



# COLUMBIA CENTER **FOR** URBAN AGRICULTURE

**WRITERS:**

**TRICIA WOOLBRIGHT**

**CHRISTINE BAKER**

**TONY DEMARCO**

**EDITORS:**

**ADRIENNE FISHER**

**RALEIGH TAYLOR**

**THANK YOU TO:**



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**WELCOME!**

Here at the Columbia Center for Urban Agriculture, we believe that everyone should have access to nutritious, affordable, chemical-free food. Starting your own garden is one of the most sustainable ways to do this, but it can be difficult and time consuming to find answers to all of your questions! Where do I start? What will grow in my backyard? How do I do this on a tight budget? Once I've started, how do I take care of what I've built?

We hope that this Guide will be a trusted tool as you begin providing food for you and your family, adding natural beauty to your neighborhood, and inspiring your neighbors to do the same!

You are now part of a vast, worldwide movement of people who believe that growing our own food with our own hands ensures a future for our families, and for all of us. We thank you for your sense of adventure, determination, and enthusiasm.

Let's get started!

# CHAPTER 1: PLANNING YOUR GARDEN

**STEP ONE: WHAT ARE MY GARDEN GOALS?**

**STEP TWO: WHERE DO I PLANT?**

**STEP THREE: WHAT DO I GROW?**

**STEP FOUR: MAKING A GARDEN**

**STEP FIVE: MAKING A PLANTING CALENDAR**

## **STEP ONE: WHAT ARE MY GARDEN GOALS?**

Why do you want to garden? People start gardens for all sorts of reasons, but there are always big ones that make us want to keep building and maintaining our gardens even when they are a challenge! Here at CUA, we love the idea of growing healthy food affordably, feeding our families with something we have grown ourselves, knowing exactly where our food comes from, and simply watching something grow from seed to plate.

So what are your own reasons? Write them down here, and you can come back to them later to remind yourself of the purpose of your very own garden, and to encourage yourself to stay focused on what matters to you:

**Why do you want to start a garden? List your reasons here.**

**Which of these reasons feels most powerful to you?**

## STEP TWO: WHERE DO I PLANT?

Location, location, location!

When we're deciding where we want to plant our garden, here are 4 things we need to keep in mind:

- 1) Sunlight
- 2) Water
- 3) Drainage/Erosion
- 4) Distance from your kitchen



### Sunlight

Is there a spot in your yard that will provide at least **7 hours of direct sun** for summer plants?

We may want veggies and fruits for all seasons, but when we pick a location for our garden, we need to focus on the summer plants as these will need the most sunlight! Summer vegetables like tomatoes and cucumbers need 7 or more hours of direct sun. Is there a spot in your yard that will provide at least 7 hours of direct sun for summer plants? Pay attention to trees (your neighbors' too!), and the amount of shade at different times of the day.

\*\*Note: A bit of afternoon shade is okay, but a shady yard may not produce as bountiful a garden. A south facing garden usually gets more sunlight.

## Water

Your garden will need access to water all year round, meaning that you will need to be able to water it when seasonal rains aren't enough. This seems obvious, but it is easy to overlook this step, and having to carry a heavy water can a long distance can also discourage you from wanting to take care of your garden over time! Use the questions on the next page to help you plan!

## Drainage/Erosion

**Erosion** is the process of gradual destruction of our soil by wind, water, or other natural forces. This can take place in our garden. Making sure we build a garden with good drainage in the first place can keep our soil from washing away. To ensure proper drainage, many people use **raised beds**. If we plant our garden in soil that is raised off the ground, this allows water to drain away without taking our soil with it. This is a simple and low cost way to keep our garden healthy.





We can build a raised bed by either mounding up our beds with more soil (if you have the space to plant a garden in ground soil) or constructing a bed out of wood, cinder blocks, or other materials that will hold in soil and allow water to drain. Once you have your raised bed, you can surround it with **mulch**, which will absorb water and combat erosion by protecting the ground, and keeping soil from getting washed away. We will talk more about the benefits of mulch later in the guide.

## Distance From Your Kitchen

Planting your garden as close to your kitchen as possible is a great idea for several reasons. First, it will keep you motivated to use and maintain it if it's easy to get to. And second, a wonderful habit to get into



eventually is paying your garden a short visit every day. If you do this, you can monitor for new growth, soil moisture, pests, or plant diseases.

How far is your **water source** from your garden?

Do you have an **outdoor faucet**, and if so, where is it?

Will you need only one **hose**, or extra hoses? **Measure the length you will need to reach your garden!**

Will you have to use a **watering can**?

Is the garden area you have chosen **sloped** or **flat**?

Sloped areas can be a problem for your garden if rain water will flow down over your work. It can carry soil with it. Flat areas will work, but is there a dip in the soil? If so, this area may collect water. If you are planning to build your garden in either area, you will want to raise your beds.

Do you see any areas in your yard where **water collects**?

If so, try to plant your garden in another location. If this is not possible, you will definitely want to build a raised bed to keep your garden from getting water-logged.

**Checklist for a Good Spot:**

\_\_\_\_\_ Does this spot get at least 7 hours of direct sunlight per day during the summer?

Hints: Check for shade and nearby tall trees!

\_\_\_\_\_ Is my spot as close to a water source (outdoor water spigot) as possible?

\_\_\_\_\_ Can I see my spot from my house/kitchen?

\_\_\_\_\_ Will I be able to put plants I want to use every day close to my house/kitchen?

## STEP THREE: WHAT DO I PLANT?

When we begin planting a garden, it's important that we know which plants are most essential to us. Knowing your priorities will help you choose what and how much to grow.

On the next few pages, you will find worksheets and checklists to help you pick which plants you would like to start with!

**Appendix II** in the back of the Guide will tell you about each vegetable's **planting season**, how much **space** it needs to grow, how long it takes to **mature**, it's **yield** (how much food you can expect to get out of each plant you grow), along with other helpful information to help you plan your garden.

Fill out these worksheets and checklists, with **Appendix II** as your guide, and you'll be one step closer to starting your garden!

What **seasons** do you want to grow in?

Think about your family and work schedule during each season of the year.

When would you and your family have the most time to work on your garden?

**Spring** \_\_\_\_\_

**Summer** \_\_\_\_\_

**Fall** \_\_\_\_\_

An **annual** plant is one that will live for only one growing season, and then die on its own. A **perennial** is a plant which will regrow every season. Which kind of plants do you want to grow?

\_\_\_\_\_

Do you want to grow only enough produce for your family to eat fresh from the garden during each season, or do you want to grow enough produce to **freeze** over the winter? This will allow you to have your garden produce all year round, but it will also require a bit of extra work to harvest and freeze your extra produce.

\_\_\_\_\_

Do you have **kids** in your family?

If so, are there particular vegetables they love, or that are kid-friendly, that you would like to make sure you plant?

List them here, and check out their requirements in **Appendix II:**



Let's double-check the list you just made, and see if the **growing seasons** of any of your favorite plants **overlap!**

Check **Appendix II**.

List plants that overlap below. Keep in mind that if you want to plant both, you will need to have room for both in your garden to be growing at the same time:

Spring	Summer	Fall

Now, using the information you've gathered, let's start mapping out your garden!

## STEP FOUR: MAKING A GARDEN MAP

**Mapping** a garden and picking where to plant everything can feel overwhelming at first. This is why we recommend **square foot gardening** for beginning gardeners! Once you get the hang of it, square foot gardening allows us to easily and clearly visualize where we want to plant everything.

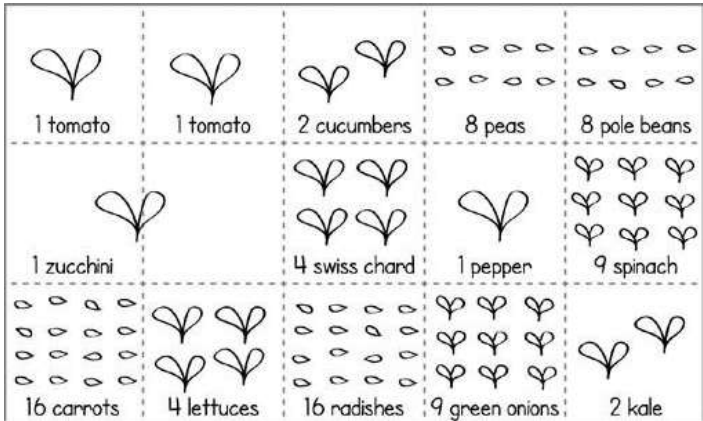
### So, what is square foot gardening?

Square foot gardening uses block spacing (where each block is one square foot) instead of rows to help new gardeners visualize plant spacing. It also allows for easy clearing and replanting a block of vegetables without disturbing other areas in your garden.



Our goal is to create a square foot garden for each season in which you want to plant!

Here is an example of what your garden can look like using square foot gardening, if you want to plant a garden that is 3 feet by 5 feet (3 x 5 ft):





Look back at your Season list on page 15. .

Use **Appendix II** to help you, and list your chosen plants below with this information:

How many can you plant **per square foot**? This can make a difference when planting, as you don't want tall veggies to shade short veggies.

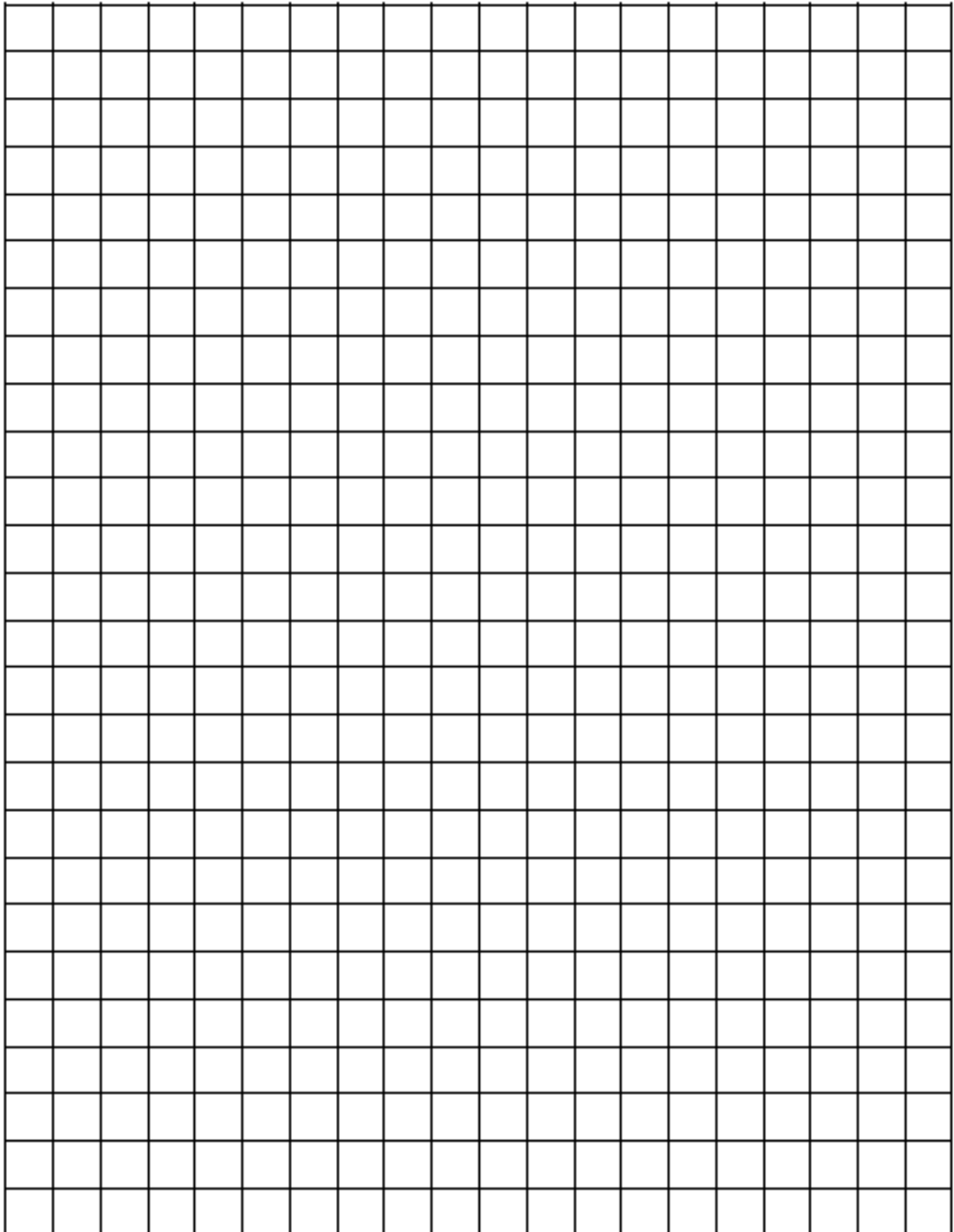
Is it tall or short? Will it need a **trellis**?

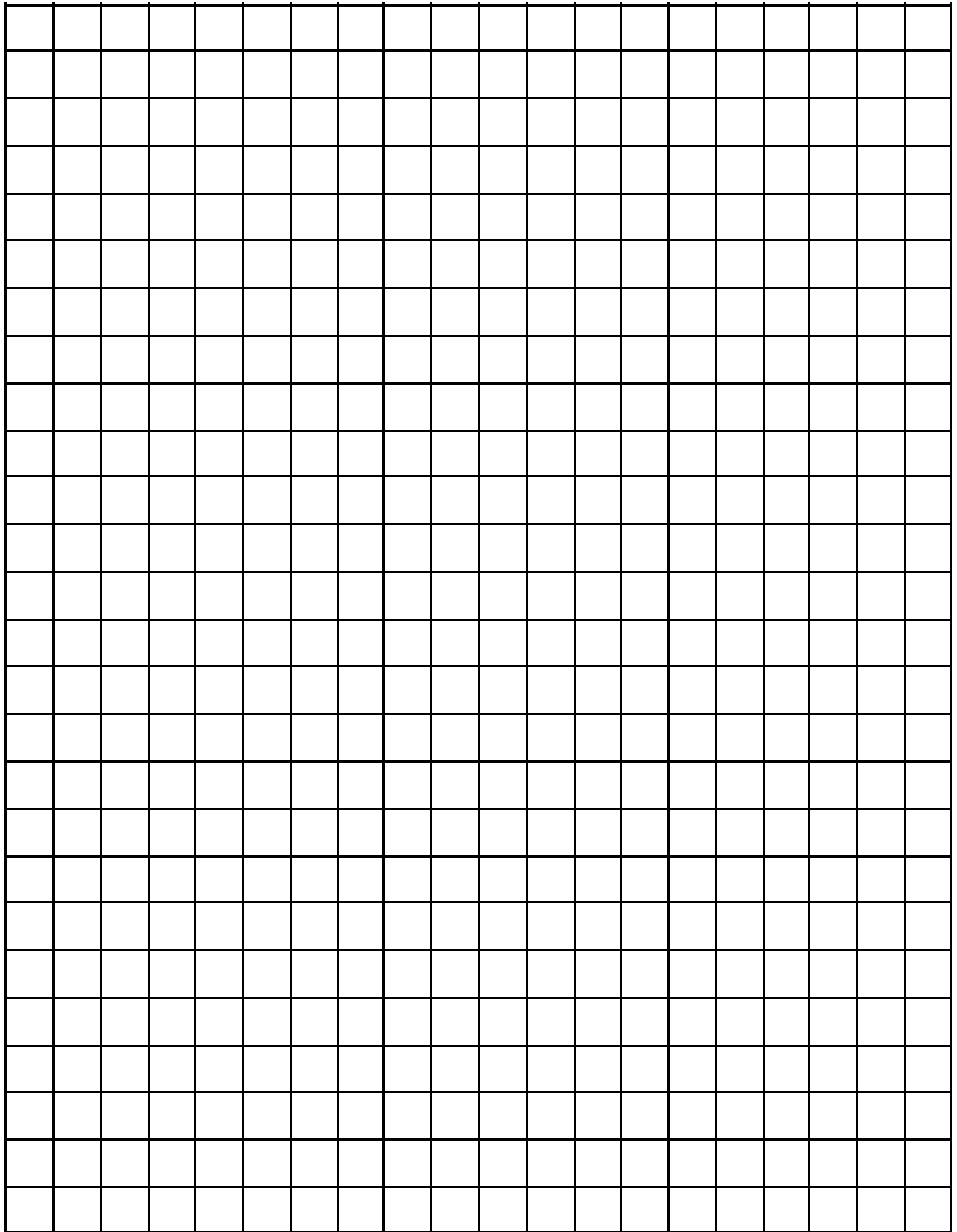
**Spring:**

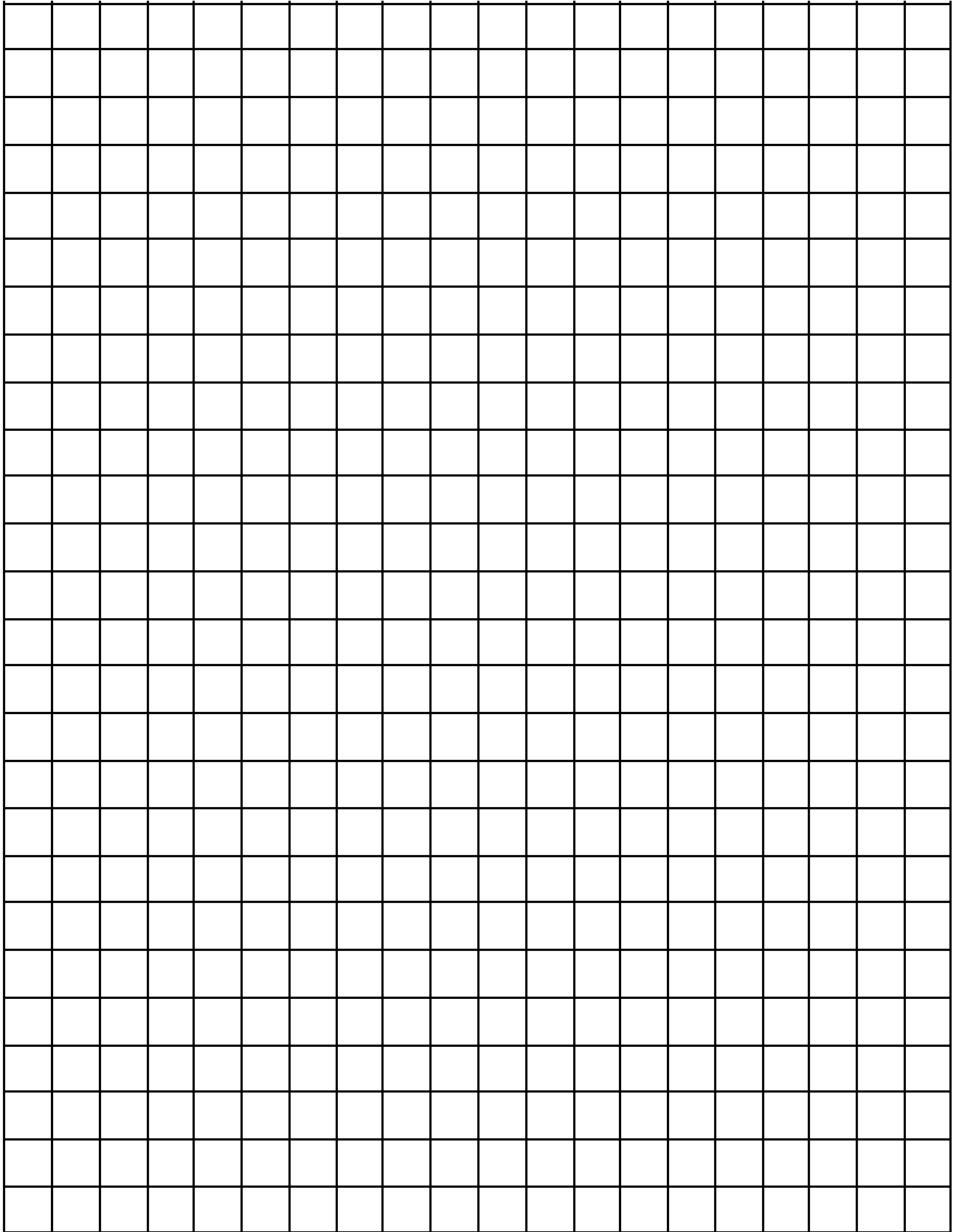
**Summer:**

**Fall:**

Now, with all of this information, we're ready to draw our square foot gardens on the provided **graph paper**! Draw **one garden per season** you want to plant in, and use the 3 x 5 ft. drawing above to help you:







## STEP FIVE: MAKING A PLANTING CALENDAR

Congratulations! You have a **planting list** and a **garden map**. Now, it is time to make a **planting calendar** so you know when to plant your Spring, Summer, and Fall veggies. If you want to get even more organized, you can also plan in this calendar for when to harvest each vegetable by checking **Appendix II** to see how many days they take to **mature** after they've been planted.

