small green sprout.

### ***Red Lentils***

1 part lentils, 2 parts fresh filtered water

Soak overnight

Drain and rinse, draining very well after rinsing

Let sit 8 hours (be sure not sitting in water)

Rinse and drain every 8 hours for 2-3 days

When the little sprout tail is about 6 mm/ ¼ inch long they are ready!

### ***Radish Sprouts***

3 tbsp. of seeds with 2-3 times as much cool filtered water

Soak overnight

Drain soak water away and rinse well, drain well

Keep out of direct sunlight and rinse and drain well every 8 hours for 3 days.

On the fourth day you can put them into some indirect light to green up, continuing to rinse/drain

They should be ready on day 5 or so, and will have one open set of leaves, which should be green now!

Finally, rinse well to remove seed hulls, and let the sprouts drain very well one more time, using salad spinner helps. Eat immediately or store dry in the fridge.

### **Tips for Sprouts**

Be sure your containers, lids, and hands are CLEAN!

Sterilize your sprouting equipment before use

Use fresh filtered cool water

Be sure they are fully drained at each step

Sprouts need air flow, so be sure to use a container for sprouting or jar with cheesecloth/mesh lid, and tip it properly for full drainage and air flow

Be sure to rinse well and drain well regularly. If you forget and they sit there for a long time, toss

Keep out of direct sunlight and room temperature (21C/70°F is best)

If it is a sprout that needs to be greened, put into sunshine only on the final day

Use immediately or use a salad spinner to be sure they are extra dry and store in an air tight container in the fridge

Make sure all of your tools (and hands) are thoroughly cleaned before starting, and wash your hands before handling anything!

# resources

## **Mushroom Growing**

USA - Field & Forest Products:

<http://www.fieldforest.net/>

UK - Woodfruit Gourmet Mushroom Co.

<http://woodfruit.co.uk/>

## **Hardwood Lump Charcoal**

How to make your own charcoal -

<https://www.youtube.com/watch?v=XiFHXg9o2wo>

Natural wood lump database: -

<http://www.nakedwhiz.com/lump.htm>

## **Coffee Roasting**

### ***Fair Trade Green Coffee Beans***

Coffee Bean Shop UK:

<https://www.coffeebeanshop.co.uk/>

York Coffee Emporium:

<http://yorkcoffeeemporium.co.uk/green-coffee.html>

Amazon (search for 'green coffee beans'):

<http://www.amazon.co.uk/>

(USA) Burman Coffee:

<http://www.burmancoffee.com/>

(USA) Home Roast Coffee, LLC:

<http://homeroastcoffee.com/>

## ***Roasting Supplies***

Stove Top:

<http://www.amazon.co.uk/Wabash-Valley-Farms-25008-Whirley-Pop/dp/B00004SU35/>

FreshRoast home roasters:

<http://homeroastingsupplies.com/>

## **Hydroponics**

US: Paradigm Gardens

(<http://www.paradigmgardens.com/>)

UK: GroWell ~ The Growing Experts

(<http://www.growell.co.uk>)

How-To Hydroponics, Fourth Edition by Keith Roberto

## **Sprouting & Microgreens**

Microgreens: A Guide to Growing Nutrient-Packed

Greens by Eric Franks and Jasmine Richardson

Sprout People - <https://sproutpeople.org/>

## about



Denise Cusack is an artist, mother, organic gardener, photographer, herbalist, nature lover and aromatherapy student. When she isn't having fun with her two unschooled sons and husband, she is often found in the kitchen cooking up allergy-safe meals or wandering in one of her many gardens with a hoe or a camera.

Brice is a tech-loving geek and loves trying new gadgets and approaches for gardening with maximum efficiency and minimum work. Software Engineer by day, he spends his evenings and weekends with his family making, growing, and automating. He has been happily bitten by the hydroponics bug and loves to try new techniques as time permits.

Brice and Denise live in Wisconsin with their two sons.



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