50 HOMEMADE FERTILIZERS AND SOIL AMENDMENTS:

The Ultimate Collection of EASY, ORGANIC Recipes for EDIBLE GARDENS using FREE and Recycled Materials

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WHERE to find FREE ORGANIC materials, WHEN to apply them, WHY they might help, HOW MUCH to use, and WHICH plants to target.

Home Grown Fun Garden Series

Book One

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HomeGrownFun.com

DEDICATION

To my husband who puts up with my spontaneous, wacky projects and crazy ideas. He's dented his truck to help me transport giant hypertuffa sculptures, thrown out his back building me inventive contraptions and dealt with all kinds of smelly experiments - including the composting scraps in the refrigerator that have been mistaken for leftovers.

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From ALFALFA to FISH HEADS

From GRASSES to MOLASSES

From NUTS to WORMS

PREFACE

Goodbye to Synthetic Fertilizers

When we bought our first home 15 years ago I used synthetic fertilizers to make the yard pretty. The retired pro golfer who sold us the house left us a box of bright blue granules and a huge bag of iron pellets for the lawn. Wow, my turf looked great and I felt like a proud, suburban wife!

I started thinking about water contamination and potential health issues but more often I asked myself if I really needed to buy all this stuff. I didn't feel right using it on my vegetables. Eventually I gave away what was left and stopped using synthetic garden chemicals all together.

Wonderful Weeds

Our lawn didn't look as green or pristine - we had more weeds, bugs and signs of trouble. When the kids were born, the crabgrass and prickly lettuce spread even more.

The retired marine colonel next door walked around with his trusty canister of weed killer annihilating all enemy plants with a quick squirt. He called it his **"can of death"**, and offered it to me regularly with a playful, devious smile.

While everyone near us was grooming, trimming and slaying weeds with their own chemical weapons of choice, we picked by hand, trucked in yards of compost

and mulch, shoveled, amended, low-crawled and layered until we blew brown goo out of our noses.

Then I found out I could use those annoying weeds to make homemade fertilizer!

Gardening for Fun

The hours at work and travel were crazy. Many projects turned into all-nighters and I grew accustomed to staying on the computer until the birds tweeted everyone awake. **Gardening became an outlet**, a chance to get away from computers, proposals and phone calls.

Before my girls could walk, they gardened. And I hoped our tiny Southern California backyard would seem magical to them. I wanted my kids to have some form of nature outside their back door like I did growing up in Maine. So we planted lots of fruit trees and got creative with containers.

I needed to figure out how to keep everything going, naturally.

I can still picture my toddler girls scuffling outside to pick breakfast wearing their footsy pajamas. The youngest would twist off a green pepper and chomp on

it like an apple, balancing on the edge of a half whiskey barrel. The oldest loved looking for carrots and long beans.

There's nothing like little smiles covered in home grown strawberries. Those were the days!

Composting Like a Crazy Woman

When I got my first compost tumbler, a birthday present from my father-in-law, I was instantly hooked. I learned on my own how to mix materials to get results in just a couple of months. The neighbors caught on and left bags of stale bread and veggie scraps on top of the fence.

Kids and Composting

As my passion for composting grew, I brought the fun to our elementary school and organized a **Recycling and Composting Fair**. We created a giant landfill that showed how we could recycle stuff found around the house and convert it into soil amendment. The kids explored different composting systems including heaps, tumblers and bins. **The red wiggler worms were the star of the show!**

Along the fence I attached examples of what materials we could compost and what we should not, including a dollop of dog poo. (Cleared that with the teachers first, since it might incite a potty humor riot!)

I didn't anticipate that my zeal for composting would cause a bit of trouble. After the event, motivated students halted their parents at the trash can, forbidding them to throw away school papers, banana peels and apple cores, explaining that they could be transformed into compost.

Moms and dads passed me in the school parking lot casting appreciative but annoyed "thanks a lot" smiles.

Kids in the neighborhood started ringing the doorbell to check out our worms and to smell and touch what was growing in our wild backyard. Soon, we had the regulars-the door would open and I would hear, **"How is the borage growing?" or "Can I feed the worms today?"**

“Cindy, Is this for the worms or for me?”

I keep bags of veggie scraps in my refrigerator until I’m ready to feed my red wigglers. I must be a terrible cook if my husband can’t tell the difference between the leftovers and the scraps I’m saving for the composting worms.

Brown, squishy bananas that would never get eaten by my daughters get recycled into fruit leather, fertilizer for my plants or worm food. The worms seem to love melon rinds so if I’m not in the mood to pickle them, they get shredded and dumped in the bin.

Reduce, Reuse, Recycle

We all have extra stuff lying around or within close reach that could potentially be recycled in our gardens. **This book shows you what to reuse and how to reuse it to amend your soil, feed your plants and reduce landfill waste.**

In my own trials and research over the last 15 years I discovered hundreds of ways to improve my garden using materials found around the house - even my kids’ pee - more on the yellow stuff later on. Try out the recipes and discover what works best for you, in your mini ecosystem.

Hope you find the information easy to understand, enjoyable to read and useful for years to come!

Cindy Rajhel

ABOUT THE BOOK

Who Should Read This Book

This book is a good fit for anyone curious about natural fertilizer options and interested in reducing what ends up down the drain, piled in a landfill and stashed in and around the house.

The recipes cater to folks that grow in **smaller garden plots**, 100 square feet or less: community gardens, school gardens, raised beds, pots, barrels, sacks, bags, bottles and pretty much anything we can stick a plant in.

Why Read This Book

Get inspired to repurpose your weeds, seashells and urine. If you like to experiment in the garden, you'll find plenty of ideas and suggestions for combining materials such as **alfalfa pellets and seaweed**. Learn why natural options benefit your garden, which materials will improve soil over time and how to apply them effectively. **Discover new ways to save money and conserve resources.**

You may never buy another commercial fertilizer product again!

I have personally used every recipe several times in my own garden, or in the school garden with good to great results. I can't prove without a doubt that the materials I use will make a difference for you. However, I can honestly say that I've done a good amount of research on each material and am confident that my recipes have merit. Who knows, you may know of a way to make them even better!

In addition to the recipes I explain how I test my soil without purchasing lab or strip tests and why **pH tests may be unnecessary in your garden**. Through my own investigation I discovered **secrets about sewage sludge and fish fertilizer** that I want you to be informed about.

If you want to learn how to compost with worms or use manures safely, this book could serve as your go-to-reference.

Bat Poop. What's Not Included in the Book

Techniques that I haven't used myself or that I personally deem unsafe or unsustainable are not included in the recipes. For example, I wouldn't use last

year's dog run as a vegetable garden or dump fresh kitchen scraps directly on top of the garden.

Some of the fertilizers and soil amendments I chose NOT to write about require specialized processing such as blood meal and bone meal. Hard-to-harvest materials like bat guano are omitted too because it's unlikely you have access to a bat infested cave-or the time and desire to scrape it for feces.