**\*\*Tip:** This is also great information to know when you're buying produce in stores and at a market as they are more nutritious, better tasting, and a little cheaper when in peak growing season.

Under each half-month listed on the next page, write down which vegetables/fruits you will be planting during this time based on all your previous work:

Early March

Late March

Early April

Late April

Early May

Late May

Early June

Late June

Early July

Late July

Early August

Late August

Early September

Late September

Early October

Late October

# CHAPTER 2: BASIC NEEDS OF PLANTS

1. WHAT PLANTS NEED
2. LET'S TALK DIRT
3. NUTRIENTS
4. HOW TO COMPOST

## 1. WHAT PLANTS NEED

Now that you have your garden planned out, let's talk about what else is necessary to grow a successful garden! Like people, plants have basic things they need in order to thrive – **air**, **light**, **water**, and **soil**. Beneficial insects, pollinators, and decomposer bugs are your friends as well (see **Appendix I**). For the most part, as gardeners we have control over these basic needs.

In this section, we will explore each of these needs, and help you to be successful at meeting them!

## Air

Plants and people have a very close relationship. The air we breathe contains lots of gases, including oxygen and carbon dioxide. When you inhale, your lungs take oxygen from the air; as your body uses this oxygen, it creates carbon dioxide - this is what you exhale. Plants work in the same way, but in reverse. They breathe in carbon dioxide, and exhale oxygen. We have control over the air in our garden by ensuring our plants have enough room to grow. This allows air to circulate, and our plants to breathe. Without proper air circulation, plants can get mold or fungus on the leaves, which compromises the yield (how much of each plant we can harvest), and our plants can also die from lack of oxygen (just like humans!). This is why it is extra important to pay attention to spacing in your garden, so that your plants have room to breathe.

## Light

Plants get their energy from the sun, through a process called photosynthesis (from the Greek *photos* meaning "light," and "synthesis" meaning "put together"). Plants take light from the sun, carbon dioxide from the air, and water from the ground to create energy needed for plant growth. Some plants can grow in the shade, but most fruits and vegetables need lots of sun. Placing your garden in a sunny spot will improve your chances of growing a successful vegetable garden.

\*\* Note: Placing your tallest plants on the north side of your garden bed will prevent shading of smaller plants.



## Water

Your garden will get most of its water from rainfall and irrigation. Irrigation is how we as gardeners control the amount of water provided to our plants at different times in order to manage our gardens.

### When to Water:

It is always better to water in the morning, before the heat of the day dries the soil. If it is very hot, dry and windy you may need to water twice a day to keep your plants healthy.

### How to Water:

When watering, make sure the deep parts of the soil receive water. To do this you will need to soak the soil with a low gentle stream of water for a long time (anywhere from 20-40 minutes depending on the size of your garden), because good absorption is a slow process. This watering approach will encourage roots to grow deep and stay strong during hot dry periods. Watering for a short time will only wet the top few inches of soil, which encourages the roots to grow shallow and be more vulnerable to drought in dry weather.

Pay special attention to young/new plants in your brand new garden! The roots of young plants are very shallow and sensitive to dry soil – do not allow them to dry out. Water them every day, sometimes twice a day. Stressing a plant at a young age will result in slower growth throughout its life and less produce for you to eat. Also, be gentle when watering small plants; strong or heavy sprays of the water may damage the plant and its roots. Better watering makes for sweeter food. The soil should feel like a wrung out sponge, 2 inches to 6 inches deep.

## Tools you can use to irrigate your garden include:

- ▶ Hose (we recommend using a nozzle to control the strength of the water stream in order to be gentle on plants and soil)
- ▶ Water jugs (poke holes in a lid to simulate rain).
- ▶ Watering cans
- ▶ Drip line irrigation
- ▶ Sprinklers



## Wilting:

If your plants look wilted (weak, thin, and drooping), it could mean they are not getting enough water. This is especially likely if the weather is hot, dry and/or windy. To see whether this is the problem, use your finger to dig down several inches into the soil. If the soil is dry to your touch 3 to 4 inches down, it's time to water.

**\*\*Note:** Dryness is only one cause of wilting. A plant can wilt because it has been overwatered. Damage from insects and disease may cause wilting. There are also some plants like tomatoes, peppers, and eggplants, that tend to droop slightly during the heat of the day, even if the soil has enough moisture. So always make sure you use the finger test to see if more water is needed! If the soil is moist but your plant is still wilting, you can start investigating some of the other causes listed above.

## Soil

Plants use the soil in many ways. In order to have the strength to stand up straight, plants grow their roots deep into the soil. They then use their roots to pull nutrients and water from the soil. Healthy soil is loose and fluffy and contains lots of nutrients. Remember, healthy soil grows healthy plants, and healthy plants grow healthy people!

### 2. LET'S TALK DIRT

Here, we will talk about just how central healthy soil is to a healthy garden, and what you can do to have the best soil possible!

First of all, when we grow a garden in a city, we often already have lots of issues to deal with. Many backyards in cities are already missing a layer of topsoil because contractors strip off the top layer of ground before building, leaving behind construction debris and hard-packed clay that plants cannot grow in. Grass may hide the fact that a house or driveway once stood where you want to put your garden. So construction debris, broken glass, pieces of plastic, and other sharp items are often found in urban soil once you start digging. This is why it is important to protect your hands and wear gloves while gardening!

It is a great idea to start a garden with a mixture of soil and compost (we will talk about compost in more detail later). This will provide the basic nutrients your garden needs for a few years. Another strategy is to add **mulch** to your garden to cover up bare soil. Mulch



will protect the soil from hot sunlight and help retain moisture, as well as add nutrients to the soil over time as the mulch breaks down. In a natural environment, soil is never left bare; either plant growth or a layer of plant mulch, such as leaves, covers the soil. Follow nature's design by covering any bare soil with mulch. A thick layer of mulch will also prevent unwanted weeds from growing. You can use a wide range of materials for mulch, such as straw, grass clippings, leaves, wood shavings and old hay. You will need to add mulch occasionally throughout the growing season to ensure that the soil remains covered.

It is also a great idea to change what plants are grown in your garden from season to season – this is called **crop rotation**. All plants remove nutrients from the soil, but some take more or less than others. Heavy feeders, like tomatoes, take more nutrients; light feeders, such as lettuce greens, take less (you can check **Appendix II** to see for yourself).



## Pollinators and Other Helpful Insects

Bugs, yes BUGS, are great for your garden! In your garden you will encounter many creatures like earthworms, butterflies, bees, ladybugs, wasps, roly-pollies (woodlice or pill bugs) and many, many more. If you do not have bugs in your garden, it means that your garden lacks fertility. Bugs break down compost, allowing plants to absorb nutrients. Bugs such as butterflies and bees also pollinate plants, a process vital to producing fruits and vegetables. In other words, your garden needs bugs!

There are some bugs we call pests which will try to eat your plants, but helpful bugs are important even here because they are often these pests' natural predators! This is one reason why it is important to handle pest bugs organically and cheaply - we don't want to poison the beneficial bugs while we are trying to get rid of the pests! We discourage using non-organic pesticides for many reasons, but mostly because of their harmful effects to both the environment and to your health. Refer to **Appendix I**, which will help explain which bugs are beneficial, which are pests, and what organic pest control techniques are available and effective.

### 3. NUTRIENTS

You were told to eat your vegetables and fruits as a child because they have vitamins and minerals in them! What we often don't realize is that those nutrients come from the soil. A plant absorbs nutrients through its roots. So the healthier the soil is, the healthier the plant is, and the healthier you are. Nutrients are the building blocks of all plant cells, as well as your own cells!

The three primary nutrients used by plants are **nitrogen (N)**, **phosphorus (P)**, and **potassium (K)**. Other nutrients, needed in lower amounts, include calcium (Ca), sulfur (S), magnesium (Mg) and Silicon (Si). Plants also need very low amounts of boron (B), chlorine (Cl), manganese (Mn), iron (Fe), zinc (Zn), copper (Cu), molybdenum (Mo), nickel (Ni), selenium (Se) and sodium (Na). Healthy soils have balanced levels of all these nutrients. Over time, plants will remove nutrients from the soil, and soil health will decline. This is why we add **compost** to gardens. Compost will ensure that your soil has good nutrient levels and is able to grow healthy plants. Rotating where you plant your vegetables within the garden every year will also help prevent nutrient depletion.

Interested in seeing which nutrients you will get from the plants you plan to grow? Use our chart on the next page to list your favorite plants you want to grow, and **Appendix II** to see what nutrients are in each!:



Plants:	Nutrients:

## Micro-Organisms

**Micro-organisms** are little critters that live in your soil and are, just like beneficial bugs, essential to your garden's health! In fact, there are billions of them in a handful of garden soil.

They include:

- bacteria
- fungi
- tiny insects
- nematodes (tiny worms)
- protozoa (single-celled organisms)

They help FIGHT pests and diseases, hold water, air, and nutrients in the soil, and break down organic matter to make nutrients available to the plants. Without them, our gardens cannot grow, and we cannot harvest healthy food. Stepping in your garden beds will compact the soil, which will destroy the space these microorganisms need in order to survive, as well as prevent space for water and air.

**Remember to only step in the pathways in your garden, not the beds!**



## 4. HOW TO COMPOST

**Compost** is what we get when organic materials or matter (like fruit rinds, coffee grounds, or other natural waste) has decomposed. This soil is extremely high in nutrients. You can either make your own or buy finished compost. We recommend you add compost to your garden at least ONCE if not TWICE a year. If you have a raised bed, you will notice how the soil level goes down over the year. You can refill the beds with compost to bring the soil level up and to replenish the nutrients in the soil.



## Making Compost

Making your own compost is one of the most important things you can do as an at home gardener to save money, and as an environmentalist to prevent waste from going to the landfill!

The city of Columbia provides free composting workshops for the public. There are multiple workshops throughout the year at different locations around town. Type this link into your browser for more information to sign up for a workshop:

[www.como.gov/volunteer/volunteer-programs/composting/](http://www.como.gov/volunteer/volunteer-programs/composting/)

There are many techniques for handling compost!

Examples include, but are not limited to (see previous page for images):

- ▶ Building a **pallet bin**
- ▶ Digging a **hole** and filling it with compostable materials
- ▶ Using heavy duty **chicken wire** to 'fence' in your compost (pulling the ends of the wire together to create a standing cylinder)
- ▶ Using a **trash can** with holes poked in the bottom and sides of it to hold your compost.

## Managing Your Compost

Each compost pile contains billions of **microbes**, and they are all necessary for breaking down food and other materials into compost. These microbes are easy to take care of and will make as much compost as you have material to feed them.

By maintaining a good balance of **nitrogen-based green material** to **carbon-based brown material**, your microbes will flourish.

### Green Material:

- ▶ food scraps (ie. apple cores, watermelon rind, carrot tops, etc.)
- ▶ grass clippings (as long as your lawn isn't chemically treated)
- ▶ fresh animal manure

### Brown Material:

- ▶ straw
- ▶ newspaper/cardboard
- ▶ old animal manure (not cat or dog)
- ▶ dried leaves

The ratio here is **2:1** - 2 parts brown material for every one part green material. This will help to control the smelliness!



Use a large amount of brown material to build up the compost pile. Use relatively less green material to provide the pile with the fuel it needs to heat up and break down quickly. With the microbes' help, the items you add will get hot and break down into rich, fluffy compost. **Regularly turning** over your pile will increase **air circulation** and speed up the process. If your household produces lots of compostable material, you might need to create a second compost pile to hold the extra material. You might think that your compost pile is too big, but over time the pile will shrink in size as microbes break down your food scraps.

In order to **check the progress** of a compost pile, use a shovel or pitchfork to dig into the middle of the pile. If parts of the pile don't appear to be breaking down, then mix them with other parts of the pile and bury them in the middle of the pile. Remember, the key to composting is patience; it takes about **8 to 16 months** for a compost pile to be ready to add to your garden.

When you are ready to utilize your finished compost, you will want to remove only the material that has broken down into nice, fluffy soil. Any large chunks of material like orange peels or twigs should be put back into the compost pile to continue to break down. The finished compost can then be added to your garden.

## Compost Troubleshooting

**Problem:** My compost has a bad odor.

**This means:** Not enough air. Too small. Too wet.

**Solutions:** Turn pile to increase air circulation; add dry carbon-based materials if the pile is too wet.

**Problem:** The center of the pile is dry.

**This means:** Lack of nitrogen.

**Solutions:** Moisten, add more food scraps or other nitrogen-rich waste and turn the pile.

**Problem:** The compost is damp and warm only in the middle.

**This means:** Pile is too small.

**Solutions:** Collect more waste materials and mix the old ingredients into a new pile.

**Problem:** The heap is damp and sweet-smelling but still will not heat up.

**This means:** Lack of nitrogen.

**Solutions:** Mix in a nitrogen source like fresh grass clippings or food scraps.

**Problem:** Large, un-decomposed items are still in the mix.

**This means:** Low surface area.

**Solutions:** Remove items, and chop or shred large items.

**Problem:** Too many flying insects or animals getting into compost.

**This means:** Too much nitrogen. Odor isn't being contained.

**Solutions:** Contain compost differently, cover with more carbon-based materials.

## Using Compost

Add compost to your garden in **late Fall** after crops have been harvested, or in **early Spring**, one or two weeks before planting any seeds. To use your compost, spread an inch or two evenly over your garden and be sure to mix it into the top inch of soil with your hands or a tool. Always make sure to do this if you are adding compost in Fall or Spring. If you add compost in the Fall, work around any existing plants in your garden, such as garlic or parsley, by simply adding the compost to the base of the plant without mixing the compost into the soil. This is called **side dressing**.

Another strategy is to **side dress** plants during **Summer**. This strategy especially helps tomatoes, peppers, cabbage, squash, and melons. Add a one-inch thick ring around the plant that extends about 8 inches out from the plant. Side dressing provides a boost of fertility to the plant and results in more fruit!

### **Why can't I just buy Miracle Grow or another chemical fertilizer from the store?**

It's fast and easy, but those are about the only upsides to using chemical fertilizer. It's more expensive, when you can just use your own, free compost. It doesn't add all of the nutrients your soil needs, and it doesn't add any beneficial microbes. Over time, your soil will have fewer and fewer nutrients, and good microbes will disappear completely. This is why we recommend using compost and organic matter to keep your soil rich and healthy!

## Compost Alternatives

Can't do a compost pile or worm bin?

Here are some healthy ideas for **alternatives** to add to your soil:

**Bone Meal** – made from finely ground bones; source of phosphorus and calcium; promotes root development when worked well into soil.

**Blood Meal** – made from dried, pulverized blood; source of trace minerals and nitrogen; safe for young plants.

**Fish Meal/Emulsion** – balanced fertilizer containing nitrogen, phosphorus, and potassium; slowly releases nutrients throughout season.

**Crushed Eggshells** – good source of calcium; work into soil around plants that need more calcium (tomatoes, broccoli, etc).

**Seaweed/Kelp** (dried or emulsion) – source of potassium, trace elements; dried form can be used as mulch.

**Leaves** – use as mulch on your garden or shred and incorporate into soil as a great alternative to compost

## Soil Amendments

Urban soils and city compost do not always have enough nutrients to keep vegetable plants growing big and strong, so we often need to add amendments, or **fertilizers**. Using compost from **plant matter** and **manure** will provide nutrients to your soil and maintain a healthy balance of microbes. **Nitrogen (N)**, **Phosphorus (P)**, and **Potassium (K)** are the macronutrients your plants use and need. Plants require nitrogen for leaf production and the growth of plants, phosphorus for root development, and potassium for plant functions like flowering and fruiting.

**N** = Leaves

**P** = Roots & seed development

**K** = Strength, water transfer & hardiness

Each fertilizer has a set of numbers representing the proportion of these nutrients, often labeled as **NPK**. If the numbers are 10-10-10, there are equal parts of each. Likewise, 8-4-2 signifies twice as much nitrogen as phosphorus and twice as much phosphorus as potassium. If there is a 0, this particular macronutrient is not present in that fertilizer.

There is no instant gratification or formula for every garden, though it is always a good idea to add compost and organic matter. The older your garden is, the better the soil gets.

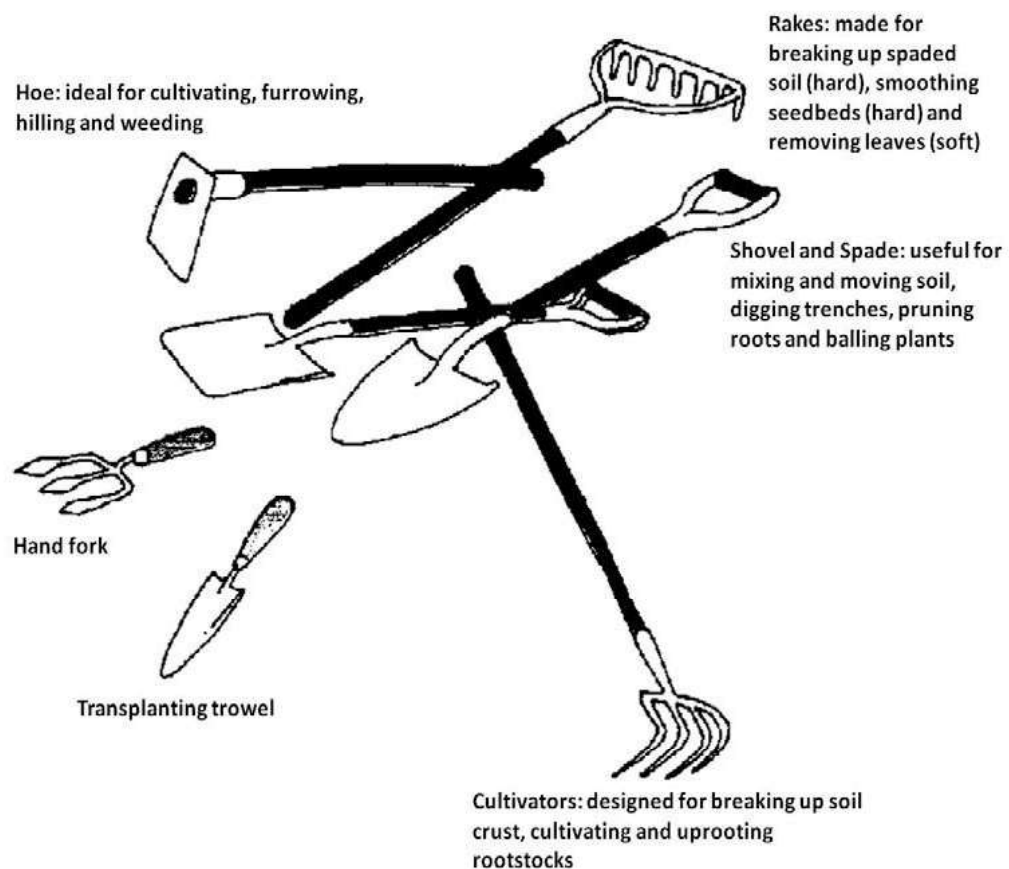


# CHAPTER 3: GARDENING BASICS

1. TOOLS
2. HOW TO PLANT
3. PLANT SUPPORT
4. CHALLENGES IN THE GARDEN

## 1. TOOLS

After thousands of years of growing our own food, humans have designed and improved on many basic gardening tools. Knowing what to look for in a tool, how to use it, and how to maintain it will make gardening a lot easier on you and your body. There are a few in particular that will be useful to you as you create and maintain your garden!