This book concentrates on accessible materials that don't require a gas mask, butchering, spelunking or even spending any extra money.

How To - Stir Up Trouble

In your quest for your own homemade remedies, please do not blow anything up, create concoctions that become environmental concerns or produce dangerous gases or liquids that cause harm to any living thing.

The ingredients here should not harm your plants or soil if used in moderation. **If you over apply any material, natural or synthetic, you risk damage to your soil, plants and the environment**.

Bottom line is I cannot be held responsible for your crazy antics. I get myself into enough messes without your help, thank you very much.

CHAPTER 1: HOMEMADE – NOT A HOAX

Experience and Evidence

I don't need guarantees or test results before I try something out in my garden. For me experience and evidence go hand in hand. **I could never garden based on science alone. Could you?**

Lots of what we learn about gardening comes from reading, discussions with friends and our own experiences, successes and failures. There are certainly more opinions out there than scientific studies.

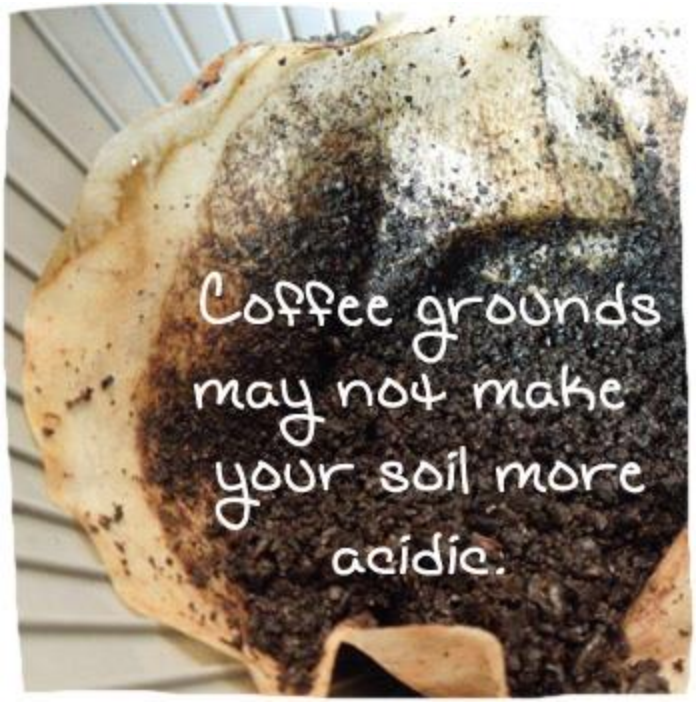
Prove It

It is difficult to prove a technique works in the home garden because there are so many variables. Controlled studies require lots of samples, time and money. But as I read more university studies and books, I find my experiences often intersect with related evidence.

Sometimes I must assume I am on the right track because the scientific data is complicated or the information is focused on much larger farms - commercial operations with different requirements, conditions and goals.

We've adopted many garden remedies over the years based largely on personal experience.

Take **coffee grounds**, for example. Rich in nitrogen, they've become a popular garden amendment. However, out of the 168,000 search results on Google for "coffee grounds fertilizer", only a few come from the research community.



After looking over a few college research papers and extension office articles, I discovered that coffee grounds may indeed provide a healthy dose of nitrogen to nutrient-needy plants. However, despite popular belief, they may not make the soil more acidic for blueberries, azaleas and other acid-loving plants.

Once inside the recipes for using coffee grounds, you'll get the lowdown on how to use them strategically to grow a healthy garden.

Folklore and Fact

There's a gray area between folklore and fact and I don't ignore ideas that live in that space, especially those that have been used for centuries, are still used today, and continue to generate favorable feedback.

Many natural and Do-It-Yourself (DIY) garden concoctions connect to history and folklore. For example, Romans and medieval French farmers used shellfish debris to fertilize the fields. And agricultural fish products are widely used today to increase the productivity of tomatoes, strawberries, lettuce and more.

I gather up kelp from the beach from time to time and add the leaves directly to the soil. I also dry fish parts to create homemade fish tea.

Ancient Manure

Manure is probably the most widely used soil amendment in the world. Until recently, researchers believed that the Romans were first to use it for edible crops. New information published in the July, 2013 issue of Proceedings of the National Academy of Sciences, reveals that **manure was used on fields in Europe thousands of years before the Romans**.

It seems Neolithic farmers understood a lot more than initially thought - that the condition of the soil can be improved over time. It was a matter of survival and family status back then.

Modern Manure

Annie Haven, from Haven Family Ranch in San Juan Capistrano, California, produces a soil conditioning product appropriately nicknamed **"Moo Poo" manure tea**. She offers it to consumers and resellers across the United States.

The small muslin bags of dried and aged manure are a popular soil amendment option because they're convenient to brew, don't smell stinky and give the soil nutrients in a form that can easily be converted to food for plants.

Cows and horses roam freely in open pasture, raised without antibiotics or hormones. Thousands of gardeners “swear by” her product raving about how it builds microbes and increases absorption of water, oxygen and nutrients.

One of my favorite uses for manure tea is to recondition worn out soil.

There’s more of a focus these days on how to acquire disease-free manures; and how to use specific manures for specific garden goals. Which manures work better for growing pumpkins? **How do you safely use manures in your garden?** Find out in this book.

Gardening Is Adventure

Many of us do not have the luxury of a large greenhouse, loads of land or raised beds filled with perfect soil. And even if we did have the tools and the space, we still need the knowledge and the desire to grow healthy food. In the process of making the most of our growing spaces, weather and budget, we’ve become more resourceful and inventive.

Research combined with our own experiences, instincts, traditions and beliefs makes gardening an adventure!

Where’d I Get All This Information?

Most of the information in this book was derived from my own experience, discussions with friends and experimentation. Many of the fact-based statements are general knowledge.

Citable research discovered from physical books, university studies, scientific journals and government websites are listed in the Bibliography and organized by topic for ease of use.

CHAPTER 2: EASY WAYS TO MANAGE YOUR SOIL

Difference Between Fertilizers and Soil Amendments

The word “fertilizer” is often used liberally, and many times incorrectly these days to describe manure, soil conditioners and pretty much anything dumped onto the surface of a garden to make something grow.

There is an important difference between fertilizers and soil amendments. This matters because you need to know why you are using a certain material and what effect it will have on your soil and plants, short and long-term.

Fertilizers

Fertilizers impact plants soon after application. Most of the nutrients are in water soluble form, making them easier for plants to absorb. Fertilizers last for hours, days or weeks and don’t do much to improve the quality of your soil (especially synthetic fertilizers). Plants in containers usually need a constant supply of fertilizers to stay healthy.

Commercial fertilizers must be tested and their nutrient content printed on the package. I know from personal experience that to register a fertilizer for sale in the State of California, it must be analyzed first to arrive at its N-P-K value: the relative percentage of nitrogen (N), phosphorus (P) and potassium (K) contained in the packaged material.

In this book I’ll be referring to some of the natural materials as fertilizers even though they are not commercially branded products with published N-P-K.

Soil Amendments

Soil amendments improve soil structure over time and their nutrients become available over weeks, months or even years.

In California, soil amendments can be sold legally without N-P-K information because their primary role is not nutrient-based. Their claim to fame is that they change the condition of the soil, improve water retention, increase porosity and aid nutrient processing.

Without a good soil that drains well and provides organic matter for microorganisms, fertilizers won’t do much good.

Five Reasons to Pass on pH

If you suspect your soil could be contaminated, maybe by runoff, or previous applications of sewage sludge or some other unknown material, have it tested professionally. Or you might want to have it analyzed in detail if you garden in a huge plot.

However, if you grow in small areas, raised beds and containers like me, and don't have worries about the safety of the soil or major nutrient deficiencies, then I suggest you skip the testing and concentrate on creating a balanced environment where nutrients can easily be absorbed by your plants and water can drain properly.

That's right, I recommend you not purchase pH home testing kits, or spend the time and money preparing samples for professional pH analysis done by a lab.

Why don't I use pH tests when it seems every Internet article and gardening expert insists that we should get our soil tested?

Most of us can grow vegetables, herbs and fruit successfully without spending a dime or the time on soil testing. Here's why:

Five Reasons to Pass on pH

1. **For many home gardeners, soil testing is not practical.** We do not have massive garden plots or the desire to fool around with powdered lime or sulfur. We have a small or medium-sized garden, a couple of raised beds, or we garden solely containers because we have a busy lifestyle, lack the quality soil or simple don't have the real estate to spread out.
2. **pH is more than a number.** pH is an indicator of not only how acidic or alkaline the soil is but more importantly it tells you how available certain nutrients are to your plants. Some laboratories may supply you with a report listing your soil's deficiencies and recommendations for applying synthetic soil amendments to change pH by pounds and square feet. Will you follow through? To use the pH scale properly, you need to take the time to understand the pH scale and how to take action based on the readings.
3. **pH testing requires follow-up.** You test, figure out what to add to the soil, wait for the amendments to change soil chemistry and test again later. pH testing is not a one-time or isolated event.
4. **pH is not an exact science.** pH readings are often used as a "license to lime" or a "summons to sulfur". Be careful because over applying lime or sulfur may do more harm than good in the long run. DIY tests you buy at home improvement centers are known to be inaccurate and certainly do not take your native soil, location or weather conditions into consideration.
5. **pH can be balanced with compost.** The pH scale runs from 0.0 (most acid) to 14.0 (most alkaline) with 7.0 being neutral. Most plants can grow well in a soil with a pH rating of 6.0-7.0. The primary nutrients that plants need (nitrogen, phosphorus, potassium, calcium, magnesium and sulfur) are widely available at a pH range of 6.0-7.0. If you amend your soil with a well-balanced compost, your pH has a good chance of balancing out to the magic range of 6.0-7.0.

Fooling around with test strips, adding amendments and testing again is not a haphazard job - and for me it's unnecessary. I can achieve a fairly pH balanced soil with compost.

For references on how compost regulates pH, go to the topic of COMPOST in the Bibliography.

The What, Why, Where and "WOW" of Organic Matter

The word "organic" is multi-dimensional and sometimes misunderstood because there are so many variations depending on context. In this book, we're using the term as it relates to organic soil amendments and fertilizers.

What is Organic Matter?

Materials that come from living or once living plants and animals are called **organic matter**. Manure, plants and leaves (dead or living), worm castings, peat, seaweed and humus are all good examples of organic matter. Plants grown to amend the soil, called green manures, are also considered organic matter.

Organic matter eventually decays in nature or we can help it decay by composting it. **Humus** is naturally occurring organic matter that has decayed about as much as it can. **Compost** is decomposed or partially decomposed organic matter created by humans.

Why is Organic Matter Good for the Garden?

Garden soil must have organic matter to retain and move water, maintain structure and feed microorganisms, fungi and bacteria. Organic matter keeps the soil "alive".

Where do I find Organic Matter?

There are many ways to gather or create your own organic matter. You can make compost, collect organic materials on the ground, look in your refrigerator, scope out the pantry, recycle weeds and pee in a cup. Friends, coffee shops and grocery stores may have excess organic matter waiting for you to repurpose.

Certified Organic Soil Amendments and Fertilizers

You may have seen the "**OMRI®**" label on packages. It indicates that a product is on the Organic Materials Review Institute (OMRI) list of approved products that comply with the National Organics Program (NOP) and United States Department of Agriculture (USDA) organic standards. That's a mouthful!

The collection of **products with OMRI status reaches into the thousands** and covers many categories: compost, potting soil, manure, fertilizers, minerals, oils, fish products, guano, pesticides, fungicides and more. The list even contains some synthetic products!

Not Certified But Probably Organic

Lots of producers of soil amendments, fertilizers and pesticides bypass the red tape and cost involved in gaining OMRI listing for their products. I was one of these folks a few years back when I registered a soil amendment in the state of California. I produced an organic product but did not seek organic status because the process is costly, regulation-driven and time consuming.

Not all Organic CROPS are Certified Organic

Similarly, many farms that grow organic crops do not want to pay the money or complete the paperwork to earn organic certification. In the United States, farms that grow certified organic crops are regularly audited by third parties that abide by standards from the NOP and the USDA.

I regularly visit a farm that chooses not to pursue organic certification. Their website uses the term "organic" but not in an official, certified way. They practice "**sustainable agriculture**" and operate much like a certified organic farm - utilizing compost, planting cover crops and applying less toxic pesticides when needed. They do supplement with synthetic fertilizers on occasion. **Did you know certified organic farms can use synthetic fertilizers and soil amendments when justified?**

Just as intriguing, farms are allowed to grow traditional and certified organic crops close together in adjacent fields. Once harvested, both types can be stored next to each other in the warehouse.

As you can see "Organic" is not a perfected status. **The recipes in this book use organic materials that may or may not be officially certified organic.**

Evaluate Your Soil in 5 Steps

Before you start whipping up your own home brews and flora fusions, identify what kind of shape your soil is in. **All the fertilizer in the world won't help if your soil is diseased, doesn't drain well or can't retain nutrients.**

There are many ways to determine the fertility of your soil and to make assumptions about what it needs. I like to use a process that doesn't involve commercial kits or laboratory tests.

We created a method at school called the **"The 5 ITs"**, based on several references from Washington State University and Cornell University's Cooperative Extension and Department of Horticulture. See the Soil references in the Bibliography to learn more.

The 5 ITs

1. **Scoop IT**
2. **Examine IT**
3. **Smell IT**
4. **Squeeze IT**
5. **Wet IT**

SCOOP IT. With a hand trowel, dig into the ground approximately 5" deep to retrieve a scoop full of soil. Place it on a tarp, paper plate or piece of cardboard. Look at your soil.