## Tool Checklist:

- ❑ **Garden Spade/Shovel and/or Digging Fork** - Great for turning, aerating, and mixing nutrients into the soil.
- ❑ **Long Handle Hoes** - Even with the narrower beds, the longer weeding hoes with their variety of head shapes are very useful.
- ❑ **Garden Rake** - Great for leveling and clearing debris from your soil.
- ❑ **Medium Length Tools** - Look for some medium length tools. There are forks, spades and other mid-length tools out there including good quality kids' tools. If you have a favorite long tool that is too long, cut the handle to length that suits your needs.
- ❑ **Trowels** - With so many different types of trowels available, you may find that a good trowel will handle all your planting needs
- ❑ **Hori Hori** - Soil knife or weeding blade

Don't forget that you and the garden you are building are unique! You may need tools that are not on this list, or a tool that is popular with others might not work for you, so look around and find the right tool for your gardening chore. Ask other gardeners what they like and why, and maybe get a demonstration to help you find the best tools for your gardening needs.

As you are picking your tools, consider the materials they are made of. Plastic will break, and some wood handled items may break but can be easily replaced. Metal will last longer, but it could be heavier to use and more difficult to replace if broken. If the metal is not stainless steel, it will likely rust if left

outside. How many tasks you can accomplish with each tool (how versatile it is) may also be an important thing to consider when deciding if a tool is worth buying. Some tools are designed to have many functions, and others are specialized to do one thing very well.

### **Best places to find tools:**

For the frugal gardener, we recommend garage and estate sales, antique and thrift stores, Craigslist and freecycle.org, online or in person swap meets, and watching for sales at bigger hardware stores. Also, sharing tools with gardener friends can cut down on costs. Maybe you and your neighbor can share a wheelbarrow, other larger supplies, or equipment. You can also rent tools from equipment rental places, and large stores like Lowes & Home Depot.



If you have children, it can be a great idea to give them a set of their own toy tools to play with and a spot in or nearby your garden where they can dig and plant. It is never too soon to get kids involved in gardening!

## Garden Safety

- ▶ Wear **personal protective equipment (PPE)** that is appropriate for the gardening task and the weather. This can include items such as a hat with a brim, long-sleeved shirt, long pants, gloves, sunglasses, closed-toed shoes, and sunscreen.
- ▶ Drink enough **water!** Especially if it is hot outside, your plants are not the only ones who require water.
- ▶ When gardening in warm weather, take **frequent breaks** in the shade.
- ▶ **Rotate gardening tasks** frequently to reduce the potential for repetitive motion injuries. This is especially important if you have any health conditions - always pay attention to your own body as you garden.
- ▶ Try to **keep your back straight** as you use long-handled garden tools such as hoes, rakes, and shovels. Curving or bending your back while working with these tools can cause back problems over time.
- ▶ Protect your back when picking up heavy items by maintaining a straight back, bending your knees, firmly grasping the object, and slowly **lifting with your legs.**
- ▶ **Avoid** using garden hand tools **above your shoulder** height.
- ▶ **Do not horseplay** with garden hand tools or allow others to do so; they are tools, not toys.
- ▶ Digging with your **bare hands can result in injuries** such as cuts, punctures, or insect bites. Remember that especially in city backyards, it is very common to find things like construction debris or broken glass in soil.
- ▶ To protect your hands, **dig with a hand trowel** or other tool and **gloves** instead of using your bare hands.
- ▶ When you're finished in the garden, **clean** your tools and **store** them in their proper locations. This will help you stay organized, but it will also protect your tools from weather damage and age.
- ▶ **Keep your work area picked up**; tripping over a rake is funny only in cartoons.

**Rub a bar of soap  
across and under your  
nails to prevent dirt  
and splinters.  
Lotion can help  
callouses.**

## 2. HOW TO PLANT

There are two main ways to get plants into our gardens.

The first is **direct seeding**, which means to plant seeds directly into our garden.

The second is **transplanting**, which usually means taking seedlings (young plants that were started inside) and planting them in our garden.

Below, we will give you more details on both methods, and why you might want to use each.

### Direct Seeding/Sowing

Why might we choose to sow our seeds directly in the soil? Some plants, like carrots, don't like having their roots disturbed, so it is best to sow our seeds and allow them to grow undisturbed. Other plants, such as radishes, lettuces, and spinach, are also best planted as seeds because they germinate so quickly, it doesn't make sense to buy seedlings.

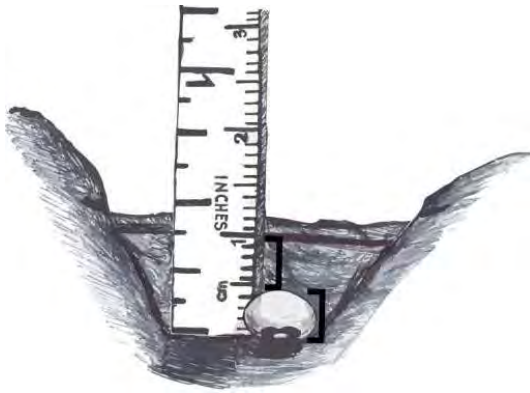
#### Instructions:

- ▶ Start with loose, weed-free soil.
- ▶ Take some time to prep the area first by removing all weeds, rocks, sticks, and large clumps of dirt.
- ▶ Loosen the soil with a garden fork, then add amendments if you wish.
- ▶ Rake the finished soil into an even, level surface.

#### Direct Seeded Veggies:

- ▶ Arugula
- ▶ Beans (pole & bush)
- ▶ Beets
- ▶ Carrots
- ▶ Cilantro
- ▶ Corn
- ▶ Cucumber
- ▶ Lettuces
- ▶ Mustard greens
- ▶ Okra
- ▶ Peas
- ▶ Radishes
- ▶ Spinach
- ▶ Squashes
- ▶ Turnips

Most of the time, you will find **instructions on your seed packet** to tell you how best to plant the fruit or vegetable inside. If there are no



instructions on the packet, a good rule of thumb is to **plant the seed as deep as it is thick** (in other words, a seed that is  $\frac{1}{4}$  inch thick should be planted  $\frac{1}{4}$  inch deep). It is important to make sure the seed is well settled into the soil, so be sure to press gently

on the area you've planted. It is always a good idea to mark clearly where you have planted your seeds. This prevents you from pulling what you have planted by mistake, and it lets you observe how your seeds are growing over time.

After you plant your seeds, be sure to keep the soil evenly moist. Nothing keeps a plant from germinating more than letting your soil become dry. Also, be gentle when you are watering new plants. A



strong blast of water from a hose will either wash your seeds completely out of the bed or ruin your spacing. If you are using a hose to water, be sure to use a shower- like, gentle setting.

## Transplanting

Why might we choose to plant seedlings or full grown plants instead of seeds in our garden?

Some produce cannot grow through their entire life cycle - from seed to mature plant - during their growing season. Depending on where you live, the growing season may not be long enough for certain plants to mature fully outside in your garden.

This is why most experienced gardeners choose to plant many warm-season crops and slow-growing cool weather crops (like broccoli, cabbage, cauliflower, Brussels sprouts, kale, collards, etc.) as seedlings, because this gives these plants a head start on the season. Therefore, these seeds are started indoors before it is warm enough to plant outside, and by the time it is warm enough, seedlings are already 3-6 weeks old.



## Instructions:

- ▶ Before you begin preparing your seedling to transplant into your garden, be sure to pick an **evening** for this process. Transplanting a seedling in the evening will give the plant a chance to settle into its new environment during cooler night-time temperatures. This will help ease your seedlings into their new home and reduce the risk of **transplant shock**.
- ▶ Now that you have picked an evening, you are ready to begin transplanting. Be as **gentle** as you can when handling seedlings for transplanting. Do your best to **keep the roots covered in soil** during this process. For example, if you are transplanting a seedling from a pot or other container, turn the pot upside-down, letting the plant stem pass between your 2nd and 3rd fingers, and tap firmly on the bottom of the pot until the seedling falls out into your hand (see image on previous page). This will gently transfer the seedling out of the pot, while keeping the roots consistently covered in soil.
- ▶ If your seedling is **root-bound** (which means that its roots have tangled tightly together with the soil inside the pot), be sure to gently loosen (but not lose) the soil by massaging the roots until they become more relaxed and less tight. By doing this, you will help prepare your seedling's roots to spread into their new home, your garden, using the least amount of energy.



- ▶ Now that you have transferred your seedling from its pot, you are ready to plant it inside your garden. When you dig a hole for planting, the seedling should be **buried up to its second pair of leaves** that emerge from the stalk (gardeners call this the first set of true leaves). If you do not plant your seedling deep enough, it could become top-heavy and affect the size and quality of your harvest.

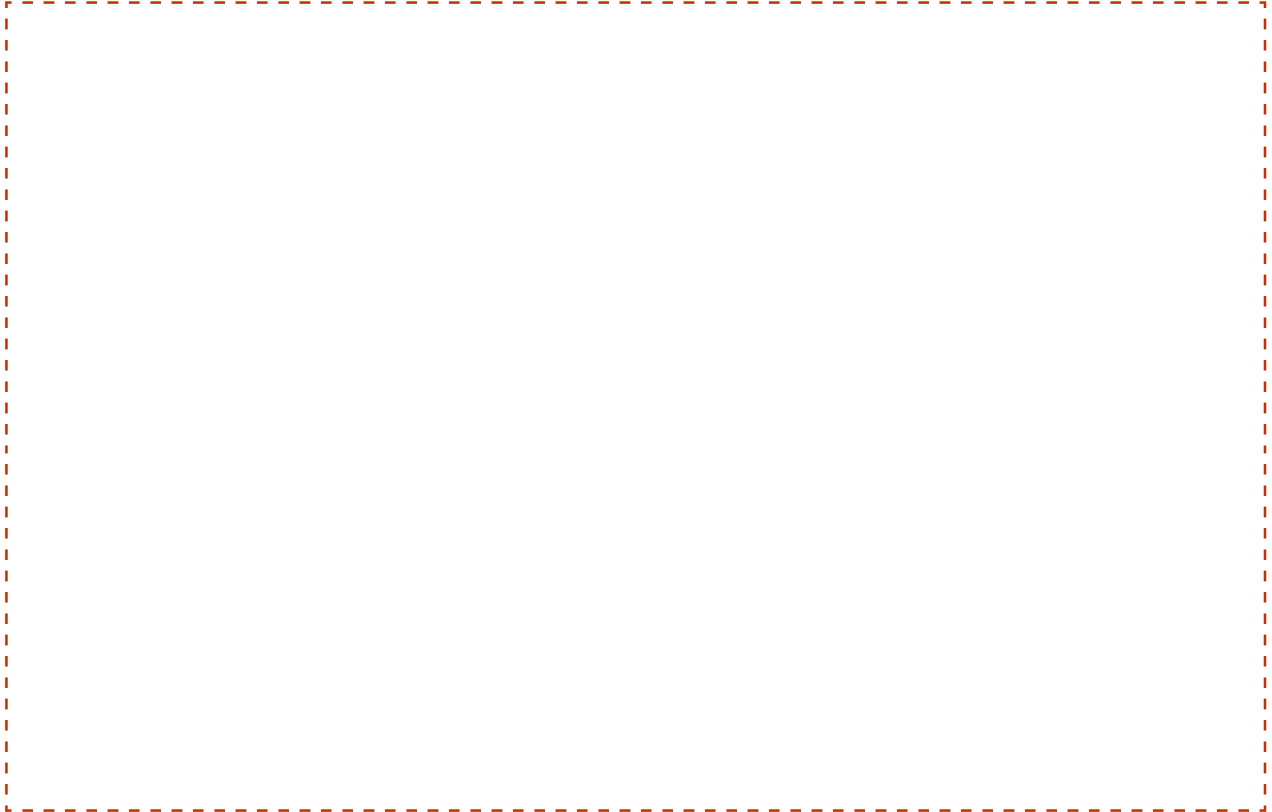
If you **purchase transplants** from local garden centers, don't be tempted to select seedlings that have already begun to flower or are already bearing little fruits. Instead, choose young plants that are concentrating all their energy on growing leaves and roots. Look for stocky, stout stems and healthy green foliage, as they will make the best transition to your garden.

### **Transplanted Veggies:**

- ▶ Big brassicas (cabbage, broccoli, Brussels sprouts, and cauliflower)
- ▶ Eggplant
- ▶ Peppers
- ▶ Perennial herbs (rosemary, sage, thyme, lovage, savory)
- ▶ Strawberries
- ▶ Tomatoes
- ▶ Tomatillos.

You may find seedlings to transplant at any **garden center**, such as **Wilson's**. **Walmart, Home Depot, Menards**, and **Westlake Ace Hardware** also have seasonal garden centers.

Look back at **your list of plants** that you would like to grow in your garden. List below any plants that you may need to **transplant**:



Do a quick search on-line - what are some **places in town** where you would want to pick up seedlings or transplants?:

### 3. PLANT SUPPORT

Why might a plant need a **trellis** or some other form of support?

The main reasons to support your climbing and sprawling vegetable plants are to **keep the fruit off the ground** and help the plant support the weight of its fruit.

Popular plants that **need trellising** include:

- ▶ cucumbers
- ▶ pole beans
- ▶ peas
- ▶ some winter squashes

Plants that **benefit from extra support** include:

- ▶ tomatoes
- ▶ peppers and eggplant



If you would like to grow any of these plants, or any others that are listed as needing extra support, here is some **advice for building** your plant supports and trellises:

- ▶ Make a support that is **strong**. You do not want your trellis to come crashing down with the weight of your ripening vegetables or because of heavy winds.
- ▶ Be sure that your support won't hinder your harvesting ability. Build the support so that your plant is **accessible** from all sides, and make sure you can harvest your produce without damaging it.

- ▶ If you are using wood, make sure it is **untreated** to prevent chemicals leaching into your garden.
- ▶ Use **materials you already have**, or that you can find cheaply and easily.

Most of us have extra stuff around the yard or house that can be used to construct a support system. Here is an example of how to stretch your budget and use your creative powers to make something recycled and unique:

For **climbing snap peas** or **pole beans**:

- ▶ Bury sturdy sticks and other pieces of wood at least 12 inches into the ground.
- ▶ Tie sticks together at the top with twine or another strong binding material to create tripods and quadpods (like a tee-pee).



A classic structure is to plant two rows of beans or peas about 1 foot (30cm) apart and to put sticks deeply in the ground beside each planting, tying the sticks together at the top with string. Adding an extra cane along the top with a supporting rope strung at each end will strengthen the whole structure. **Pole beans** will twist around the sticks and climb vertically, whereas **peas** need horizontally tied string for their tendrils to climb onto and pull upward.

For **tomatoes** or **cucumbers**:

Bury sturdy sticks and other pieces of wood at least 12 inches into the ground.

- ▶ Tie sticks together at the top with twine or another strong binding material to create tripods and quadpods (like a tee-pee).
- ▶ Run twine or bind more sturdy sticks horizontally between two tripods (and then run twine vertically to make a 'fence' pattern) in order to support plants such as tomatoes and cucumbers (see image)

Remember that these plants can grow to be over 5 feet tall, so make sure your support is **tall enough!**

Some plants, such as **cucumbers**, will not naturally attach to a trellis or other support. **Train them to climb** by twining their tendrils around strings or poles, or tying them with soft plant ties (but not ties with wire in the center). When the vines reach the top of the trellis or support, they can be allowed to bend over and hang down to within 2 or 3 feet of the ground.

Look back at your list of plants. Use **Appendix II** to check on the height and needs of each plant, and list any below that may need a **trellis** or **extra support**:

Locate the **northern** part of your garden. This is where you will want to position trellises so they will **not shade smaller plants**. Plan below where precisely you would like them to go:

Do you have **materials around the house** or in your yard that you could use to **build a trellis** or support? List them below, and if you like, put them aside now for future use:

## 4. CHALLENGES IN THE GARDEN

### Weeds

Here are some simple guidelines to remember for weeding:

- ▶ Lay down thick layers of **mulch** to avoid future weeding altogether!
- ▶ Try to remove weeds **as soon as you spot them**; the younger they are, the easier they will be to remove.
- ▶ Get as much of the **root** as you can when weeding; perennial weeds will keep growing if their roots are left in the ground.
- ▶ Catch weeds before they start releasing **seeds** (go to seed) in your garden - this is how they spread and become a bigger problem.
- ▶ **Be careful** when weeding around seedlings to avoid disturbing their developing roots. If you aren't sure whether a weed is tangled with the roots of your new plant, trim the weed just below ground-level with scissors; later pull it out completely once your vegetable plant is better and more clearly established.

### Diagnosing Garden Problems: Pests & Disease

Diagnosing plant problems is often a difficult task. If a plant in your garden has, for instance, leaves that are turning yellow, or black spots on its fruit, how can you tell what's causing the problem—an insect, a disease, a nutrient imbalance, or something else? There can be many different causes for a given symptom, and not all of them are related to insects or diseases.

The health of a plant can also be affected by **soil nutrition** and **texture**, **weather conditions**, quantity of **light**, and other environmental or cultural conditions. Plants are usually quite resilient when given a healthy environment to grow in; however, the above-mentioned factors can interact with one another to compromise a plant's immunity to pests and diseases. For example, a prolonged period of **drought** may weaken plants so that they are more susceptible to pests.

So, what can we do? Often, we can go through a **process of elimination** to figure out the most likely cause of more common problems:




- ▶ You can start to rule out **insect damage** by inspecting your plant carefully and closely. If it's an insect problem, you can usually find some evidence of insects on the plant, such as feces or webbing (this will look like a fine spiderweb).
- ▶ If the edges of your plant's leaves are dry and brown, we should consider a few possible problems. This can be caused by environmental issues. **Too much water or too little** can cause your leaves to brown - consider both possibilities. If you notice **wilting**, remember that this can be caused by too little or too much water as well.
- ▶ It is also possible to **over-fertilize** your plants, and this can cause them to turn brown as well due to too much nitrogen.

Learning how to care for the specific needs of plants and provide the best habitat for them is something that takes **time and practice** to master. The **library and internet** are very helpful for finding plant information and their most common ailments, and should be the first places you go for attacking a plant problem. Use the internet first, and be sure not to rush to the chemical aisle at the store!



## Living Causes

If disease is a possibility, check these general guidelines for identifying the different causes of disease:

- ▶ A **fungal pathogen** often causes round leaf spots, stem rots with a dry or papery texture, concentric rings, discoloration, or wilt. Abnormal structures may form on affected tissue.
- ▶ A **bacterial disease** can take the form of galls (swollen areas), irregularly shaped leaf spotting, leaf yellowing or death, wilting, or rot.
- ▶ A **viral pathogen** can cause degrees of yellowing or spotting, stunting, distortion, or dieback of part of the plant. Viruses usually weaken rather than kill plants.
- ▶ **Nematodes** are microscopic roundworms that cause disease-like symptoms. Root nematodes are the most common and feed on plants underground, damaging their root system. This damage leads to moisture and nutrient stress, which manifests as wilting and stunting.