EXAMINE IT. Look for life. Do you see spiders, insects and worms? That's good. Do you see at least 5 living things? If you do, your soil is on the right track. Beneficial bacteria and fungi are usually present in soils that contain living things. They work hard to break the organic matter down. **If you don't see signs of life, the soil needs organic matter.**

SMELL IT: Take a good whiff of your soil. Does it smell good - like the ground in a moist forest? That's ideal. Or does it smell like something has spoiled? **If it smells**

“funky”, your soil would be better off amended with carbon-rich materials such as dried leaves or straw. Another good technique to balance out the soil is to add compost that has fully decomposed.

SQUEEZE IT. Now take a handful of the soil and squeeze it. Does the soil make a ball that stays together? That’s good. Does it fall apart when you poke it. That’s also good. **If it doesn’t hold a shape at all and falls through your fingers like sand then you probably need to add organic matter. If it stays together so well that you can’t break it apart with a poke, then you need to add materials to increase aeration and drainage.**

CLAY SOIL is usually sticky, brownish-red and moist.

SANDY SOIL is usually coarse, tan-colored and gritty.

LOAMY SOIL is usually crumbly, spongy and dark-colored.

WET IT: Finally, put the soil in a cup with a hole in the bottom. Place the cup over a bowl to capture drained water. Measure a cup of water and pour it onto the soil. How much water leaks through into the bowl? How fast does the soil drain? Does the soil soak up the water? **If the water sits on top or soaks in but doesn’t drain, your soil may contain high amounts of clay. Add organic materials to improve drainage. If the water flows through quickly, you need to add materials to keep the water in longer.**


garden soil.
Distribuya 2.5-7.6 cm (1-3") del
producto ecoScraps Compost
Mix sobre el suelo de su jardin
Ingredients: compost, montmorillonite
Ingredientes: compostados, montmorillor
a clay that helps
sandy soils retain
more water

CHAPTER 3: NUTRIENTS IN A NUTSHELL

There are **16 nutrients** that plants need the most - nine crucial macronutrients and seven micronutrients vital for growth in lower concentrations.

Macronutrients

Carbon (C)

Hydrogen (H)

Oxygen (O2)

Nitrogen (N)

Phosphorus (P)

Potassium (K)

Calcium (Ca)

Magnesium (Mg)

Sulfur (S)

Plants must have **carbon**, **oxygen** and **hydrogen** to live and they get these primary elements from the air and water during the process of photosynthesis - carbon comes from the air and hydrogen and oxygen from water.

N-P-K

You've probably seen the N-P-K ratings on fertilizer bags. That figure represents the relative percentage of nitrogen (N), phosphorus (P) and potassium (K) in the package by weight. Those three nutrients are considered the most important.

For example, a popular synthetic fertilizer containing urea, ammonium phosphate and potassium chloride has an N-P-K ratio of 15-30-15.

An organic fish meal fertilizer might test at 10-6-2. The nutrients in organic materials tend to be less potent and release much slower than their synthetic counterparts.

Primary Nutrients

Nitrogen stimulates green growth and is used more often on plants in spring or at the beginning of the growth cycle. **Phosphorus** encourages healthy roots, and **potassium** promotes flowering and fruiting.

Secondary Nutrients

Calcium makes for strong plant cell walls among several other functions including the regulation of other nutrients. **Magnesium** plays a multifaceted role as part of chlorophyll, plant enzyme processes and phosphorus utilization. **Sulfur** is essential to amino acid, chlorophyll and plant tissue formation. Its presence also impacts the availability of nitrogen.

Micronutrients

- Boron (B)
- Chlorine (Cl)
- Copper (Cu)
- Iron (Fe)
- Manganese (Mn)
- Zinc (Zn)
- Molybdenum (Mo)

Boron levels impact growth from initial cell construction to fruit development. **Chlorine** helps water move through cells. **Copper** makes it possible for roots and proteins to move nutrients around efficiently. **Iron** is needed most when plants are young to produce chlorophyll.

Manganese affects how plants utilize energy, water and nutrients during photosynthesis, respiration and metabolism. **Zinc** regulates growth hormones. Without enough zinc, iron can become deficient. **Molybdenum** makes nitrogen more accessible and a shortage can hinder healthy growth of cauliflower and other brassicas.

If your soil has ample amounts of organic matter in it, then it should have most of the macro and micronutrients it needs to support healthy growth - as long as plant, soil, moisture and environmental conditions are favorable.

Differences Between Natural and Synthetic Nutrients

Plants might not be able to tell the difference between synthetic and natural nutrients. But that doesn't mean using a fertilizer made in the lab is just as good as one derived from nature.

Natural and Organic Fertilizers

Natural and organic fertilizers and soil amendments encourage growth of beneficial fungi, bacteria and other organisms. Most contain multiple nutrients and trace minerals that benefit soil and plants. They feed soil organisms.

Natural nutrients are usually not a "quick fix". They tend to release nutrients slower than the synthetic version.

Synthetic Fertilizers

Although synthetic fertilizers are not generally accepted in organic gardening, they are used by commercial farmers and home gardeners because they are **convenient, reliable and produce fast results.**

Synthetic chemical fertilizers usually do not increase microbial activity in the soil. They have one or just a few nutrients, act quickly and produce vigorous growth.

The down side is that they are potent and tend to be over-applied, increasing the chances of root shock, soil contamination and environmental pollution.

Have you ever fertilized tomato plants with synthetic nitrogen and wondered why you got lots of leaves and green growth but little fruit? Excess nitrogen will delay and even inhibit flowing and fruiting.

Synthetic Pathetic

Have you ever purchased bagged potting soil that works like a "miracle"? Plants will grow like crazy over a few months and then the soil will seem dead. Bagged, amped up soil that lacks organic matter and relies heavily on synthetic chemicals will render itself useless after one season. You must keep feeding to keep the plants alive.

Example: Natural and Synthetic Urea

Natural urea is created by mammals, amphibians and some fish. It's the main component in urine. Human urine contains nitrogen, phosphorus and potassium. It has an N-P-K nitrogen value somewhere between 11 and 15 depending on a person's diet.

A popular ingredient in many potting soil products is **synthetic urea**. It can be formulated in a lab. Again, it works like a "miracle". Synthetic urea has a much higher nitrogen value, a whopping 46, and no other nutrients. It contains high amounts of ammonia.

Although ammonia is used worldwide as a fertilizer in crop production, it is highly toxic.

Nitrates from synthetic urea are highly water soluble and taken up quickly by plants. But a plant can only absorb so much. **Any excess nitrogen stays in the ground until carried off to other locations by runoff.**

How Plants Absorb Nutrients

Many types of soil organisms populate the garden. Bacteria dominate with millions occupying just one teaspoon of soil. Fungi, protozoa, nematodes, anthropoids and earthworms also share the "soil food web". The **soil food web** is a network of organisms that live as a community with plants and animals – all impacted by the environment and other factors.

Bacteria

There are several types of bacteria in the soil food web. Some focus on decomposing carbon-based organic matter, processing nutrients and gobbling up pollutants. Others target organic matter rich in nitrogen.

"Nitrogen-fixing" bacteria convert nitrogen from the air into nutrient forms plants can absorb. Soil borne bacterial pathogens are the bad guys. They damage plants and cause disease.

Fungi

Fungi also decompose organic matter and certain fungi called **mycorrhizae** attach to the root like tiny hairs and ramp up nutrient and water intake. Just as in the case with bacteria, some fungi do NO good and cause plant diseases.

Environment

How efficiently plant roots absorb and process nutrients depends on several factors:

~Moisture

~Temperature

~Soil management practices

~Soil acidity

~Chemical composition of the nutrients

~Concentration of the nutrients

~Interaction between nutrients

Water

Most of what a plant absorbs comes from what is dissolved in water. Without enough water, plants can't take advantage of what's in the soil. Microorganisms find it harder to break stuff down and nutrients don't move where they need to go. That is why I **always water BEFORE I apply any fertilizers or foliar sprays.**

Organic Matter and Nutrients

Soil with a good amount of organic matter should contain a variety of macro and micro nutrients. However, all minerals may not exist at sufficient levels because of a wide array of environmental factors such as temperature, location, water content and the types of plants you're growing.

Adding compost to your soil, ideally compost made from multiple sources, can increase nutrient content as well as increase microorganism activity that makes nutrients available to plants.

Why Some Fertilizers Get Wasted

Just because nutrients are applied doesn't mean they'll be absorbed**.**

In sandy soil, nitrogen can leak through before the plant gets a chance to absorb it - potentially adding harmful nitrates to the surrounding area. Prevent leaching by starting out with a good quality soil and your fertilizers and soil amendments will stay where they're supposed to.

In addition, large quantities of a fertilizer or soil amendment won't always improve plant health. If the excess doesn't drain away, it could throw other nutrients off balance.

CHAPTER 4: 100 NATURAL FERTILIZER RECIPES

I've lived in apartments, condominiums, military housing and my own home, from the East Coast to the West. The soil types and ecosystems in each location were all different.

The size of your growing area, the types of plants you grow, the weather, soil and watering methods you use will all impact the effectiveness of fertilizers and soil amendments. Try to keep those variables in mind when you put these homemade concoctions to the test.

How to Use the Recipes

Each recipe features a key material. Learn how a material benefits the garden, where to find it, how to use it and what other materials it can be combined with to enhance your soil and plant growth.

Only ingredients and combinations that I have personal experience with are included. Like any recipe, you can adhere closely to the instructions or experiment with your own ratios and combinations.

I don't list the N-P-K ratios of each material in the recipes because the numbers can be misleading. **Lower N-P-K values do not necessarily mean the nutrients are weaker.** Nutrient concentration and availability depend on many factors including source of the materials, age, environment and handling practices.

Simple Measurements

Application quantities are recommended based on my own trials, sometimes tested many times and sometimes only a few.

I usually measure by the handful, cup or spoon. Sometimes I forget to take a measuring cup into the garden so I estimate. I have medium-sized hands so I figure 3 handfuls of a chopped or ground material equals a cup. **I also use the size of my thumb to estimate a tablespoon.** A tablespoon equals 15 milliliters and 1 gallon equals 3.8 liters.

A common dimension for a raised bed is 4 feet by 8 feet (or 1.2 x 2.4 meters). That's about 32 square feet (or 9.8 square meters).

It's always better to apply less than more of an ingredient until you figure out what works in your garden. You might be surprised just how little some recipes use.

How Often and When

When applicable, recipes give recommendations for frequency. Generally speaking, **soil drenches and foliar feeds can be applied twice a month** since the nutrients in water-based natural fertilizers usually last just 2-3 weeks. (Solids decay at different speeds depending on the material.)

Natural fertilizers are gentler and take longer to be absorbed making it less likely plants will experience shock, burn or over-fertilization. Still, it's important not to overdo it. You can still damage your soil and plants with "too much of a good thing".

Each recipe has advice on timing and always errs on the side of safety. For example, be careful not to apply nitrogen too late in the growth cycle for flowering and fruiting plants, especially fruit trees that are going dormant. Also, in my opinion, fresh manures should never be applied during growth.

So here you have it, finally, 50+ ways to use up extra stuff around the house to improve your soil, help your plants grow and reduce waste.

From ALFALFA to FISH HEADS

ALFALFA

Preparing planting beds, side dressing and watering with alfalfa tea can make a positive difference in your garden. Alfalfa is one of my favorite materials for making homemade fertilizer.

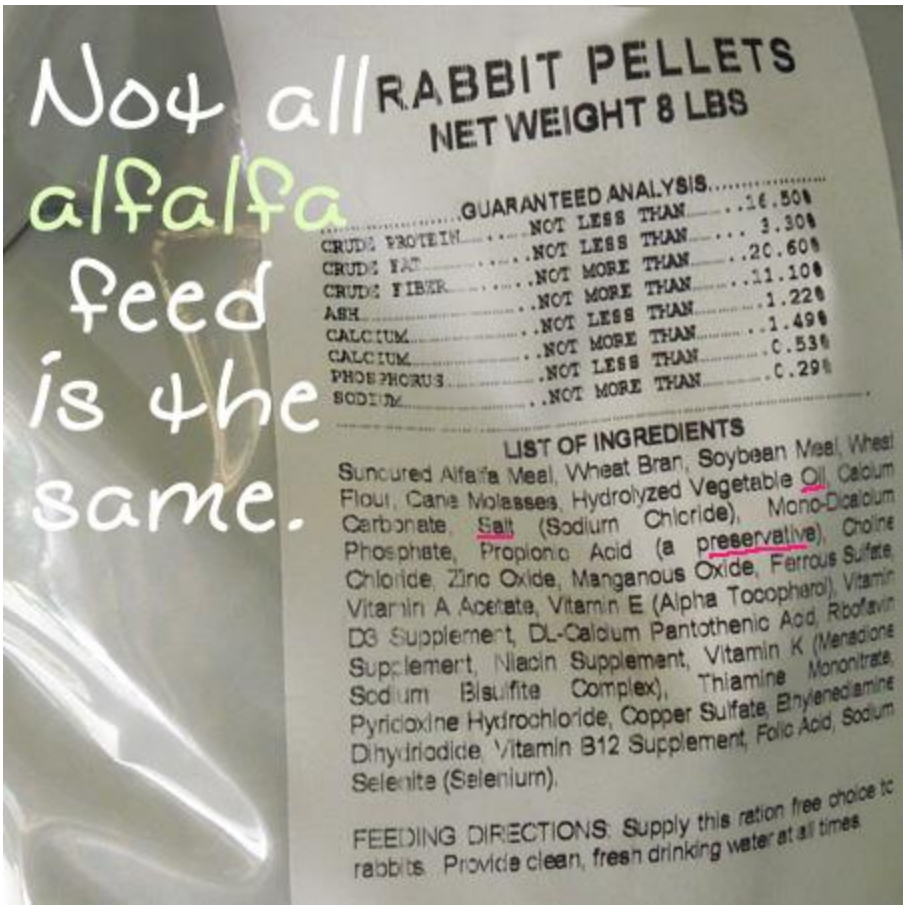
Why might alfalfa be good for the garden?