If an insect problem seems likely, check the following:

A **chewing or rasping (scraping) insect** feeds on plant tissue and can cause ragged/chewed or missing leaves (caterpillars, slugs, beetles, grasshoppers), rolled leaves (leaf roller), and tunnels throughout the leaf (leaf miners). They can also cause holes in stems, branches or trunk, premature yellowing (wood borers); contorted or dead stems (cutworms, twig girdlers, or stem borers); or general decline of plant health due to root damage (soil-dwelling insects).

A **sucking insect** feeds on plant fluids and injects toxins into the plant. The toxins can cause leaf spotting or discoloration (aphids, leafhoppers, spider mites), leaf curling or puckering (leafhoppers and thrips), or poisoning of the entire plant, resulting in stunted growth and/or yellowing (scale, mealy bugs, mites, aphids, whitefly).



## Non-Living Causes

- ▶ Damage caused by **mechanical factors** is usually revealed by close visual examination. Check for broken or otherwise damaged stems or roots, and bruised, punctured, or broken leaves.
- ▶ Damage due to **physical factors** often results from environmental extremes. Cold damage will kill exposed foliage. Container plants are susceptible to cold damage to the root system, characterized by blackened or spongy roots with lack of new growth or root hairs, usually near the container edge.
- ▶ A rapid change from low **light** to high light intensity, or vice versa, can cause yellowing of leaves, reduced growth, and leaf drop or death. Too little light can reduce, delay, or prevent flowering and will also result in very lanky, sparse growth.
- ▶ Excess **heat** causes scorch symptoms on leaf tips and inter-vein areas. Portions of leaves shaded by other leaves, or leaves on the shady side of the plant, may be undamaged. Frequently, heat damage will occur uniformly over all plants in an affected area.
- ▶ If **drought and water-logging** occur, they produce many of the same symptoms on the aboveground parts of the plant, mainly chlorosis (yellowing leaves), abscission (shedding older leaves), and wilt. Water-logging of the root zone also results in oxygen deficiency, leading to a halt in root growth, death of the roots, and wilt.

- ▶ Damage due to **chemical factors**, such as inappropriate or excessive herbicide use, causes leaf burn or curl, distortion, chlorosis, or bleaching, depending on the chemical.
- ▶ A **nutrient deficiency** can show up as yellowing, stunting, or death of older plant leaves or new growth, depending on the missing nutrients.



## Double-Check the Obvious

It never hurts to look again for obvious problems:

- ▶ Is the plant's stem or trunk badly damaged?
- ▶ Has the plant been sitting in a puddle of water for a week?
- ▶ Has your neighbor sprayed an herbicide lately?
- ▶ Are pets getting into your garden?
- ▶ Do your children "help" you by cleaning the plants with furniture polish or window cleaner?

## Chemical Free Pest Management

If you have pest bugs in your garden (see [Appendix I](#)), our best recommendation is to avoid using chemicals, because they are harmful not only to you, but to your pets and the environment too!

There are many ways to try to prevent these pest bugs from showing up in your garden, but once you have them and you want to get rid of them, what should you do? It turns out that many of these pests can be managed using **insecticidal soap** that is gentle on both your garden and the environment, but which often takes care of pest bugs. You can make this yourself by mixing 1 quart of filtered water with 1-2 tablespoons of true soap (not detergent). The most highly recommended soaps are either Dr. Bronner's Peppermint Castile Soap (liquid) or Fels Naptha (bar soap, which can be dissolved into the water). You can also purchase commercially made insecticidal soaps. Look for those products that contain "potassium salts of fatty acids" or "potassium hydroxide".



An insecticidal soap needs to come into direct contact with the pest insect to be effective. Apply the insecticidal soap in the early morning or late afternoon, only spraying on the particular plant(s) that you find the insects on – remember to check for these bugs on the underside of leaves,

Although most of these soaps are fairly gentle, it is still important to wash this produce later after you harvest and before you eat it to avoid ingesting the soap.

Another pest management tool is **Diatomaceous Earth (DE)**, a fine white powder that is the fossilized remains of marine phytoplankton. When it is sprinkled on insects that have an exoskeleton, it works under the insect's shell and punctures their body, dehydrating and killing the insect. DE is nontoxic, and there is no buildup of tolerance like there is to poisons because this method of killing is physical, and not chemical.



## Pest & Disease Prevention

Plant diseases and pests become established when environmental conditions are favorable. Reduce the chance that these conditions will occur through a combination of prevention methods:

- ▶ Select **disease-resistant varieties of vegetables** (many seed companies sell disease resistant strains of certain vegetables - for information on these, you can search online)

- ▶ Rotate vegetable planting sections (**crop rotation** – see next chapter) in your garden to prevent planting vegetables from the same family in the same section year after year. This can often help keep conditions unfavorable for both diseases and pests that can develop over time.
- ▶ Control **weeds**, which compete with vegetables and possibly carry plant diseases.
- ▶ Control **insects** that attack your plants and may carry diseases.
- ▶ Allow **beneficial pollinator and predator insects** to have a home in your garden.
- ▶ Remove **plant materials** soon after harvest or after the plant has quit producing; **destroy any diseased** plant materials.
- ▶ Disinfect **garden tools**.
- ▶ Apply **organic fungicides** in a timely manner as needed if resistant vegetables varieties are not available.
- ▶ Practice **companion planting** (see **Chapter 4**) to deter bugs, increase plant health, and hinder disease transfer.
- ▶ Use **row covers** (a simple cloth cover for your garden, available in garden stores - see **Chapter 4**) to protect young plants, especially when certain insects are in their egg-laying stage.

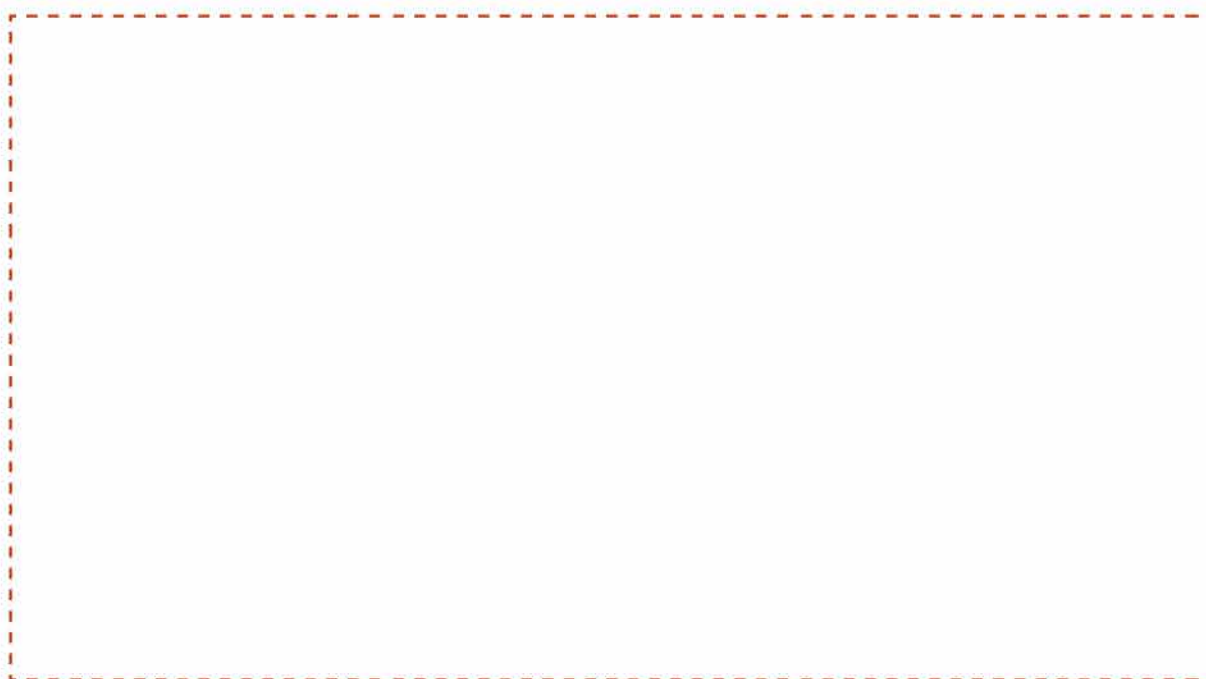
Pick some favorite produce you want to plant in your garden. List them below.

Check **Appendix I** and list any **bug pests** you will need to watch out for:



If it is Spring or Summer, take a walk around your yard.

What insects do you see? Check **Appendix I** - are there beneficial insects you already have in your yard? List them. What about pest bugs you will need to be aware of when you start planting? List them here as well:





Take some time to go online and look at **weather patterns** in your area over the last few years.

Which seasons do you want to grow in?

What are the weather patterns in your area for each season?

Can you expect too much rain? Not enough? Extreme weather?

Make some notes below for each season:

**Spring:**

**Summer:**

**Fall:**

**Winter:**

# CHAPTER 4: ADVANCED GARDENING

1. WORKING WITH THE ENVIRONMENT

2. ADVANCED PLANTING METHODS

3. EVERYONE TEACH ONE

4. YOUR GARDEN JOURNAL

1. WORKING WITH THE ENVIRONMENT

## Season Extension

It can be confusing to hear about “Spring and Fall” crops, and realize too late that they should have been **planted during the previous season**. This is especially the case with **Fall crops**, which are actually planted in late summer and harvested in the fall.

**Irregular weather patterns** often interfere with the typical timing of planting Spring and Fall crops. Timing gets complicated when winter persists into March and April and it’s still too cold for spring seeds to germinate. This is also the case if summer heat drags on and it’s too hot for germinating fall seeds.

Here are some **tips** and potential options to try to keep your **planting schedule** on track:

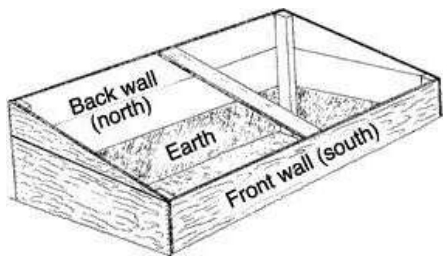
Germination of Spring crops when it's **COLD**:

For seedlings you plan to **transplant**, you can:

- ▶ Use heating mats.
- ▶ Place a big pot of hot water in the green house (if you own one).
- ▶ Put mirrors on the back of the seedling table to reflect more light.
- ▶ Install a heat lamp.

For **direct seeding**, you can:

- ▶ Create mini greenhouses (cloches)
- ▶ Use milk jugs or two liter soda bottles; cut off the bottom, place jug over the seeded area, and open the lid for ventilation.
- ▶ Place small plastic hoop tunnels or row covers (see pictures



below) over your beds to help the ground warm up more quickly. When it gets warmer, but is still cold at night, remember to vent your tunnel during the day.



Germination of Fall crops when it's **HOT**:

For seedlings you plan to **transplant**:

- ▶ Do not let your seedlings dry out. Water regularly to keep them moist until they are ready to be planted.
- ▶ Keep a fan in the greenhouse (if you own one) to increase ventilation.

For **direct seeding**:

- ▶ You may have to wait for a break in heat to plant crops such as carrots, spinach, and radish.
- ▶ Remember, the smaller (and more fragile) the seed, the more likely it is to break down in the heat. You may have to re-seed, and/or use shade cloth (see pictures below) over your beds until the temperature drops.



## Fencing

Sometimes, we have more than just pest bugs getting into our gardens. **Pesky animals** are part of the environment too, even in a city. Rabbits, ground mice, groundhogs, raccoons, deer and more may try to eat your plants. Squirrels may plant oak trees in your garden. Dogs may hunt through your dirt looking for pests, and cats may try to use your mulch as a litter box. Thankfully, installing **fencing** around your garden can keep your plants mostly safe from these threats.

Before you start, remember that it is best to **match the size** of your fence to the size of your pest. For instance, a deer fence will be much larger than a rabbit fence. Besides deer, most city critters will be kept out by a two to three foot high mesh or chicken wire fence. For deer, your fence should be about eight feet high, and shiny things keep them away. Old CD's every few feet on string works well.

To **construct a fence**, you will need something for posts and something for the fencing. You can purchase materials, but remember to check around your home and yard for materials you already have. For posts, you can use wood stakes, t-posts, sturdy tree branches secured in the ground, or anything else that can go in the ground and stand tall enough.



As for fencing, **chicken wire** works great for smaller critters as do plastic or metal mesh fencing materials. Put your posts every 4 to 6 feet apart and attach the fencing to the posts with twine or baling wire. Be sure to have the fencing touch the ground; it can be useful to have gardening stakes in between your posts. Do not forget to leave a gate so that you can still access your garden while keeping pests out!



Electric fences are often more effective, but cost more to buy and operate. Most of the materials mentioned and shown above can be found for free or cheap around town, or from gardening friends.

## 2. ADVANCED PLANTING METHODS

### Inter-Planting

**Inter-planting** is a growing method that will allow you to fit more vegetable plants in a single planting bed and increase your crop yield. **Intensive vegetable gardening** uses this method to cover all available space in the growing area – as opposed to single row planting which requires the most cropping space since the space between rows goes unplanted. Once you have been gardening for a while and know your garden and your crops well, this is a great way to take full advantage of every bit of space in your yard.

There are **several ways to inter-plant** your crops. You can grow **fast-maturing** plants, such as radishes, between **slower growing** ones, like swiss chard. The radishes will be ready for harvest before the chard begins to mature and requires more space to spread out. This method of inter-planting is similar to **succession planting** – planting the seeds of the same crop multiple times throughout a season to keep the garden bed productive all season.

You can also inter-plant crops with **different growing habits**, tall crops near short ones, or deep-rooted with shallow-rooted. Crops inter-planted by growing habit can be set equidistant according to their size (height and width or root depth) at maturity; or they can be planted in their own alternate rows in a wide bed.

Inter-planting requires **planning**. You need to know the days to maturity for each crop and its height and breadth or root depth at maturity. Do some planning on paper if you decide to try out this planting method, and feel free to use the work you have done with the guide to help you! Talk to other gardeners. Take note of what you see in other gardens. As ever, we welcome visitors to our urban farm for more ideas!

## Companion Planting

**Companion planting** is the idea that certain plants are beneficial to one another when grown together. It is a common inter-planting practice. There are many ways in which companion plants can serve and benefit each other. For example, tall plants provide shade for sun-sensitive shorter plants. Sprawling vegetables cover the ground, while trellised plants grow vertically, allowing you to plant two vegetables in one patch.

Companion planting can also help prevent pest problems. Certain plants, like onions and marigolds, repel some pests. Other plants that attract pests can be used as a **trap crop** to lure existing pests away from more desirable vegetables in your garden. Furthermore, every successful garden needs plants that attract beneficial pest predators and beneficial pollinators to help your plants



produce their vegetables. Planting certain types of flowers throughout your garden creates food sources and habitats for these beneficial bugs. There are many helpful resources at the library and on the internet with more information



## Crop Rotation

As we have talked about previously in the Guide, dividing your garden into sections and planting a different vegetable family in each section is a practice called **crop rotation**. When you choose to plant each family will change from year to year to ensure that the same family of vegetables is not planted in the same section over and over again. This is managed by creating a **rotating schedule**, where four different plant groups are rotated within four different sections of your garden. You can develop your own rotation system depending on the food varieties you like to grow; the main idea is that you keep things moving around from year to year.

Reasons to rotate crops:

















- ▶ **Disease Prevention:** The main reason to rotate crops is to prevent the spread of plant disease. Diseases that favor particular vegetable families can build up over time, resulting in eventual crop failure. Rotating crops keeps these organisms in check.
- ▶ **Insect Control:** Crop rotation also helps reduce insect infestations by moving their food sources every year.
- ▶ **Nutrient Balance:** Different families of plants use and require different nutrients. By rotating your crops, you keep the soil from being depleted of certain nutrients over others, and you can target soil amendments to keep your garden balanced.
- ▶ **Nutrient Enhancement:** Some plants actually enhance the soil, so rotating them through the garden can produce free organic soil conditioning.

We recommend dividing your garden into **four planting sections** (four vegetable families) based on the part of the plant you eat:

- ▶ Plants grown for their **leaves or flowers** (salad greens, mustard, kale, collards, broccoli, cauliflower, cabbage, Brussels sprouts)
- ▶ Plants grown for their **fruits** (tomatoes, peppers, eggplants, squashes, cucumbers, melons)
- ▶ Plants grown for their **roots** (carrots, turnips, radish, beets, onions)
- ▶ Vegetables that feed the soil (beans, peas, cover crops such as alfalfa, clover); these plants are called **nitrogen-fixers** because they feed the soil by grabbing nitrogen out of the air and releasing it into the soil!

**Did you know that cauliflower and broccoli are technically flowers?**

### Sample 4 year plan:

Year 1	Area 1  Leaves	Area 2  Fruits	Area 3  Roots	Area 4  Legumes	Year 2	Area 1  Fruits	Area 2  Roots	Area 3  Legumes	Area 4  Leaves
Year 3	Area 1  Roots	Area 2  Legumes	Area 3  Leaves	Area 4  Fruits	Year 4	Area 1  Legumes	Area 2  Leaves	Area 3  Fruits	Area 4  Roots

### 3. EVERYONE TEACH ONE

Now that you have all the basic skills to grow food in your own yard, there is more! At CCUA, we are not only stewards of the earth, but also **stewards of our neighborhoods**. You can make plants flourish from just a little work, and your garden's presence creates an opportunity for you to share ideas with neighbors and friends to create abundance all around you!

Here are some ideas:

- ▶ If you have **extra seeds**, think about **sharing** these with your neighbors and friends.
- ▶ If you know how to **compost**, teach someone else! It will help reduce waste in the landfill and repair soil in your area.
- ▶ Did you know there are **social media** groups about gardening? There are even local seed **swap pages on Facebook!**
- ▶ Try getting out and meeting people at **events** at the Urban Farm, farmers' markets, and local garden centers. There are community garden tours in the spring! All you have to do is start asking and looking for information.
- ▶ What about starting a **garden club** in your neighborhood? Have a location, a regular date and time, and everyone bring a few snacks. Share gardening tips and seeds and discuss problems you can solve together.

- ▶ Are there people on your street who **live alone** and may not have the skills or materials to cook fresh food? Maybe they have never tasted some of the vegetables you are growing. You can take them a meal or invite them to dinner. Help to inspire them to cook and share ideas with them. You never know when they could help you out in turn, or **pay it forward** by helping out someone else.
- ▶ Do you have extra **volunteer hours** you would like to give? Maybe helping out with an Urban Farm, at a school garden, or a local soup kitchen would allow you to find other gardeners and would-be gardeners.



Trying even one of these things can create a community where before there wasn't one. This is the power of gardens, but it is also the power of gardeners!



## 4. YOUR GARDEN JOURNAL

A **garden journal** is your own personal diary of what happens in your garden. It will be a **daily record** of your achievements from year to year, and of the changes you make to your garden. Your journal can be a daily record of what you did in the garden, how you did it, what the weather was like, your successes and failures, what grew well, what didn't, varieties you used and how they did, exciting things you saw or did, harvest details (yields), and any other personal thoughts you have about your garden.

It's also a great way to record how much you've learned from the very first time you planted a garden. When you finish recording a gardening season, your journal becomes your own personal book filled with facts and information about what went on in your garden and how you did things.

Your journal can be as plain or fancy as you would like. What's important is that you keep one. Use any notebook of your choice to keep track of all the details!

Another idea is to **include drawings** and pictures of your garden and you in your garden. You may even want to include pressed flowers or leaves. Your garden journal will become a snapshot of a particular day and all those days put together give you a picture of your exciting garden year!

# CHAPTER 5: SEED TO PLATE

## 1. PLANNING, SHOPPING & BUDGETING

## 2. FOOD PRESERVATION

### 1. PLANNING, SHOPPING & BUDGETING

Planning meals on a budget for a family can be very stressful. In the long run, your garden will save you money by providing a wealth of vegetables for you, your family, and your neighbors. But first, we have to incorporate your new wealth into your life so that you can adjust your family's budget without any initial waste!

Using the following structure for your family's shopping list is a simple but efficient way to make sure nothing goes to waste. It will help you keep track of what you already have available in your garden!:

<i>meal:</i> _____		<i>grocery</i> LIST:	
HAVE	NEED	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

<i>meal:</i> _____		<i>grocery</i> LIST:	
HAVE	NEED	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

What are my family's **favorite meals**?:

Now look at what you are growing or planning to grow in your garden.

**Add these ingredients** to your family's favorite meals in the **above list**!

## 2. FOOD PRESERVATION

Some of your food will be abundant only one or two times a year.

**Freezing, drying,** and **canning** are all options for saving your harvest to use in meals ALL year. This is where your garden will save you real money in the long term!

### Freezing

**Freezing** your harvest is by far the quickest and easiest way to preserve vegetables. It requires very little time and effort, and the risk of foodborne illnesses is very low. Even better, the **flavor** of your produce is preserved well when frozen. The only limitation on how much you can freeze is the size of your home freezer. Keep in mind produce also **will not last forever** frozen in plastic baggies, as it can get freezer burn and decrease in flavor as months go by.

You can freeze any of your produce simply by placing them in bags and freezing them immediately (or directly), straight out of the garden. Another option or technique is to **blanch** them. Blanching your vegetables involves briefly boiling them first before you freeze them. This will preserve more color and nutrients. The blanching process will also kill off harmful bacteria, and therefore can make a product safer to eat for longer. For this reason, directly frozen produce will not last as long as blanched and frozen produce. Foods that are frequently directly frozen are herbs and fragile fruits. It is also a good tip to freeze your produce in a form that is easy to use. Try to avoid storing huge



bags of frozen peppers if you will only use one or two at a time, and also avoid leaving inedible parts on a plant when you freeze it, such as the stems.

Remember also to limit the amount of air inside the storage vessel and freeze foods at their freshest to make them last the longest.

Some common fruits and vegetables to freeze:

Peppers, grapes, cherry tomatoes, large tomatoes, basil, cilantro, apples, peaches, pears, blueberries, collards, kale, green beans, peas, and broccoli.



## Drying

Drying your foods is the next easiest method of preserving the produce from your garden. You can save money on expensive ingredients like herbs and dried fruits year round by growing your own. You can even experiment with making your own chili powders and other spices. Dried foods store very well, lasting and keeping their flavor into the following growing season if stored properly. Most foods keep good flavor when dried, but may change in unexpected ways. For example, replacing dried herbs for fresh herbs in a recipe requires half the amount because dried have more potency, and dried tomatoes change to a different delicious flavor and have a chewy texture when cooked.

There are two main methods of drying foods: **hang-drying** and **dehydrating**. Hang-drying foods requires no special equipment, though often requires more space and a week or two to dry. It is important to hang your produce in a dark, dry, warm, and well-ventilated space while drying, which is sometimes hard to find in a small apartment or house. Light saps away color and nutrients when drying food, so it should be avoided. Extra moisture can grow mold on your food and so dryness and ventilation are required. Warmth helps to speed up the process.



Using a **food dehydrator** or **oven** dries foods more quickly, but requires extra time and effort on the gardener's part. An electric dehydrator costs as little as \$30 and is very easy to use. To use an oven, put on the lowest setting (around 150 degrees is ideal) and/or open the oven door if it does not go that low. Spread produce on a baking sheet and stir it every 30 minutes until dry. This can take longer depending on the food and your oven.

**To store** any dried food, place in airtight glass container. Plastic bags or tupperware are not ideal as they allow air and moisture to pass through. Glass containers can then be stored anywhere, but the foods will keep flavor and nutrients best if stored away from light.

## Canning

Preserving food by **canning** is a great way to store a lot of produce, and when done properly makes your foods edible forever! It saves flavor very well, and you can preserve many foods this way. This isn't only for individual vegetables either. You can preserve recipes like salsa, fruit jam, pickles, applesauce, juices, and even meats. You can also choose the size of the jar, so you have the proper amount of an ingredient for a recipe months later when you use it.



Canning is the most time intensive and difficult method of preserving any food and it brings with it the risk of botulism, a bacterial infection possible if jars are not sealed properly. For this reason, it is **imperative to maintain cleanliness**. We must always boil the jars and lids and sterilize all equipment before use. Follow the directions of timing carefully. You will notice that most canning requires the ingredient citric acid - in most cases, you can use lemon juice for this ingredient.

The canning process can be very messy and will also take hours to complete, especially if you have a large harvest. Although it requires some equipment, all of it can usually be acquired cheaply at garage sales, flea markets, or department stores. Remember that the process of canning something requires cooking, so the texture of many foods will change.

## Tools needed:

- ▶ Rangetop
- ▶ Large pots (6-10 quart) or pressure cookers
- ▶ Jars, rings, new lids
- ▶ Lemon juice (for citric acid)
- ▶ Canning tongs
- ▶ Canning funnel
- ▶ Mixing bowl for ice bath
- ▶ Clean towels

For many of these tools, you may use different variations or improvise something, but it is imperative when canning to **only use glass mason jars with never-used lids**. Glass jars that foods came in from the grocery store do not work as they are thinner and frequently crack. The proper ones will say Mason, Ball, or Kerr. The rings to these are reusable, as are the lids for storing leftovers, but each time you can something, brand new lids are required to make a quality seal on the glass.

When your produce or recipe is prepared, fill the jars (a canning funnel helps prevent messes), affix a ring and brand new lid, and set them in a boiling water bath for the time required. Boiling times for canning change depending on the food being preserved, the altitude, and the equipment being used. Make sure to research times before canning a food. After taking them out, allow jars to sit for roughly 15 minutes or until the lid seals. Remove the rings and store in pantry.

For further step by step information on how to can your produce, visit [pickyourown.org](http://pickyourown.org)!

# THANK YOU!

One of the beautiful things about the knowledge you now possess, is that it is cross cultural. Food is good, and everybody eats. Garden talk and sharing tips and tricks bring together every gardener, no matter what background, what level of education, or where they live. We hope that having this new skill will help you make more friends, create a greater safety net in your community, and give you pride. You are achieving something generations of people from all walks of life have contributed to. We are so proud to be part of this journey with you and look forward to long talks of tomatoes, beans, and bugs.



There is no end here; this is only the beginning. The beginning of many beautiful flowers, tasty meals, smiles, and laughter over the garden, and dirt under your nails to show for it. You are now joining the mighty force of gardeners with a long history. It's not an exclusive club after all, and you may be able to offer up your knowledge and skills to people looking for ways to supply their own family and friends with food from the yard. You have also been a key player in creating a bountiful and beautiful habitat in your town! On behalf of the butterflies, the bees, the earth worms, and the neighborhood children who delight at your plants, we thank you!

## Appendix I: Insect Information and Beneficial vs. Pestilent Bug Identification

### ***Beneficial Insects***

*These bugs should always be a welcome sight in your garden. Most are predatory or parasitic, attacking pests in your garden, some are pollinators helping your plants produce fruits and vegetables, and some are soil builders. We have included identifying descriptions and methods of attracting these bugs where applicable.*



#### **Assassin Bug**

Assassin bugs are non-picky predators in the garden. While they live on plants, they do not feed on them preferring instead variety of smaller insects including aphids, caterpillars, hornworms, beetles, and more. They have a sharp beak to violently stab their prey to death and will bite humans if handled carelessly. While this can be incredibly painful, it can be easily avoided by not handling them.



#### **Bee**

Bees come in a few varieties and their distinguishing factor from wasps and hornets is that they have hair, giving them a fuzzy appearance. These black and yellow insects are imperative to your garden in being one of the most prevalent pollinators. As it eats pollen from flowers on your plants, it spreads that pollen to other flowers, essential in the production of fruits and vegetables. While bees will sting humans, they will leave us alone if we do not bother them. Avoid making fast motions while bees are around, and you can live in harmony with them.

Avoid pesticides in your garden as these will often cause damage to bees. Plants in the mint family such as mint, oregano, salvia, and lavender will heavily attract bees, though they will be found nearby almost any flowering plant.



#### **Butterfly**

There exists a broad range of butterfly species of various sizes and color, but all share the same basic shape of small body connected to wings. These are great creatures for pollinating your garden, like bees. They feed on pollen from flowers and in the process, may pollinate your fruit and vegetable plants. A wide variety of flowering plants will attract butterflies including fennel, dill, and oregano in the category of edible ones. Certain plants will attract beneficial caterpillars too, including milkweed, borage, and fennel. Chemical pesticides or herbicides may kill pollinating butterflies in your garden, so try other pest control methods before resorting to these.



### **Convergent Lady Beetle**

Commonly known as ladybugs, they have a recognizable red coloring with black dots and a hemispherical shell. They are not only cute to have around, but incredibly helpful if your garden has too many aphids. Lady beetle larvae consume up to fifty aphids a day and adults about twenty. They may be difficult to attract but are **commercially available** online.



### **Pirate Bug**

This small bug works as a beneficial biological pest control for the gardener and farmer. They are yellowish to greenish and are typically only a fraction of an inch long. They feed on other small insects, spider mites, and insect eggs. In this way, they act as a convenient organic pest management system.



### **Praying Mantis**

This green or brown predator eats a multitude of other insects over its life. As it molts through nymph stages, it eats leafhoppers, aphids, and mosquitoes and attacks larger insects such as beetles, spiders, moths, and grasshoppers once fully grown. It uses its eponymous front legs to hold down its prey while eating the insects alive. It hunts constantly and is therefore a good garden pest manager, but does not discern between garden pests and beneficial insects.



### **Predatory Mite**

Spider mites feed on the undersides of leaves on garden plants, but there are some predatory mites that feed on these pests. The predatory mites consistently attack red mites and two-spotted spider mites. They are very small, pear-shaped, and typically a translucent creamy color, though may take on a reddish or brown coloring depending on individual diet.



### Pillbug

Pillbugs, frequently called roly-polies, are the little bugs that live in the dirt and roll up into an armadillo shape when they know you are around. They are not insects at all, but in fact crustaceans like shrimp or lobster. These creatures feed on dead and decaying matter, returning organic matters back to the soil. They are even capable of digesting heavy metals, which are bad for humans but possibly present in urban soil. If there are none in your garden, try watering more as they prefer highly moist environments. They will be frequently found in the soil in your garden and in your compost pile.



### Six Spotted Thrip

Thrips are very small and skinny insects less than 1/8th of an inch long. They are identifiable by the three spots on each wing in their adult stage. They prey on spider mites and provide a natural control in the garden, unlike other thrips which eat more plant material.



### Soldier Beetle

These black and yellow or orange beetles are closely related to fireflies. They are often referred to as leatherwings on account of having soft wing covers. Soldier beetle nymphs will eat eggs and nymphs of grasshoppers, beetles, moths, and other insects. Adults eat aphids and other soft bodied insects. Planting **marigolds** and **goldenrod** frequently attracts soldier beetles to your garden, as do herb gardens in bloom.



### Spider

Depending on the species, spiders can eat almost any insect. Some spiders have more picky diets and prefer to only eat certain prey while others are not overly choosy. While spiders are known for spinning webs, not all collect their food this way. Some live on the ground to eat ground-dwelling insects that are not caught in webs, and crab spiders spend time on flowers or vegetation waiting until prey comes within attacking distance. In this way, spiders do act as a beneficial predator in the garden, but are not consistent in managing one specific pest.





### Syrphid Fly

Syrphid flies are commonly known as hoverflies, flower flies, or sweat bees. There are thousands of species of them, many of which have different habits. Adults mainly feed on pollen and nectar, but the larvae feed on many different foods. Predatory species often eat aphids, leafhoppers, and some other plant-eating insects. These black and yellow-patterened syrphid flies also act as pollinators and are important for both wild and agriculturally grown plants. To attract them, gardeners suggest companion plants of **buckwheat, chamomile, parsley, yarrow,** and the **flowers alyssum, statice, and iberis umbellate.**



### Predatory Wasp

Wasps may be scary for some people to see in a garden, though they can be beneficial hunters of pests. They will eat or parasitize a wide variety of animals including beetles, beetle larvae, caterpillars, flies, and other large insects. They are generally larger than bees (even up to 2"), though lack hair like bees and do not look fuzzy. Social wasps live together and will defend their territory, therefore could sting you. However, some wasps are solitary and will not defend their territories and are therefore not a threat to humans if found in a garden.



### Worm

Earthworms are integral in transforming organic matter back into nutrient-rich soil for your garden. These wriggly creatures ingest soil with organic matter and nutrients unavailable to plants. Their waste, referred to as "castings," are rich in plant-available nutrients and can even be used as a fertilizer. Further, they aerate soil as they move, creating little tunnels that are good for your soil health. Many urban gardeners utilize vermicomposting to decompose and reuse food scraps in their garden.

## **Garden Pests**

*These bugs are a bad sight in your garden; they can and will harm your plants or your fruits and vegetables. Some are easy to get rid of while others are more difficult. You will find here identifications for each pest with some recommended management techniques. The most important key to dealing with pests is inspecting your plants regularly to catch any infestation early.*



### **Aphid**

These tiny, somewhat pear shaped pests live most often in large colonies together on certain crops. Aphids can be white, green, brown, red, or black depending on the species and its food source. They are leaf eaters, and when living in large populations leave damage such as small yellow spots, stunted plant growth, leaf curl, and black fungal growth. Aphids also transmit viruses, which can cause even greater problems than the aphids themselves.

#### *Management*

- Insecticidal soap – spray after watering
- Check for ants and manage – they “farm” aphids, protecting them from predators and eating aphid excrement
- Introduce beneficial insects – especially parasitic wasps, lady beetles, lacewing larvae, soldier beetles, and syrphid fly larvae
- Examine your plants – catch an infestation early



### **Cabbage Maggot Fly**

The cabbage maggot is the larval stage of what is known as the cabbage root fly. This insect lays its eggs at the base of plants it eats, primarily cabbage and other cold weather crops. They are hard to notice since the larvae live under the ground living off the roots of crops. An affected plant will show signs of wilting and look indicative of plants lacking water. The larvae are about 1 cm in length.

#### *Management*

- Row covers
- Succession Planting
- Crop Rotation
- Compression of soil after transplanting
- Trap crops
- Encourage beneficial insects



### **Cabbage Looper**

This caterpillar, also commonly known as an inchworm, is called a looper on account of the action of its movement. It has no middle legs and so loops its body up while it moves along leaves. The adult is a grayish-brown moth with a wingspan about 1½ inches wide and a white mottled figure 8 on each wing. The pale green caterpillar grows up to 1½ inches as well. They are leaf eaters and can do damage to a wide variety of plants including

cabbage, broccoli, cauliflower, collards, many other greens, and occasionally to almost any plant with leaves.

#### *Management*

- Hand picking – target larvae and eggs preventing more generations
- Insecticidal soap
- Encourage beneficial insects – especially trichogramma wasps
- Pheromone traps – mostly to signal that moths have arrived
- Row covers



### **Tomato Hornworm**

This caterpillar feeds on tomato plants and other nightshades including peppers, eggplants, and potatoes. This is likely the largest caterpillar you will see in your garden, reaching 3-4 inches long. The green caterpillar grows white stripes or V-shapes on its sides as it reaches maturity. Notably, it has a horn-like projection pointing up from its tail end. It grows into a large moth known as a butterfly moth or hawk moth on account of its size.

#### *Management*

- Weed your garden – prevents hornworms having a home to lay eggs
- Hand pick
- Till affected plants
- Encourage beneficial insects – especially parasitic braconid wasp lacewings, wasps, and ladybugs



### Cucumber beetle

These beetles feed on the leaves and fruit of cucumbers especially, but all cucurbits including melons, squash, and pumpkins. The beetle is yellow and black and are either spotted or striped. The spotted variety is mainly yellow with a dozen black spots on its wings, while the striped variety has black stripes going down its wings. Besides causing foliage and fruit damage, the larvae feed on roots of plants and the beetle also spreads malicious plant bacteria.



#### *Management*

- Examine your plants – catch an infestation early
- Trap crops
- Crop rotation
- Inter-cropping
- Row covers – when cucurbits are young
- Companion planting – white varieties of radishes and beans
- Plant from transplant, rather than seed
- Encourage beneficial insects – especially parasitic tachinid fly and braconid wasp
- Straw mulch



### Cutworm

The cutworm is a 1-2 inch long dull gray or tan caterpillar that curls up when inactive. It feeds on the stalks of plants near ground level, frequently eating through the stalk and cutting it down. The cutworm feeds on a host of crops, including beans, corn, beets, cabbage, broccoli, and kale. Damage to plants is noticed in the morning, since the cutworm is a nocturnal eater. Gardeners may wake up to find entire rows of newly planted crops decimated. Pesticide use on cutworms is "often unsuccessful," according to Michigan State University Extension.

#### *Management*

- Remove grasses near garden beds – cutworms feed on this, too
- Cardboard collars around plant stalks – insert an inch into ground
- Trap crop – especially sunflowers
- Hand pick – at night since they are nocturnal
- Encourage beneficial insects – especially trichogramma wasps and nematodes
- Diatomaceous earth
- Water in the morning
- Avoid – planting cover crops during infestation
- Avoid – mulched pathways, dig them so that dirt dries out as cutworms do not like dry dirt



### **Flea Beetle**

There are many different species of these tiny, jumping beetles prevalent in gardens in earlier growing seasons. They frequently feed on brassicas (broccoli, cabbage, kale, collards) and nightshades (tomatoes, potatoes, eggplant, peppers) and leave buckshot-like holes covering leaves. Heavy infestations may cause plant wilting and stunted growth. Larvae feed

underground and adults above ground and both can kill seedlings and small transplants.

#### *Management*

- Yellow sticky traps
- Diatomaceous earth
- Trap crops
- Row covers
- Introduce beneficial insects – especially nematodes
- Adjust planting schedule
- Garden sanitation – especially removing mustard or nightshade weeds
- Plant eggplant in pots and elevate above ground



### **Harlequin Bug**

This black and red or orange bug affects only the southern states in the US. It migrated from Mexico and is thought to have been used as an agent of crop warfare by the Union during the Civil War. Their pattern changes slightly during larval stages but is always distinctively red-orange and black. They feed on brassicas and favor kale, but will eat broccoli, collards, cabbage, chard, among other plants. They feed by sucking out sap from plant foliage and sometimes fruit and seeds. Damage will appear as small discolored spots and stunted growth.

#### *Management*

- Hand pick
- Trap crop
- Insecticidal soap
- Diatomaceous earth
- Encourage beneficial insects – especially ant, ladybird beetles, pirate bugs, and lacewings
- Companion planting – especially garlic, tansy, mint, and catnip
- Garden sanitation - remove heavily weedy, bushy areas near garden



### Japanese Beetle

The Japanese beetle is a non-native pest across the United States. The shiny beetle is recognized by its distinctively shiny mix of green to red to black coloration. It feeds on a very broad range of plants including grasses, trees, fruits, vegetables, and flowers. Damage produced are skeletonized leaves resulting from the beetle eating the vegetation of leaves between veins.

#### Management

- Pheromone traps – *Use caution:* may attract more than it kills
- Row covers
- Companion planting – especially catnip, chives, and garlic
- Hand pick
- Encourage beneficial insects – especially blue-winged wasp



### Mexican Bean Beetle

This beetle often gets mistaken for a ladybug, and it is closely related to lady beetles but is one of the only species in the family that feeds on plants. It can do some drastic damage to beans of all varieties since both the larvae and adults eat the leaves of these plants. The larvae are oval-shaped, yellow-orange in color, up to 1/3 inch long, and have long spikes all over its body. The adult resembles a lady beetle in size and pattern but is usually yellow or orange in color. If they are in your garden, you will find the any stage of the Mexican beetle on the underside of bean plant leaves. The damage to the leaves can range from holes in them with yellowing color to completely skeletonized.