Alfalfa, a **nitrogen-rich** legume, is used as livestock feed and is also abundant in an array of macro and micronutrients. Without enough nitrogen, plants are stunted and foliage will take on a pale yellow tint. Tomatoes with a nitrogen deficiency will get purple-looking veins. **Alfalfa encourages microbial activity in the soil, breaks down quickly and stimulates plant growth.**

Where do I find alfalfa?

You're in business if you have stale pellets hanging around from a pet rabbit or can snag a small bucketful of horse feed from a friend. The same goes for alfalfa hay. Sometimes animals decide they don't want to eat the food put in front of them and so it will just sit there until it can be composted or given away.

I got my hands on a bag of pure alfalfa horse feed in pellet form. **If you have access to packaged rabbit food, look at the label to check for additives.**



Which plants may benefit from alfalfa?

Alfalfa treatments are especially good for nitrogen-loving plants such as cucumbers, sweet corn, tomatoes, peppers, eggplant, squash, pole beans, broccoli and cabbage (all Brassicas).

Celery, potatoes and carrots can also benefit from a bit more nitrogen but read the tips coming up to find out when it's best to apply.

There are several reasons why you should not over-apply alfalfa or any nitrogen-rich material.

1. Alfalfa produces a lot of heat when it decomposes. It will rob the soil of nitrogen while it breaks down because the microbes that work on it need nitrogen for fuel.
2. Excess nitrogen can decrease the plants ability to fight off disease and pests (aphids will multiply quickly).
3. You will get lots of leaves but little in the way of fruit or flowers.
4. If applied too late in the growing cycle, you run the risk of weaker crops, e.g., cracked cabbage heads, split carrots and poor quality potatoes.

Combine alfalfa with…

Alfalfa works well with kelp for added phosphorus and trace minerals. Simply add 2-3 chopped kelp leaves for every cup of alfalfa.

Sometimes I use 2-3 crushed eggshells per square foot along with an alfalfa treatment.

1. Alfalfa Pellets Soil Amendment Recipe

To prepare the garden a few weeks before planting, scatter alfalfa pellets in your planting bed. For a 3 foot by 3 foot area use one cup, or **3.5 cups for the entire raised bed**. Work into the top layer of soil and water well. **A few weeks later, plant your seed or transplants.**

For a smaller area, planting hole or container, add a small handful of alfalfa pellets for every square foot and cover with an inch or two of soil before planting.

You can also use **baled alfalfa hay** to prepare a planting bed although it will take longer than pellets to decompose. Pull the bale apart, lightly spread it in the planting bed and **wait at least a month before planting**. Or add a 3 inch layer of alfalfa in the fall and it will decompose during winter. Come spring you won't have to do much to get the garden prepared for planting!

Alfalfa Pellets to Recondition Container Soil

If you use containers and the soil has lost its life, dump all the spent stuff in a giant tub with drainage holes. Mix equal amounts of alfalfa, chopped kelp leaves and crushed eggshells. Add a cup of this combo for every square foot of soil and let it sit for a month.

2. Alfalfa Pellets for Compost Recipe

Alfalfa pellets are an effective compost accelerator. There's no need to buy commercial starter products to rev up the pile. Alfalfa will increases heat and speed decomposition, especially helpful in cool weather.

Use one cup of pellets for every square foot of compost material.

Make sure you add about a square foot of carbon-rich brown materials for every cup of alfalfa pellets to balance out the nitrogen in the alfalfa: dried leaves, straw or uncoated paper work well. Check out my list of 100 Compost Ingredients for more ideas.

3. Alfalfa Pellets Top Dressing Recipe

Sprinkle alfalfa pellets on top of your garden bed and water in. Do not over apply because excess nitrogen can harm your plants and make them more susceptible to disease.

I use a small handful (about 1/4 cup) for each square foot or two large handfuls (about a cup) for every 3 square feet, **making sure the pellets do not touch the plants.**

Timing is Important

For vegetables such as cabbage, carrots and potatoes, time your top dressing so that you **do not apply the alfalfa too late in the growth cycle.**

~Do not add alfalfa after cabbage heads out or you'll run the risk that it will grow too quickly, become weak and crack.

~For carrots, apply alfalfa a few weeks into growth only. If you apply a month out or even closer to harvest, the carrots might split.

~Just as with cabbage and carrots, potatoes might get weak and become more prone to damage if subjected to too much nitrogen too late. Stop adding any nitrogen-rich fertilizer 60 days prior to harvest. (This is why bagged soil with time released nitrogen fertilizer is not a good idea for potatoes.)

4. Alfalfa Fertilizer Tea

For small applications use a quart jar or any similar-sized container. Add ¼ cup (or a small handful) of alfalfa pellets and let sit for 5-10 minutes. Water one plant with the liquid and keep the solids in the container. Add water again and wait another 5-10 minutes to use once more. Keep doing this until all your plants that need nitrogen are fertilized.

To make a larger batch, add 1 cup of alfalfa pellets to a gallon of water or 5 cups to a 5 gallon container.

For a more complete fertilizer, add the same amount of worm castings and/or kelp to the water. The solids leftover from the tea can be worked into the soil or added to your compost bin.

Alfalfa Tea Using Hay Dust

Compressed bales of alfalfa when shaken will drop fine particles that you can use to make a tea for your plants. Just open the bale of alfalfa over a tarp and sweep up the powder. Place in a pantyhose or sock and tie the end. Drop in a bucket of water and let sit for a day or two. Water your nitrogen-loving plants as usual with the alfalfa tea.

Foliar Feed

Spray your liquid fertilizer tea on the leaves early morning or evening. Make sure to get the undersides of leaves because they are more porous.

Alfalfa Tips

- Rabbit alfalfa pellets are smaller than horse alfalfa pellets and may break down faster in water and the soil.
- Alfalfa feed may have other ingredients added. Check the label or ask.
- Do not use alfalfa on plants that are going dormant because it will stimulate growth at the wrong time.