#### Management

- Examine your plants
- Varietal selection – early maturing is best
- Hand pick
- Diatomaceous earth – beneficial but will not eradicate
- Trap crop
- Encourage beneficial insects – especially parasitic
- tachinid fly, ladybug, lacewing, and pirate bug



### **Colorado Potato Beetle**

This beetle is easily spotted on potatoes or other nightshades (tomato, eggplant, etc.) because of its red-orange color. It is fairly small, about 1/3 inch and has a series of black stripes going down its back. The larvae are more bulbous in shape, have black spots instead of stripes, and are yellowish to red in color. Both larvae and adults are able of fully defoliating a crop if left too long. The Colorado potato beetle is known for becoming resistant to many insecticides, and so this pest especially is best treated with organic methods.

#### *Management*

- Cover crop – vetch and rye surrounding potato bed, cut down in June or July
- Varietal selection – some are resistant
- Hand pick
- Row covers
- Crop rotation
- Garden sanitation
- Encourage beneficial insects – especially beneficial nematodes, ladybugs, spined soldier bugs, lacewings, and parasitic tachinid flies



### **Brown Marmorated Stink Bug**

There are many varieties of stink bugs, and in gardens there are varieties that are beneficial and malicious. The southern green stinkbug may be seen in parts of Missouri and is shield-shaped and green. The Brown marmorated stink bug is more prolific in Missouri though. It is also shield-shaped, and is brown with whitish markings along its edges and on its back. They feed on a large number of plants including fruit trees, soybeans, and tomatoes. They smell bad when you squish them.

#### *Management*

- Companion planting – especially sunflowers and French marigolds
- Encourage beneficial insects – especially ants, ladybird beetles, and some lacewings
- Hand pick
- Traps – especially in spring
- Trap crops – especially sweet corn, amaranth, and okra



### **Squash Bug**

This bug is prevalent anywhere squashes grow and will feed on any cucurbit. They lay small coppery eggs in the spring. The adult can be over 1/2 inch long and are gray to brownish in color. Larvae are teardrop shaped and smaller and go through five molting stages before adulthood. Both larvae and adults can be destructive to plants, piercing them with sharp mouths to suck sap. They also secrete a toxic saliva, often causing plants to wilt. They most frequently feed on leaves but in need will feed on fruits of plants as well.

#### *Management*

- Hand pick – especially eggs in the spring
- Encourage beneficial insects – especially tachinid flies and ground beetles
- Crop rotation
- Garden sanitation
- Transplant rather than direct seed
- Row covers
- Trellising may help



### **Grasshoppers**

There are many varieties of grasshoppers and many, but not all are garden pests. They are generally long and narrow with large hind legs for jumping and range in color from yellow, green, gray, to brown. Adults are up to 1 ½ inches long and young ones resemble adults but are smaller and missing membranous wings. Both the young and adults feed on foliage and berries and can do large amounts of damage to crops when in great numbers. Snakes, toads, cats, bluebirds, sparrows, crows, mockingbirds, spiders, field mice, chickens, ducks, and praying mantises eat them. Fish like them as well and so catching grasshoppers can be free bait.

#### *Management*

- Encourage beneficial predators – especially blister beetles and ground beetles
- Companion planting – especially horehound, cilantro, and calendula; nitrogen fixers clover, peas, and beans
- Garlic Spray
- Row covers
- Trap crop – even small area of uncut grass will suffice
- Till in crops – late fall
- Insecticidal soap – especially for larvae
- Diatomaceous earth



## Appendix II: Plant Identification and Growing Information

### Arugula

#### Spring/Fall

**Planting:** direct seed, ¼ inch deep

*[for row planting: space 1 inch apart; when seedlings are 3 inches tall, thin to 1 plant every 6 inches]*

**Recommendation:** An early spring planting can be followed by a second planting 3 weeks

**To maturity:** ~20 - 40 days

**Height:** Under 1 ft.

**Feeding level:** low

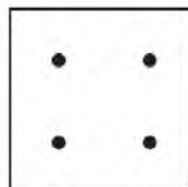
**Needs:**

- plenty of water
- full to partial sun - shade if it gets too warm

**Harvest:**

- cut outside leaves at base of the stem to encourage new growth from center of plant
- seeds viable for up to 5 years

**Nutrition:** - rich in vitamin C and minerals



4 plants per ft<sup>2</sup>  
(6-inch spacing)



### Basil

#### Summer

**Planting:** direct seed, 1/4 - ½ inch deep; or transplant (seeds started 4-6 weeks before last Spring frost)

*[for row planting: space 8 inches apart]*

-

**Height:** 1 - 2 ft.

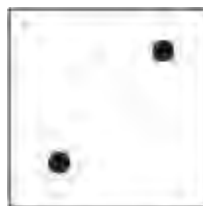
**Feeding level:** low

**Needs:**

- plenty of water
- full to partial sun

**Harvest:**

- cut stem/branch just above a node
- pull flowering stems off to prolong production throughout season
- seeds viable for up to 5 years



2 plant per sq. ft.  
(8-inch spacing)



## Beans

### Summer

**Planting:** direct seed, 1 inch deep, 2 weeks after last Spring frost  
*[for row planting: space 3 inches apart; when seedlings are 3 inches tall, thin to 1 plant every 6 inches]*

-If using poles, plant 4-6 seeds at the base of each pole

**Recommendation:** If trellised, plant on the north side of your garden so bean vines do not shade shorter plants too much

**To maturity:** ~50-65 days to snap bean  
~90-100 days to dry bean

**Height:** 2 - 8 ft.

**Feeding level:** low

**Needs:** - vertical/tepee trellis, up to 15 feet, if pole-variety (install before planting seeds)

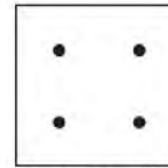
- full sun

### Harvest:

- harvest snap beans when pods are small and tender, before seeds begin to really swell
  - continuously harvest snap beans to encourage more pod production from plant
- harvest shell beans when pods are plump, but before they begin to turn brown
- dried beans should be left on plant until pods are fully dry and seeds are hard
  - if frost threatens, pull plants and hang upside-down in a dry location
- seeds viable for up to 5 years

### Nutrition:

- rich in vitamin A, B1, B2, and C, calcium, iron, fiber, and protein



4 plants per ft<sup>2</sup>  
(6-inch spacing)



## Beets

### Spring/Fall

**Planting:** direct seed, 1/2 - 1 inch deep  
*[for row planting: space 2 inches apart; when seedlings are 2 inches tall, thin to 1 plant every 4 inches]*

- Soak seeds overnight in room temperature water before planting for better germination

**Recommendation:** Sow a number of plants every two weeks to spread out harvest

**To maturity:** ~50-60 days

**Height:** under 1 ft.

**Feeding level:** low

### Needs:

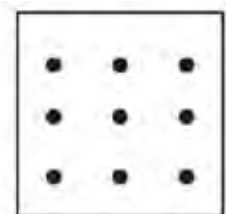
- moist soil
- full to partial sun

### Harvest:

- greens can be cut as soon as they are large enough to eat
  - leave at least 5 leaves on plant so its root continues to grow
- pull beets when the root measures between 1-2 inches across at the surface of the soil
  - immediately cut off greens to increase root's storage life
- seeds viable for up to 4 years

### Nutrition:

- both roots and greens are highly nutritious
- contain vitamin C, folate, iron, and fiber



9 plants per ft<sup>2</sup>  
(4-inch spacing)

## Broccoli

### Spring/Fall

**Planting:** transplant (seeds started 6-8 weeks before last Spring frost)

- plant seedling in ground up to first true leaves

**To maturity:** ~60-85 days

**Height:** 1 - 3 ft.

**Feeding level:** high

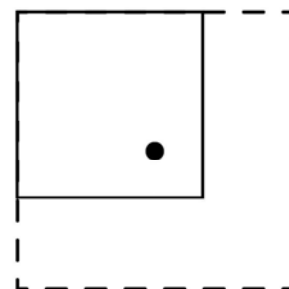
**Needs:** - moist soil  
- full sun

- watch for green cabbage worms/cutworms on leaves; remove by hand or spray with bacillus thuringiensis solution every 10 days
- cover plants with insect netting
- look for black&white harlequin beetle eggs under leaves; remove by hand
- remove red&black harlequin beetles by hand and submerge in soapy water

**Harvest:** - cut broccoli 2 inches below head with a knife, before it starts turning yellow

- harvest side shoots often to encourage further shoot growth

**Nutrition:** - rich in vitamin A and C, potassium and fiber



1 plant every 1.5ft  
(18 inch spacing)

## Brussels Sprouts

### Spring/Fall

**Planting:** transplant (seeds started 4-6 weeks before last Spring frost)

**To maturity:** up to 110 days

**Height:** 1 - 3 ft.

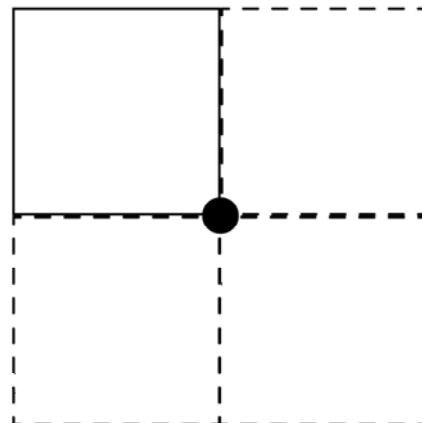
**Feeding level:** high

**Needs:** - plenty of water  
- full sun

- as sprouts begin to appear, remove leaves growing beneath them
- watch for green cabbage worms/cutworms on leaves; remove by hand or spray with bacillus thuringiensis solution every 10 days
- cover plants with insect netting
- look for black&white harlequin beetle eggs under leaves; remove by hand
- remove red&black harlequin beetles by hand and submerge in soap water

**Harvest:** - ready when sprouts are between 3/4 in. and 1 1/2 inches wide  
- For a full stalk of uniform-sized sprouts, pinch out the growing point (rosette of small leaves at the top of the plant) when lower sprouts are 1/2 - 3/4 inch in diameter... harvest entire stalk 4 weeks later

**Nutrition:** - rich in vitamin A, C and minerals



1 plant per 4 sq.ft.  
(24 inch spacing)

## Cabbage

### Spring/Fall

**Planting:** transplant (seeds started 4-6 weeks before last Spring frost)

**To maturity:** ~60-90 days

**Height:** 1 - 2 ft.

**Feeding level:** high

**Needs:** - moist soil

- full to partial sun

- avoid letting the head mature in hot weather

- watch for green cabbage worms/cutworms on leaves; remove by hand or spray with bacillus thuringiensis solution every 10 days

- cover plants with insect netting

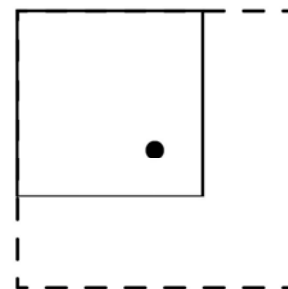
- look for black&white harlequin beetle eggs under leaves; remove by hand

- remove red&black harlequin beetles by hand and submerge in soapy water

**Harvest:** - heads are ready as soon as they are firm to touch, regardless of size

- cut stem below leaves (outer leaves are edible yet tougher than the head)

**Nutrition:** - rich in vitamin C, also contains fiber, potassium, and other minerals



1 plant every 1.5ft  
(18 inch spacing)

## Carrots

### Spring/Fall

**Planting:** direct seed, ¼ - ½ inch deep

- for row planting: space 1 inch apart; when seedlings are 2 inches tall, thin to 1 plant every 3 inches by cutting unwanted plants down to the ground

**Recommendation:** soak seeds 6 hours to overnight in room temperature water before planting for better germination

**To maturity:** ~55 - 75 days

**Height:** under 1 ft.

**Feeding level:** low

**Needs:** - moist soil (if soil dries out, slowly moisten it in order to avoid splitting)

- full sun

- light soil

- weed-free environment (cut, rather than pull, weeds so as not to disturb carrot roots)

**Harvest:** - loosen soil with a garden fork to assist with harvesting

- immediately remove tops for better storage

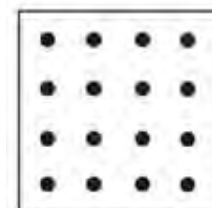
- seeds viable for up to 5 years

**Nutrition:** - rich in vitamin A & C

- potassium

- fiber

- antioxidants



16 plant per ft<sup>2</sup>  
(3-inch spacing)

## Cauliflower

### Spring/Fall

**Planting:** transplant (seeds started 4-6 weeks before last frost)

**To maturity:** ~65-90 days

**Height:** 1 - 3 ft.

**Feeding level:** high

**Needs:** - full sun (partial shade if it gets hot)  
- plenty of compost (side-dress)

- watch for green cabbage worms/cutworms on leaves; remove by hand or spray with bacillus thuringiensis solution every 10 days

- look for black&white harlequin beetle eggs under leaves; remove by hand

- remove red&black harlequin beetles by hand and submerge in soapy water

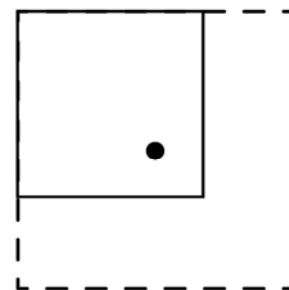
- *blanch*: when cauliflower head is about the size of an egg, gently lift up surrounding leaves and tie with twine to help shade head and preserve white color (colored varieties do not need blanching)

**Harvest:** - once head is 4 inches wide, begin checking every day and harvest before the dense florets begin separating

- cut head, leaving several inches of stem

- seeds viable for up to 5 years

**Nutrition:** - rich in vitamin C, potassium and iron



1 plant every 1.5ft  
(18 inch spacing)

## Cilantro/Coriander

### Spring/Fall

**Planting:** direct seed 1/4 - 1/2 inch deep, or transplant

- for row planting: space 1 inch apart; when seedlings are 3 inches tall, thin to 1 plant every 4 inches

**To maturity:** ~40 days **Height:** 1 ft.

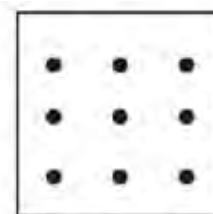
**Feeding level:** medium

**Recommendation:** successive seedings every 2 - 3 weeks for continual leaf harvest

**Needs:** - plenty of water  
- full to partial sun (will bolt if it gets too hot)

**Harvest:** - leaves can be pinched off as needed  
- seeds viable for up to 5 years

**Nutrition:** - source of vitamin A, C, and E



9 plants per ft<sup>2</sup>  
(4-inch spacing)

## Collards

### Spring/Fall

**Planting:** transplant (seeds started 6 weeks before last Spring frost)

**To maturity:** ~70 - 80 days

**Height:** 1 - 2 ft.

**Feeding level:** low

**Needs:**

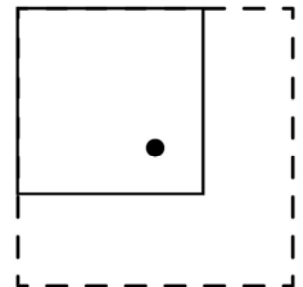
- plenty of water
- full sun
- shade if it gets too warm
- watch for green cabbage worms/cutworms on leaves; remove by hand or spray with bacillus thuringiensis solution every 10 days
- cover plants with insect netting
- look for black&white harlequin beetle eggs under leaves; remove by hand
- remove red&black harlequin beetles by hand and submerge in soapy water

**Harvest:**

- leaves are ready when they are at least 6 inches long
- cut outside leaves at base of the stem to encourage new growth from center
- leave at least 2 leaves on plant to speed up further leaf production
- seeds viable for up to 4 years

**Nutrition:**

- rich in vitamins A, C, & K
- calcium & iron
- fiber & folate



1 plant every 1.5ft  
(18 inch spacing)

## Corn

### Summer

**Planting:** direct seed, 1 inch deep

- for row planting: 2 seeds every 9 inches, thinning to 1 plant every 9 inches
- plant on the north side of your garden so corn does not shade shorter plants too much
- arrange in blocks of at least 4 rows for proper pollination

**Recommendation:** sow a number of plants every two weeks to spread out harvest  
- OR sow a few of the same type (sweet or pop) but each with different maturity periods to prolong harvest

**To maturity:** ~65-90 days

**Height:** 4 - 7 ft.

**Feeding level:** high

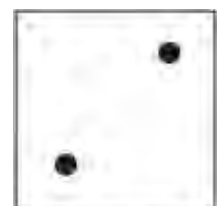
**Needs:**

- full sun
- plenty of compost
- moist soil
- hand pollination helps

**Harvest:**

- ears are ready about 20 days after silks appear
- give ear a sharp, downward twist to pull off stalk
- harvest in the morning
- seeds viable for up to 2 years

**Nutrition:** - modest amounts of vitamin A, B, potassium, and fiber



2 plant per sq. ft.  
(8-inch spacing)

## Cucumber

### Summer

**Planting:** direct seed, 1/2 - 1 inch deep

- for row planting: sow 2-3 seeds in each hole, spaced 12 inches apart; when seedlings are 3 inches tall, thin to 1 plant per hole
- mound up soil and plant seed in the mound
- plant on the north side of your garden so cucumber vines do not shade shorter plants too much

**To maturity:** ~45 - 65 days

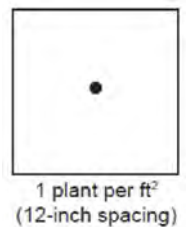
**Height:** 2 - 6 ft. (if trellised)

**Feeding level:** high

- Needs:**
- plenty of water
  - full sun
  - trellis before planting
  - 1 month before first Autumn frost, pinch all flowers to encourage existing fruits to ripen in time

- Harvest:**
- once fruits start setting, check daily as they ripen quickly
  - 3-4 inches long for pickles; 6-8 inches long for slicers
  - harvest fruits often to encourage more fruit growth
  - seeds viable for up to 5 years

- Nutrition:**
- Antioxidants which reduce inflammation and may slow or stop heart-related diseases
  - Vitamins B, C, & K
  - Minerals such as Magnesium, Potassium, Phosphorus, and Copper



## Eggplant

### Summer

**Planting:** transplant (seeds started 8 weeks before late spring or early summer)

**Recommendations:** - Cover plants with insect netting when young

**To maturity:** ~60 - 80 days

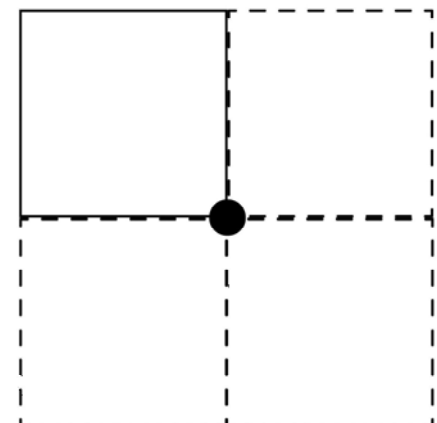
**Height:** 2 - 4 ft.