- When alfalfa hay gets wet it can mold and take on a musty smell. Fresh alfalfa hay smells good, like newly cut grass. You can use it for the garden even if it’s starting to spoil.
- Usually alfalfa hay is cut and baled before it goes to seed. Try using it as a mulch much like grass clippings. Let it dry out first and apply thinly so it won’t heat up and rob nitrogen from the soil to decompose. As with the side dressing recipe above for pellets, make sure to have a bit of clearance around the plants to prevent nitrogen burn.

Banana Peels

BANANA PEELS

We eat a lot of bananas at our house and I feed my worms the peels. But there are other uses for banana peels in the garden.

Why might banana peels be good for the garden?

Banana peels provide plants potassium and add organic matter to the soil. The skins have conditioning properties that help protect foliage.

Although there is usually lots of potassium in the soil to begin with, it's not always in a form that plants can use. **Banana peels decompose quickly (about 3-4 weeks)** and therefore are less likely to rob the soil of nitrogen while breaking down.

Where do I find banana peels?

I find them in my kids' room, under the car seat or rotting on the counter!

Which plants may benefit from banana peels?

Vegetables such as cabbage, kale and tomatoes seem to thrive with added potassium.

Combine bananas with…

Since banana peels offer potassium, use them alongside applications of seaweed or kelp to add additional nutrients and trace minerals.

5. Recipes for Adding Banana Peels to Vegetable Beds, Planting Holes and Containers

Drop whole or chopped peels in the bottom of the planting row. Cover and water the soil. I use 1-2 peels for every 3 square feet of planting area.

You can also chop up banana peels and add them to the container soil before planting. I don't use too much, maybe a ½ cup per container.

To top dress established plants, I bury chopped peels 1-2 inches under the surface. Four of five peels work well for a 3-foot square area. Peels will decompose faster if cut into smaller pieces although the extra work is not necessary.

6. Banana Peel Soil Drench

Make banana peel soil drench by adding 1-2 peels to 2 quarts of water or 3-4 peels to a gallon of water. Let sit for several hours or overnight at room temperature and then water around your plants.

Banana Peel Quick Tips

- When adding directly to the soil or planting area, rip or chop up peels into smaller pieces so they will break down faster.
- If I have too many peels or don't have the time or reason to use them right away, I store them in a bag in the refrigerator or freezer until it's time to amend the soil.
- Moist soil helps potassium absorption so it's important to ensure the plants that "go bananas" don't dry out.
- Weather plays a role as well. Nutrients are absorbed faster in warmer soils.

Beans

BEANS

Why might beans be good for the garden?

Beans contain proteins which convert to nitrogen. Because they're organic matter, they help keep the soil "alive". They also decompose quickly depending on environmental factors as well as the type and age of the material.

Where do I find beans?

I don't usually have extra dried or cooked beans lying around. If you need to get rid of dormant bags of beans in the cupboard, go ahead and recycle them in your compost. Cooked beans can be composted too as long as they do not contain meat juices or lots of oil.

Spent beans and pea plants, and their roots, also make an excellent compost ingredient.

Which plants may benefit from beans?

I think the best use for beans is in the compost. I have never used them directly in planting holes but suppose this would work if you left the materials for at least a couple months to decompose.

Combine beans with…

Carbon-rich materials such as leaves, cardboard and straw.

7. Beans in the Compost Recipe

Add dried beans, cooked beans, fresh beans and stalks, vines, leaves and roots of bean plants to the compost pile. Chop up plant matter if possible.

Because **bean plants "fix nitrogen" from the air** and ground and contain more nitrogen than carbon, they are considered a "green" material in terms of composting. Add the same amount or a bit more of carbon-rich materials to balance out the carbon to nitrogen ratio (dried leaves, straw and paper). If dried beans sprout, no worries, just stir them back into the compost, preferably in the middle where it gets the hottest.

Beans Quick Tips

- If your bean plants look infested or diseased, do not add them to your compost. To be on the safe side, discard the plants if you see signs of trouble – you might not be able to see the eggs and larvae of the bean beetle or leaf miner.
- Lots of websites list beans as carbon or brown composting materials. That may be incorrect. Beans contain more nitrogen than some plants and certain types of legumes are valued as green manures and cover crops.

Beer

BEER-SPENT GRAINS

Beer from a bottle or can is not highly beneficial to the edible garden as a fertilizer or soil amendment. The yeast is dead in many bottled beers and the sugar does little to excite or feed microorganisms. Generally, I am not convinced that adding straight sweets to the soil is a good practice for my vegetable garden.

Then why might beer be good for the garden?

There is a by-product of the beer making process that you can turn into an asset. If you live near a brewery, or brew yourself, you can recycle the **spent beer grains** into your compost. Beer grains are a **protein-rich, fibrous mash** - the tough leftover hulls, seed parts and plant tissue. Spent grains contain nitrogen and a texture that can help fluff up the pile.

Where do I find spent beer grains?

Many large companies including Craft Brewing Company give away their spent grains to farms and agricultural organizations for use as livestock feed and a compost medium. If you have friends that brew at home, you might actually be doing them a favor by recycling the waste.

Spent grains can also be used in baked goods such as bread, pizza dough, cookies and even dog biscuits! So you might find there's a bit of competition for spent grains with their new found popularity.

Which plants may benefit from spent beer grains?

I got my hands on some spent grains and immediately dried them to prevent them from going sour on me. Unfortunately rain was in the forecast and I had to take them inside. My family will not let me forget just how gross the garage smelled during those three thunderous days.

Once dry, I spread it out as a mulch and top dressing around kale. The goal is to keep moisture in and provide a natural, gentle boost of nitrogen.

I am not sure if the grains rob the soil of any nitrogen during decomposition, so my favorite way to recycle them is in the compost heap.

Combine spent grains with…

In the compost, combine with lots of *brown* materials such as hay, straw and old leaves, to reduce odors and speed decomposition.

8. Spent Beer Grains for Compost Recipe

If you already have a compost pile in full swing, add the spent grains and the same amount or more of carbon-rich materials such as paper, straw and dried leaves. Make sure to mix the ingredients well and fluff up the pile. **The more integrated the grains and balanced the compost pile, the less stinky the pile will become and the less likely you will be visited by wild animals.** If you live in an urban area, odor control will be much more important to you, and your neighbors.

Keep the pile moist like a wrung out sponge - not wet because the grain mash already contains plenty of water.

If you'll be creating a new compost pile, add some soil from your yard to introduce microbes into the mix.

Spent Beer Grains as Worm Food

While I was experimenting with worm food I tried adding spent beer grains into the bin. I combine it with other scraps and layer the slurry in between moist cardboard. **The worms seem to love it.**

Spent Beer Grains Quick Tips

- It's important to keep the beer grains covered in a worm bin to prevent a fly problem. Covering food scraps with a few inches of shredded cardboard is always a good practice.
- Spent beer grains will start spoil in a few hours if left in a bucket or thick mass, especially so in warm weather. Freeze them if you can't use them right away or spread them out on a hot surface in full sun if you want to dry them for storage.
- I've heard spent beer grains combined with straw make a great medium for growing mushrooms! Something to try out. Please let me know if you've done this and if you would recommend it. Leave a comment on my website and join the conversation about homemade fertilizers here.
- Breweries also use materials like paper filters and diatomaceous earth during processing. Diatomaceous earth is finely ground fossilized shells. Both the filters and diatomaceous earth can be composted.