**Feeding level:** medium (beware of excessive Nitrogen)

- Needs:**
- moist soil
  - plenty of compost
  - full sun
  - Diatomaceous earth applied regularly for flea beetle control
  - Scuffle hoe top 1/4 inch of soil weekly to disturb flea beetle eggs and inhibit life cycle
  - 3 weeks before first Autumn frost, pinch all flowers to encourage existing fruits to ripen in time

- Harvest:**
- pick fruits as soon as they are large enough to eat (depends on variety)
  - bigger fruits aren't necessarily better, as they become bitter with age
  - if the seeds are brown/hard, the fruit was harvested after peak ripeness

- Nutrition:** - contain fiber and some protein



1 plant per 4 sq.ft.  
(24 inch spacing)

## Garlic

### Fall

**Planting:** individual HARDNECK cloves are planted October - November

- plant pointy-end up, 2 inches deep
- larger cloves will produce larger heads; smaller cloves can be used for green garlic

**To maturity:** 9 months

**Height:** 1 ft.

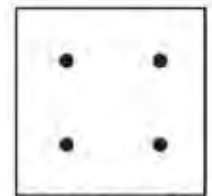
**Feeding level:** medium

**Needs:** - moist soil (but stop watering when leaves begin to yellow/fall over)

- plenty of compost
- full sun
- heavy mulch with thick layer of straw to overwinter and prevent weeds later
- cut back flowering stalk (scape) to divert energy back to producing a larger head of garlic

- Harvest:**
- green garlic scapes can and should be harvested in late Spring/early Summer
  - bulbs are ready to be dug up when 3/4 the length of the leaves are yellowed and wilting
  - take care not to damage bulbs as you are digging them up; they do not store well if nicked or bruised
  - before storing, bulbs must be cured by hang-drying for 2-3 weeks (with roots and tops still attached), until bulbs are completely dried

**Nutrition:** - reduces risk of heart disease (especially those with diabetes), anti-inflammatory properties, & boosts immune system



4 plants per ft<sup>2</sup>  
(6-inch spacing)

## Kale

### Spring/Fall

**Planting:** Transplant (seeds planted 6 - 8 weeks before last Spring frost)

- for row planting: space 4 inches apart; when seedlings are 3 inches tall, thin to 1 plant every 12 inches

**Recommendation:** sow a number of plants over two weeks time to prolong harvest

**To maturity:** ~55 - 70 days (from seed)

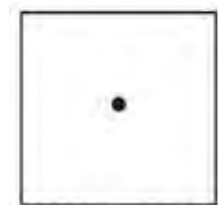
**Height:** 1 - 2 ft.

**Feeding level:** low

- Needs:**
- plenty of water
  - full sun in cool weather; partial shade in heat
  - watch for green cabbage worms/cutworms on leaves; remove by hand or spray with bacillus thuringiensis solution every 10 days
  - cover plants with insect netting
  - look for black&white harlequin beetle eggs under leaves; remove by hand
  - remove red&black harlequin beetles by hand and submerge in soapy water

- Harvest:**
- leaves are ready when they are at least 6 inches long
  - cut outside leaves at base of the stem to encourage new growth from center of plant
  - leave at least 2 leaves on plant to speed up further leaf production
  - seeds viable for up to 4 years

**Nutrition:** - rich in vitamin A, C, calcium, iron, and fiber



1 plant per ft<sup>2</sup>  
(12-inch spacing)



## Head Lettuce

### Spring/Fall

**Planting:** transplant (seed started 4 weeks before planting or last Spring frost)

**Recommendation:** sow a number of plants every two weeks to prolong harvest

**To maturity:** ~50 - 75 days

**Height:** 1 ft.

**Feeding level:** low

**Needs:**

- moist soil
- compost before planting in fall
- full sun in cool weather; partial shade in heat

**Harvest:**

- use a knife to cut plant off of root below soil surface
- harvest when head is firm and fully formed, before any signs of bolting occur (elongated form rather than round form)
- harvest second growth as leaf lettuce



1 plant per ft<sup>2</sup>  
(12-inch spacing)

**Nutrition:**

- modest amounts of vitamin A, B, C, & K
- Minerals such as Iron
- romaine and buttercrunch varieties contain Calcium

## Leaf Lettuce

### Spring/Fall

**Planting:** direct seed, very shallow: scratch dirt, place seed, and sprinkle dirt to cover

- for row planting: space 1 inch apart; when seedlings are 2 inches tall, thin to 1 plant every 4 inches

**Recommendation:** sow a number of plants over two weeks time to prolong harvest

**To maturity:** ~45 - 60 days

**Height:** under 1 ft.

**Feeding level:** low

**Needs:**

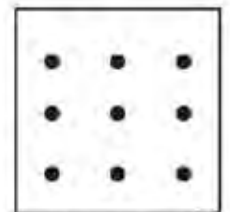
- moist soil
- full sun in cool weather; partial shade in heat
- compost before planting in fall

**Harvest:**

- harvest leaves from the outside (to encourage inner-leaf growth) as soon as they are large enough
- seeds viable for up to 4 years

**Nutrition:**

- modest amounts of vitamin A, B, C, & K
- Minerals such as Iron
- romaine and buttercrunch varieties contain Calcium



9 plants per ft<sup>2</sup>  
(4-inch spacing)

## Marigolds

**Summer** (early, as soon as ground is warm)

**Planting:** direct seed, ¼ inch deep, or transplant (seeds started 4-6 weeks before last Spring frost)  
for row planting: space 4 inches apart; when seedlings are 2-3 inches tall, thin to 1 plant every 8 - 12 inches, depending on whether it is a shorter or taller variety

**Recommendation:** - plant with tomatoes and root crops such as turnips

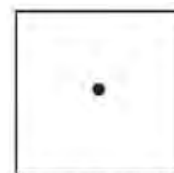
**To maturity:** ~45 - 60 days

**Height:** 2 - 4 ft.

**Feeding level:** low

**Needs:** - protection as a seedling  
- full sun

**Harvest:** - snip the dead heads off the plant to encourage new flowers  
- if harvesting for bouquets, be gentle because stems break easily  
- seeds viable for up to 4 years



1 plant per ft<sup>2</sup>  
(12-inch spacing)

## Melons

**Summer**

**Planting:** direct seed, ½ inch deep, or transplant (seeds started 4 weeks before last Spring frost)

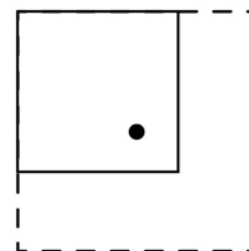
- for row planting: sow 2-3 seeds in each hole; when seedlings are 3 inches tall, thin to 1 plant per hole
- mound up soil and plant seed in the mound
- Some varieties can be trellised to save garden space
  - if trellised, plant on north side of your garden so melon vines do not shade shorter plants too much

**To maturity:** ~70 - 140 days

**Height:** 1 - 3+ ft.

**Feeding level:** high

**Needs:** - plenty of water, but reduce watering after fruits reach the size of a tennis ball  
- full sun  
- lots of compost before planting - good air circulation between plants to prevent disease



1 plant every 1.5ft  
(18 inch spacing)

**Harvest:** - check the underside of watermelons first, if the spot in contact with the ground is yellow rather than white, check the stem...  
- check the end opposite the stem on cantaloupe and honeydews, if it gives when pressed, check the stem  
- fruits are ready when just a little pressure on the stem separates it from the melon (the stem will be dry if its ready...cantaloupe and honeydew will have mild cracking where stem meets fruit)

**Nutrition:** - Vitamins A, B, C, & K  
- minerals such as Potassium and Iron  
- antioxidants (such as Choline which benefits those with asthma)  
- folate (in Honeydew melons)

## Mustard

### Spring/Fall

**Planting:** direct seed, ¼ inch deep

- for row planting: space 1 inch apart; when seedlings are 3 inches tall, thin to 1 plant every 9 inches

**Recommendation:** sow a number of plants every two weeks time to prolong harvest

**To maturity:** ~20 (baby leaf) & ~50 days (full size)

**Height:** 1 ft.

**Feeding level:** low

**Needs:**

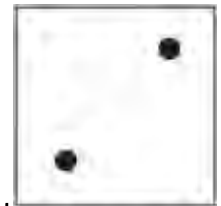
- plenty of water
- full sun in cool weather; partial shade in heat
- compost before planting in fall

**Harvest:**

- cut outside leaves at base of the stem to encourage new growth from center of plant
- seeds viable for up to 4 years

**Nutrition:**

- rich in vitamin A, B1, B3, B6, C, & K
- minerals such as calcium & iron
- antioxidants (such as glucosinolates which may fight cancer cells and prevent tumor formation)
- fiber



2 plant per sq. ft.  
(8-inch spacing)

## Okra

### Summer

**Planting:** direct seed, 1/2 - 1 inch deep

- for row planting: space 2 inches apart; when seedlings are 3 inches tall, thin to 1 plant every 18 inches
- soak seeds overnight in room temperature water before planting for better germination

**To maturity:** ~50 - 70 days

**Height:** 4 - 6 ft.

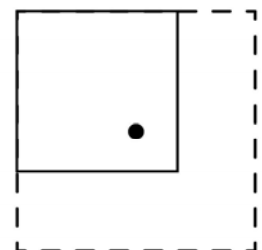
**Feeding level:** high

**Needs:**

- plenty of water
- full sun

- Harvest:**
- pick daily, to every other day, when pods are still soft and small, 2 - 3 inches long
  - if not easily snapped off, use a knife or scissors to cut pod from stem
  - seeds viable for up to 5 years

**Nutrition:** - rich in calcium and fiber



1 plant every 1.5ft  
(18 inch spacing)

## Onions

**Spring/Fall** (if overwintered)

**Planting:** directly planted sets (small dormant bulbs) planted pointy-end up, ½ inch deep; or transplant (seeds started 8-10 weeks before last Spring frost)

- for row planting: space 1 inch apart; when seedlings are 3 inches tall, thin to 1 plant every 9 inches

**Recommendation:** sow a number of plants every two weeks time to prolong harvest

**To maturity:** ~90-150 days (up to 300 days if overwintered) for bulbing onions

~65-75 days for green onions

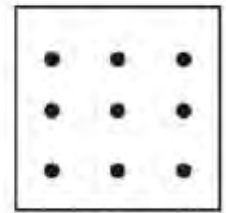
**Height:** 1 ft.

**Feeding level:** low

- Needs:**
- regular watering (stop watering when tops turn yellow or fall over)
  - full to partial sun
  - mulch for a weed-free environment

- Harvest:**
- for green onions, harvest as soon as tops are about 6 inches tall
  - for bulbing onions, harvest after tops have fallen over and yellowed
  - take care not to damage bulbs as you are digging them up; they do not store well if nicked or bruised
  - before storing, bulbs must be cured by air-drying for 10 days to 2 weeks (with roots and tops still attached), until bulbs are completely dried and tops have completely withered

- Nutrition:**
- source of potassium
  - rich in quercetin (known to lower risk of lung cancer)
  - rich in sulfur compounds which increase insulin production



9 plants per ft<sup>2</sup>  
(4-inch spacing)

## Parsley

**Spring/Fall**

**Planting:** direct seed ½ inch deep, or transplant

- for row planting: space 3 inches apart; when seedlings are 3 inches tall, thin to 1 plant every 9 inches
- soak seeds overnight in room temperature water before planting for better germination OR cold-wet stratification for 6 weeks before planting

**Note:** seeds take 3 weeks to germinate

**To maturity:** ~80 days

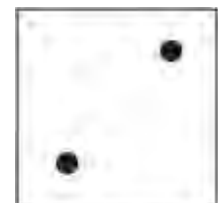
**Height:** 1 ft.

**Feeding level:** low

- Needs:**
- plenty of water
  - full sun (partial shade is okay in hot weather)

- Harvest:**
- leaves can be pinched off as needed
  - seeds viable for up to 5 years

- Nutrition:** - rich in vitamin A, C, and E



2 plant per sq. ft.  
(8-inch spacing)

## Peas

### Spring/Fall

**Planting:** direct seed 1 inch deep

**To maturity:** ~60 - 70 days

**Height:** 3 - 5 ft.

**Feeding level:** low

#### Needs:

- full sun, cool weather
- good air circulation
- string trellis
- increase watering once plant begins to flower

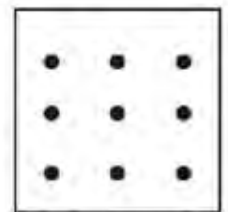
#### Harvest:

- peas are typically ready about 3 weeks after plants begin to flower
  - snow peas are ready when their pods reach full size, before seeds begin to swell
  - snap peas are ready when their pods reach full size and seeds have begun to swell, but before they become overly large and hard
  - garden or shell peas are ready when seeds have filled out the pods, and the pod is still bright green (not dull)
  - dried peas are ready when pods have withered and turned brown on the vine
    - shell and dry peas in a warm location for about 3 weeks, until seeds are dry and hard

- cut pod off plant with scissors; regular harvesting will encourage pod production
- seeds viable for up to 3 years

#### Nutrition:

- rich in vitamin A, C, iron, folate, protein, and (when also eating the pod) fiber



9 plants per ft<sup>2</sup>  
(4-inch spacing)

## Peppers

### Summer

**Planting:** transplant (seeds started 6-10 weeks before last Spring frost)

**To maturity:** ~65-95 days, depending on how green or ripe you want your pepper (most peppers start out green, and turn red or orange when mature)

**Height:** 1 - 4 ft.

**Feeding level:** high (additional phosphorus recommended)

#### Needs:

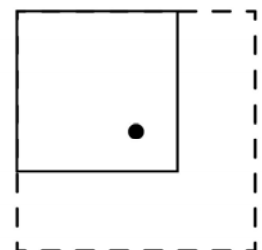
- warm temperatures
- consistent watering, especially once fruit begins to set
- full sun (may need some shade if leaf canopy is inadequate to protect fruits sunscald)
- tall plants may need stake for support

#### Harvest:

- sweet green peppers can be harvested as soon as they are large enough
- mature sweet peppers are ready when they are two-thirds colored
- hot peppers can likewise be picked green; their heat increases with maturity/color
- use scissors to cut peppers from the plant

#### Nutrition:

- rich in vitamin A, B6, C, & E
- high in fiber
- minerals such as Potassium
- folate



1 plant every 1.5ft  
(18 inch spacing)

## Potatoes

### Spring

**Planting:** seed potatoes are used to grow potatoes - mound up soil and plant in the mound, 3 inches deep, 'eye' side up

- Small seed potatoes are planted whole
- Larger seed potatoes are cut into pieces, ensuring each piece has 2 "eyes" or buds

**To maturity:** ~65 - 95 days

**Height:** 1 ft.

**Feeding level:** low

**Needs:** - cool/moderate temperatures

- full sun
- plenty of water
- when plants are 6 -8 inches tall, mound more soil up and around the plant, within 1/2 inch of lower leaves to encourage further growth (continue every so often until time to harvest)

**Harvest:** - early potatoes can be harvested about 8 weeks after planting  
- harvest main crop potatoes once plants have died back  
- use a potato fork to dig and loosen soil, and pick out potatoes by hand (be careful using the fork; damaged potatoes do not store well and should be cooked first)  
- brush dirt off potatoes by hand and allow to air out in a shady area for a day  
- cure potatoes for storage by letting them air out in a cool, dark location for up to 2 weeks  
- potatoes can be saved for planting the following year

**Nutrition:** - rich in vitamin B & C

- soluble fiber
- leave the skins on for added calcium, magnesium, potassium, and folate



1 plant per ft<sup>2</sup>  
(12-inch spacing)

## Radish

### Spring/Fall

**Planting:** direct seed, 1/2 inch deep

- for row planting: space 1 inch apart; when seedlings are 2 inches tall, thin to 1 plant every 2-3 inches

**Recommendation:** sow a number of plants every week, until outdoor temperatures reach 65 degrees F, to extend harvest (resume successive plantings in Fall)

**To maturity:** ~20 - 65 days, depending on variety

**Height:** under 1 ft.

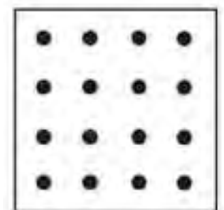
**Feeding level:** low

**Needs:** - full to partial sun

- light, moist soil
- diatomaceous earth applied regularly to control flea beetles

**Harvest:** - pull as soon as they are large enough to eat (or) for Fall harvests, pull no later than first hard frost

**Nutrition:** - glucosinolate and isothiocyanate (which can help regulate blood sugar levels)  
- coenzyme Q10 which prevents the development of diabetes  
- Vitamins B & C  
- minerals such as Calcium, Manganese, Potassium, & Iron  
- antioxidants such as catechin, pyrogallol, vanillic acid, and other phenolic compounds



16 plant per ft<sup>2</sup>  
(3-inch spacing)

## Spinach

### Spring/Fall

**Planting:** direct seed, ½ inch deep

- for row planting: space 2 inches apart; when seedlings are 3 inches tall, thin to 1 plant every 6 inches

**Recommendation:** sow a number of plants every two weeks, until outdoor temperatures reach 75 degrees F, to prolong harvest (resume successive plantings in Fall)

**To maturity:** ~40-50 days

**Height:** under 1 ft.

**Feeding level:** low

**Needs:** - full sun in cool weather; partial shade if it gets warm

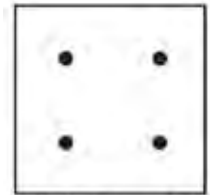
- moist soil
- plenty of compost
- cool weather

**Harvest:**

- cut outside leaves at base of the stem to encourage new growth from center of plant
- harvest entire plant once it bolts (begins to go to seed)
- seeds viable for up to 2 years

**Nutrition:** - rich in minerals such as iron, calcium and potassium (but should be consumed with something rich in vitamin C to maximize absorption of spinach's nutrients)

- Vitamins A & K
- lutein (an antioxidant which protects against cataracts and macular degeneration)



4 plants per ft<sup>2</sup>  
(6-inch spacing)

## Summer Squash

### Summer

**Planting:** direct seed, 1-2 inches deep

- for row planting: sow 2-3 seeds in each hole; when seedlings are 3 inches tall, thin to 1 plant per hole
- mound up soil and plant seed in the mound

**Recommendation:** - mulch around plants with straw

- insect netting over young, unflowering plants
- regularly check for and crush squash bug eggs under each leaf

**To maturity:** ~50 days

**Height:** 1 - 3 ft.

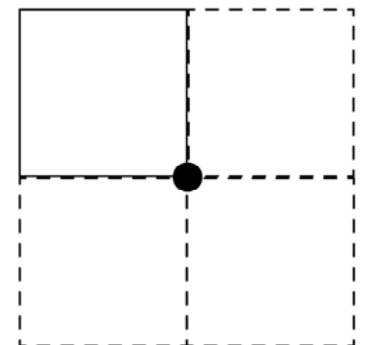
**Feeding level:** high

**Needs:**

- full sun
- consistent watering
- warm weather
- lots of compost before planting
- good air circulation between plants to prevent disease

- Harvest:**
- long fruits should be harvested when they are about 6 inches long
  - scalloped fruits should be harvested when they are about 4 inches in diameter
  - use a knife to cut stem, leaving 1 inch of stem on fruit to extend storage life
  - pick fruits every 2 to 3 days to encourage further fruit production

**Nutrition:** - contain vitamin A and potassium



1 plant per 4 sq.ft.  
(24 inch spacing)

## Winter Squash

### Fall

**Planting:** direct seed, 1 - 2 inches deep

- for row planting: sow 2-3 seeds in each hole; when seedlings are 3 inches tall, thin to 1 plant per hole
- mound up soil and plant seed in the mound
- if trellised, plant on the north side of your garden so squash vines do not shade shorter plants too much

**Recommendation:** - mulch around plants with straw  
- insect netting over young, unflowering plants  
- regularly check for and crush squash bug eggs under each leaf

**To maturity:** ~75 - 105 days

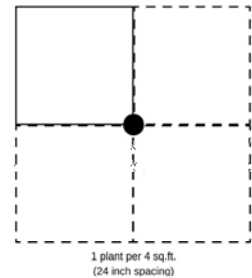
**Height:** 1 - 4ft.

**Feeding level:** high

**Needs:** - full sun  
- good air circulation between plants to prevent disease  
- some varieties can be (vertical or A-frame) trellised to save garden space (fruits may need extra support with a cloth sling)

**Harvest:** - squash is ready when stem is shriveled and skin of fruit is hard to scratch with your fingernail  
- use a knife to cut stem, leaving 2 inches of stem on fruit to extend storage life  
- seeds viable for up to 6 years

**Nutrition:** - contain vitamin A, C, calcium and potassium



## Sunflowers

### Summer

**Planting:** direct seed, one inch deep

- for row planting: space 6 inches apart; eventually thin to 1 plant every 12 inches
- confectionary varieties have large gray and white seeds and are most commonly eaten; oilseed varieties have smaller black seeds, which are good for sprouting
- plant on the north side of your garden so flowers do not shade shorter plants too much

**To maturity:** ~50-95 days, depending on variety  
- seeds are ripe in 85-100+ days

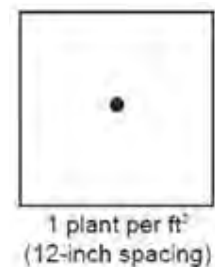
**Height:** 4 - 12 ft.

**Feeding level:** low

**Needs:**  
- full sun  
- consistent watering when plant is small  
- support, if variety is 6ft. or taller

**Harvest:**  
- when backs of flowers begin to brown, cut off flower, keeping 2 ft. of stalk attached  
- hang head in a dry, airy location until seeds are completely dry  
- rub seeds off head and store in an airtight container  
- seeds viable for up to 6 years

**Nutrition:**  
- rich in protein, and vitamin B6 and E





## Sweet Potatoes

### Summer (May)

**Planting:** transplant "slips" (rooted sweet potato sprouts)

- begin about 3 months before slips will be transplanted outdoors
- set a sweet potato in a cup about half-filled with water (with about 1/3 of the potato submerged in water)

- poke toothpicks into potato so that the picks stick out over edge of cup
- Leave in warm, sunny location to grow sprouts

- Once sprouts are 6 inches long, pull them off the potato and sit in water until roots emerge (and then they are ready to plant)

- mound up soil and plant slip 12 inches apart in the mound, as deep as the first set of leaves

**Recommendation:** cover with insect netting to protect leaves from deer browsing

**To maturity:** ~95 - 120 days

**Height:** 1 - 2 ft.

**Feeding level:** medium

**Needs:** - generous watering and meticulous weeding when plants are young

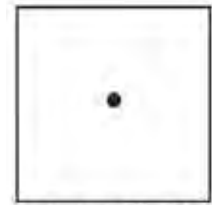
- full sun
- light soil

**Harvest:** - ready when vines are killed by a light frost or daytime temperatures drop into the 50's  
- use a potato fork to dig and loosen soil, and pick out sweet potatoes by hand (be careful using the fork; damaged potatoes do not store well and should be cooked first)

- brush dirt off potatoes by hand and allow to air out in a shady area for a day
- cure potatoes for storage by letting them air out in a cool location for up to 2 weeks
- sweet potatoes can be saved for sprouting and planting the following year

**Nutrition:** - rich in vitamin A, B, & C

- minerals such as calcium, magnesium, phosphorus, potassium, iron, and zinc
- antioxidants such as carotenoids (which might reduce risk of cancer)



1 plant per ft<sup>2</sup>  
(12-inch spacing)

## Swiss Chard

### Spring/Fall

**Planting:** direct seed 1 - 2 weeks before last Spring frost, 1/2 inch deep, or trans-plant (seeds started 5-6 weeks before last Spring frost)

- for row planting: space 4 inches apart; eventually thin to 1 plant every 8-9 inches

**Recommendation:** sow a number of plants every two weeks to prolong harvest

**To maturity:** ~50-60 days

**Height:** 1 ft.

**Feeding level:** low

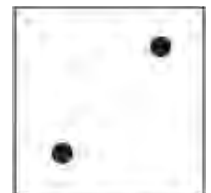
**Needs:** - plenty of water

- full sun; partial sun in heat
- compost before planting in fall

**Harvest:** - leaves are ready when they are at least 6 inches long  
- cut outside leaves at base of the stem to encourage new growth from center of plant  
- leave at least 2 leaves on plant to speed up further leaf production

**Nutrition:** - rich in vitamins A, C, & K

- minerals such as calcium, magnesium, phosphorus, potassium, selenium, & zinc
- antioxidants such as alpha-lipoic acid (which benefits those with diabetes in variety of ways)



2 plant per sq. ft.  
(8-inch spacing)

## Tomato

### Summer

**Planting:** transplant (seeds started 6-8 weeks before last Spring frost)

- plant on the north side of your garden so tomato vines do not shade shorter plants too much

**Recommendation:** keep soil consistently moist to prevent calcium deficiency (blossom end rot)

**To maturity:** ~65-85 days

**Height:** 2- 7 ft.

**Feeding level:** high

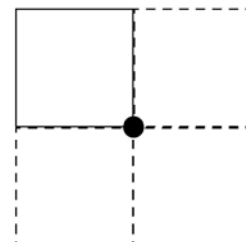
**Needs:** - full sun

- warm weather
- plenty of compost before planting and after first flowers appear
- plenty of consistent watering until fruits start ripening
- trellis, stake, cage, or other support - installed before plant gets too large
- to promote stronger plant growth, pinch off flowers until plant is about knee high

**Harvest:** - fruit color should be even and glossy, and texture should lie between firm and soft  
- about 1 month before first Fall frost, pinch all flowers so remaining fruit ripens in time

**Nutrition:** - contains vitamins B & E

- antioxidants such as lycopene, lutein, and zeaxanthin (which together have many health benefits)



1 plant per 4 sq.ft.  
(24 inch spacing)

## Turnips

### Spring/Fall

**Planting:** direct seed, ¼ - 1/2 inch deep

- for row planting: space 1 inch apart; when seedlings are 3 inches tall, thin to 1 plant every 4 inches

**Recommendation:** sow a number of plants every two weeks to spread out harvest **To maturity:** ~35-55 days

**Height:** 1 ft.

**Feeding level:** low

**Needs:**

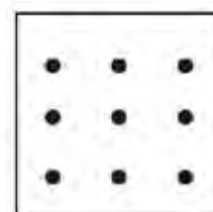
- full to partial sun
- consistent watering
- cool weather during root development

**Harvest:**

- greens can be cut as soon as they are large enough to eat
  - leave at least 5 leaves on plant so its root continues to grow
- pull turnips when the root measures between 1-2 inches across at the surface of the soil
  - immediately cut off greens to increase root's storage life
- seeds viable for up to 4 years

**Nutrition:**

- greens are one of the most nutrient dense foods
  - rich in vitamin A, B, C, E, & K
  - minerals such as calcium, potassium, and iron
- roots: potassium, calcium, lutein (which prevents cataracts), and glucosinolates (which might prevent cancer)



9 plants per ft<sup>2</sup>  
(4-inch spacing)

## Appendix III: *Information and Online Mentoring Resources*

The following is a list of places to find information and receive answers to questions you may have. Free internet access is available at the Daniel Boone Regional Library for all to use. These resources represent a wealth of knowledge, but is certainly not the extent of information available. Feel free to find information through word of mouth as well as further internet searches.

### *Canning and Preserving*

<http://pickyourown.org/allaboutcanning.htm>

This website provides recipes and instructions for canning foods and produce of all varieties. Do heed all cooking times and use caution when preserving foods to ensure no unsafe bacteria can grow in your preserved food. Also contains directions for drying and freezing.

[http://nchfp.uga.edu/publications/uga/uga\\_dry\\_fruit.pdf](http://nchfp.uga.edu/publications/uga/uga_dry_fruit.pdf)

This is an in-depth instruction book about drying foods.

<http://extension.missouri.edu/p/GH1452>

This Extension site details more about canning.

### *Community Garden Coalition*

573-875-5995

P.O. Box 7051, Columbia, MO, 65205

<http://comogardens.org/>

This nonprofit in Columbia oversees dozens of gardens in the city. Their website can lead you to finding a community garden plot and also has helpful garden information from germination to preservation.

### *Cooking*

<http://afroculinaria.com/>

Michael Twitty writes more about cooking, eating, food history, and a little about gardening on his blog.

<http://stellaculinary.com/>

From how to hold a knife to how to make fancy French sauces, this website has a host of free videos demonstrating cooking methods. When you have a vegetable from your garden you don't know how to best cook, this website will likely have a video on it.

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

Saveur has been one of the leading epicurean magazines for decades. Their website has a large number of recipes using seasonal vegetables.

### *Extension (Missouri and National)*

<http://extension.missouri.edu/>

<http://www.extension.org/>

Extension provides a wide array of information revolving around agriculture in Missouri. For the home gardener, this website contains information local to Missouri on plants, insects, weeds, health, and many other topics.

<https://ask.extension.org/ask>

On Extension's "Ask an Expert" page, you can ask gardening related questions, describe situations, upload pictures, and receive answers and suggestions for your garden.

## *General Gardening Info*

These websites all share a variety of gardening knowledge. Find information pertaining to growing calendars, composting, pest management, weed management, plant diseases, and more.

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

Planet Natural has useful instructions and information on techniques for home gardening and pest management.

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

Golden Harvest Organics is an online retailer of organic pest control products among other things, but it has a lot of great information too. It is a good starting point to find info on common weeds, diseases, and garden pest management.

<http://farmersalmanac.com/calendar/gardening/>

The Farmer's Almanac has an "age-old formula" for determining when is good to plant. This calendar will hopefully help your crops germinate and thrive.

<http://www.rodalorganiclife.com/garden>

One favorite piece of information from Rodale's Organic Life are their periodic "Gardener's To-Do Lists," detailing tasks month by month for gardens in different zones. Missouri is in Zone 6.

<http://www.farmmarketingsolutions.com/growingfarmspodcast/>

Geared toward the professional farmer, anyone who eats food can take away something from this lucid podcast. Each episode has a good length interview with a professional farmer discussing topics such as how to grow hops, chickens making eggs, logistics of urban gardening, and much more.

## *Master Gardeners, Naturalist, Composter*

<http://mg.missouri.edu/>

<http://extension.missouri.edu/masternaturalist/>

<http://www.mastercomposter.com/index2.html>

The master gardener, naturalist, and composter programs trains people in those respective tasks and then requires volunteer hours for those enrolled. The websites are filled with useful information for you, and local chapters can connect you to a person who can answer questions from a range of questions pertaining to growing food.

## *Pest Management*

<http://www.missouribotanicalgarden.org/>

The Missouri botanical garden website has a wealth of information about garden pests. Go to the "pests and problems by plant" section to find Missouri's most common outdoor vegetable garden pests, along with their pictures and suggestions for dealing with them.

## *Seed Purchasing*

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

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

<https://www.southernexposure.com/>

These catalogs, free to order, are some of the best local seed companies.

## *Seed Saving*

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

<http://www.seedsavers.org/Education/Seed-Saving-Resources/>

<http://www.rodalorganiclife.com/garden/beginners-guide-seed-saving>

Seed saving can be a great way to increase biodiversity in your garden, save varieties of plants, and find new varieties of plants. It also provides you with free seeds for coming years.

## *CCUA*

[www.columbiaurbanag.org](http://www.columbiaurbanag.org)

Many people involved with CCUA are excited to answer questions and help you grow your food. Please contact any of our staff or visit our urban farm to get the help and supplies you need.

## Appendix IV:

### Planting Calendar for Central Missouri – Community Garden Coalition – <http://comogardens.org>

Adapted from MU Extension Vegetable Planting Calendar at <http://extension.missouri.edu/publications/DisplayPub.aspx?P=G6201>.



Vegetable	How to Plant	March 15-31	April 1-14	April 15-30	May 1-14	May 15-31	June 1-14	June 15-30	July 1-14	July 15-31	August 1-14	August 15-31
Asparagus	Crowns											
Beans, bush	Direct Seed											
Beans, lima	Direct Seed											
Beans, pole	Direct Seed											
Beets	Direct Seed											
Broccoli	Transplant											
Brussels Sprouts	Transplant											
Cabbage	Transplant											
Cantaloupe	Direct Seed											
Carrot	Direct Seed											
Cauliflower	Transplant											
Collard Greens	Direct Seed											
Corn, Sweet	Direct seed											
Cowpeas	Direct Seed											
Cucumber	Direct Seed											
Eggplant	Transplant											
Endive	Direct Seed											
Kale	Direct Seed											

Vegetable	How to Plant	March 15-31	April 1-14	April 15-30	May 1-14	May 15-31	June 1-14	June 15-30	July 1-14	July 15-31	August 1-14	August 15-31
Kohlrabi	Direct Seed											
Lettuce, Leaf	Direct Seed											
Lettuce, Head	Direct Seed											
Mustard	Direct Seed											
Napa Cabbage	Direct Seed											
Okra	Direct Seed											
Onions	Bulbs or sets											
Parsnips	Direct Seed											
Peas	Direct Seed											
Peppers	Transplant											
Potatoes	Potatoes											
Radishes	Direct Seed											
Rhubarb	Crowns											
Spinach	Direct Seed											
Summer and Winter Squash	Direct Seed											
Sweet Potatoes	Transplant											
Swiss Chard	Direct Seed											
Tomatoes	Transplant											
Turnips	Direct Seed											
Watermelon	Direct Seed											

# SEED ST. LOUIS 2024 PLANTING CALENDAR

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER
BASIL			☘	♂	☘	☘	☘	☘	☘	☘	♂
BEANS/COWPEAS				☘	☘	☘	☘	☘	☘	☘	☘
BEETS			☘	☘	☘	☘	☘	☘	☘	☘	☘
BOK CHOY/TAI SOI		☘	☘	☘	☘	☘	☘	☘	☘	☘	☘
BROCCOLI		☘	☘	☘	☘	☘	☘	☘	☘	☘	☘
BRUSSELS SPROUTS			☘	☘	☘	☘	☘	☘	☘	☘	☘
CABBAGE		☘	☘	☘	☘	☘	☘	☘	☘	☘	☘
CAULIFLOWER		☘	☘	☘	☘	☘	☘	☘	☘	☘	☘
CARROTS			☘	☘	☘	☘	☘	☘	☘	☘	☘
CUCUMBER				☘	☘	☘	☘	☘	☘	☘	☘
EDAMAME				☘	☘	☘	☘	☘	☘	☘	☘
EGGPLANT			☘		☘	☘	☘	☘	☘	☘	☘
GARLIC/SHALLOTS					☘	☘	☘	☘	☘	☘	☘
GROUND-CHERRY/TOMATILLO				☘	☘	☘	☘	☘	☘	☘	☘
KALE/COLLARD/CHARD		☘	☘	☘	☘	☘	☘	☘	☘	☘	☘
KOHLRABI		☘	☘	☘	☘	☘	☘	☘	☘	☘	☘
LETTUCE			☘	☘	☘	☘	☘	☘	☘	☘	☘
MALABAR SPINACH				☘	☘	☘	☘	☘	☘	☘	☘
MELONS				☘	☘	☘	☘	☘	☘	☘	☘
MUSTARD			☘	☘	☘	☘	☘	☘	☘	☘	☘
OKRA			☘	☘	☘	☘	☘	☘	☘	☘	☘
ONIONS/LEEKS	☘		☘	☘	☘	☘	☘	☘	☘	☘	☘
OVERWINTERING BRASSICAS				☘	☘	☘	☘	☘	☘	☘	☘
PARSLEY		☘	☘	☘	☘	☘	☘	☘	☘	☘	☘
PEAS			☘	☘	☘	☘	☘	☘	☘	☘	☘
PEPPERS			☘	☘	☘	☘	☘	☘	☘	☘	☘
PERENNIAL PLANTS					☘	☘	☘	☘	☘	☘	☘
POTATOES			☘	☘	☘	☘	☘	☘	☘	☘	☘
RADISH			☘	☘	☘	☘	☘	☘	☘	☘	☘
SPINACH/ARUGULA			☘	☘	☘	☘	☘	☘	☘	☘	☘
SUMMER SQUASH				☘	☘	☘	☘	☘	☘	☘	☘
SWEET CORN				☘	☘	☘	☘	☘	☘	☘	☘
SWEET POTATO				☘	☘	☘	☘	☘	☘	☘	☘
TOMATOES				☘	☘	☘	☘	☘	☘	☘	☘
TURNIPS			☘	☘	☘	☘	☘	☘	☘	☘	☘
WINTER SQ/PUMPKIN				♂	☘	☘	☘	☘	☘	☘	♂



LAST SPRING & FIRST FALL FROSTS



START SEEDLINGS INDOORS



SOW SEEDS DIRECTLY IN SOIL



PLANTING PERIOD



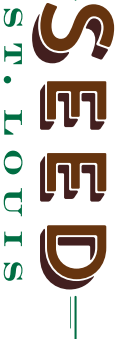
TRANSPLANT INDOOR SEEDLINGS



GROWING PERIOD



HARVEST PERIOD



## Bibliography

### *Photos:*

Shady garden ([http://acrossmytable.blogspot.com/2010\\_08\\_01\\_archive.html](http://acrossmytable.blogspot.com/2010_08_01_archive.html))

Sunny garden (<http://blogs.ubc.ca/thefuelweeat/>)

Square foot garden (<http://thewealthyearth.com/tag/kohlrabi/>)

(<http://inchsuvival.com/site/2013/04/square-foot-gardening-chart/#>)

Erosion (<http://biconstruction.wordpress.com/2012/11/08/4-easy-diy-erosion-control-tips/>)

Water (<http://www.inspiremeheather.com/2013/07/how-to-water-plants-in-summer.html>)

Mulch (<http://bobbijunod.wordpress.com/2011/05/13/potato-box/>)

Seed tray (<http://www.offthegridnews.com/2011/04/25/shady-vegetable-gardens/>)

Checking moisture ([http://www.earthonlinemedia.com/ebooks/tpe\\_3e/soil\\_systems/outline.html](http://www.earthonlinemedia.com/ebooks/tpe_3e/soil_systems/outline.html))

Vermicomposting. ([www.sustainableandinnovativelife.org](http://www.sustainableandinnovativelife.org))

Pallet Compost Bin. (<http://cajunchefryan.rymocs.com/blog2/sustainability/organic-waste-materials-create-beneficial-opportunities/>)

Composting: <http://www.eoearth.org/view/article/51cbcd517896bb431f691570/>

Kid gardening ( <http://www.sheknows.com/parenting/articles/827275/kid-friendly-gardening-projects> )

Garden Tone: <http://www.espoma.com/wp-content/uploads/2015/03/garden-tone-datasheet.pdf>

Hand in dirt ([http://perigreen.blogspot.com/2012\\_10\\_01\\_archive.html](http://perigreen.blogspot.com/2012_10_01_archive.html))

Trellises: (<http://keepitgrowingforward.blogspot.com>)

(<http://scliving.coop/home--garden/tips-on-trellises,-raised-beds/>)

(<http://diaryofafledglingfarmer.blogspot.com/2012/06/how-does-your-garden-grow.html>)

(<http://beekman1802.com/easy-durable-raised-bed-trellising/>)

Cold frames and low tunnels:

(<http://extension.missouri.edu/p/g6965>)

(<http://www.mathdittos2.com/ednews/archive/week131.html>)

(<http://investmentwatchblog.com/extending-the-harvest-in-your-home-garden/>)

Row covers and shade cloth:

(<http://gardening.ktsa.com/Floating-Row-Covers/7963109>)

([sears.com/bosmere-haxnicks-easy-net-tunnel-shade-cloth/p-07101308000P](http://sears.com/bosmere-haxnicks-easy-net-tunnel-shade-cloth/p-07101308000P))

(<http://2manytomatoes.blogspot.com/2012/06/lettuce-pray.html>)

Crop rotation: Julie Day (<http://www.todayhomeowner.com/vegetable-garden-crop-rotation-made-easy/>)

Fencing: <http://fencer1.net/chicken-wire-fence-posts/>

<http://www.homegrown.org/forum/topics/groundhog-control>

<http://www.gardeners.com/how-to/keeping-animals-out/5452.html>

Seed to Plate:

[http://www.hgof.ns.ca/index2.php?function=cooking\\_tips](http://www.hgof.ns.ca/index2.php?function=cooking_tips)



Appendix I:

(<http://assets.inhabitat.com/wp-content/blogs.dir/1/files/2012/10/uk-scientists-to-create-autonomous-robot-with-bee-brains.jpg>)

(<http://www.nathab.com/uploaded-files/carousels/TRIPS/Monarchs-Photo/Central-America-Monarchs-Photo-1-flower.jpg>)