Borage & Comfrey

BORAGE AND COMFREY

Most folks are familiar with comfrey. Lots of articles have been written about it, praising it for its fine qualities as a fertilizer and soil amendment. I have never grown comfrey but do grow lots of borage, a plant closely related to comfrey.

Borage and comfrey are members of the same plant family. Both can be used in for green manure, fertilizer tea and compost accelerator.

Otherwise known as starflower, borage (rhymes with "porridge") grows in warmer temperatures and is a prickly, bushy herb with small, droopy blue flowers. Many gardeners consider borage more of a weed because it self-sows so easily.

Why might borage and comfrey be good for the garden?

Not only do I use borage to bring beneficial insects into the garden and fend off the tomato hornworm, I use the roots, stems and leaves to **make tea fertilizer for my vegetables**. I also work it into the soil for **organic matter and nutrient replenishment**.

Both plants store nitrogen, phosphorus and a relatively high dose of potassium; plus magnesium, calcium and trace minerals. It's a sustainable material that spreads and reseeds easily. They have long tap roots that suck nutrients and minerals up from the soil - great for making homemade fertilizer.

The compost pile revs up nicely with a bunch of borage added to the mix.

I've also found using borage as a green manure does a good job of increasing the organic matter in my raised beds and potting soil. I work small seedlings back into the soil before they flower and go to seed, then wait a few weeks before planting.

I don't mind it popping up everywhere the wind blows. I pull it out and let it dry, then use it for whatever suits me at the moment.

Where do I find borage and comfrey?

I started out planting borage by seed and because it regrows so easily I haven't needed to sow it again over the last few years. Many seed suppliers sell both white and blue-flowered varieties. Starter plants pop up at some garden shops and nurseries in spring.

Which plants may benefit from borage and comfrey?

Borage and comfrey are more than a nitrogen source so I use it on all vegetables, herbs and fruit in my garden. **Because it is high in potassium, I especially like to pour borage tea near flowering plants such as loofah gourds, cucumbers, peppers, tomatoes and blackberries.**

Combine borage or comfrey with…

Borage and comfrey contain many macro and micronutrients, possibly more than kelp, so I don't bother combining it with anything else. If you require more nitrogen, add dehydrated fish parts, alfalfa pellets or coffee grounds. If you like the idea of using animal manures, see the section on Manures for safety, timing and nutrient tips.

9. Borage Fertilizer Tea Recipe

Wear gloves because the leaves and stems are prickly. Cut up the plant into smaller pieces so that it will leach out nutrients faster. Add the borage or comfrey pieces to a 5 gallon bucket and fill with water. Put a rock or brick on top of the plant matter to keep it under the surface. You could also put the pieces in a mesh produce bag, making it easier to keep the entire clump down.

Let the plant parts steep in the water for a few days in the shade. Do not cover. Remove the borage, add the leftover plant material to your compost pile or future planting hole and use the tea to drench the soil around your plants as you normally water.

I also like to dry borage leaves. Drying them first allows me to store them for weeks or months.

Sometimes I brew borage leaves for tea garnished with a flower or two. What I don't drink I pour on my plants.

Aerating Fertilizer Teas - Optional

Some folks aerate their teas with an inexpensive fish tank pump and air stone. This is supposed to increase the beneficial bacteria and fungi. By constantly **adding oxygen to the solution**, the bad bacteria have less opportunity to multiply, compete with the good bacteria or cause a foul smell.

My reading of scientific papers leads me to believe that it can't hurt to aerate but it's not absolutely necessary, so I don't.

Fermenting Fertilizer Teas – Not a Fan

There are die hard fermenters out there and I'm not one of them. I tried my hand at it several times and decided I just wasn't cut out for that lifestyle. The process goes like this. You add your plant matter to a bucket of water and let it sit

for a few weeks. **As the stuff sits and decays, oxygen is depleted and eventually the syrupy solution that's left should not smell bad.** It can be diluted and used as a soil drench or foliar feed. Unfortunately, most of the time, the tea smells too putrid to bear and if it contacts your clothes and skin, be prepared to be haunted for days with the stench.

Lots of studies have been performed on the effectiveness of fermented teas. However, I don't bother because they're inconvenient to make, stink to high heaven and might breed harmful bacteria.

10. Borage Soil Amendment Recipes (Green Manure)

Comfrey and borage suck up nitrogen from the soil and store it in their taproots and leaves. If you examine their extra-long taproots you can see the nodules that store nitrogen absorbed from the air.

Work borage back into the garden soil before it flowers or sets seed. It's best to wait for the plant matter to break down before planting and so I **let it sit for at least a month before I transplant or sow seed**. It's best to chop up the roots because they could re-root if left in the soil.

Click here to jump to the section on Cover Crops and Green Manures for more ideas.

Rejuvenate Used Potting Soil with Dried Borage

After chopping up dried stems and leaves I add a small pail full to a larger bucket or container of old potting soil, then add water and mix. Essentially, I'm adding a bunch of nutrients and organic matter to the "dead" soil. Wait a month to plant.

11. Borage and Comfrey in the Compost Recipe

Dried, wilted or fresh borage leaves added to compost will heat up the pile nicely and make the decomposition process go faster. I always add the leftover plant materials from making borage tea into the compost. **For me, there's no need to buy compost starters or accelerators.**

If the plant matter is fresh, add just as much dried leaves, cardboard, paper or straw.

12. Borage Mulch Recipe

Students at school have fun watching borage grow, pulling out the plants and chopping them up to make mulch. Make sure all handlers wear gloves! If the plant matter is dry and crumbly, wear protective glasses too. We like using it around Brussels sprouts, kale and kohlrabi.

Borage is now popping up everywhere in my community garden so I pick it, roots and all, let it dry and use it for teas and mulch whenever it makes sense.

For my purposes, borage mulch does not have to be applied thickly since the goal is to add nutrients not block out weeds. Because borage contains a good amount of nitrogen, it should not rob the soil of nutrients while it breaks down.

Borage Quick Tips

- Wear gloves when handling borage. It is prickly and uncomfortable to the touch. My kids have been around borage since they were young and have never been hurt around it. Even so, babies and toddlers should probably be watched closely when around a borage patch to prevent any “hokey pokey”.
- Borage can be substituted for spinach in salads and stews. Young leaves are best. The pretty blue flowers taste like mild cucumber and look great as a garnish on fish dishes and in iced drinks.
- Bees, butterflies and hummingbirds love borage.
- See the Bibliography for a link to more reading on Comfrey.


prickly
leaves

Borax

BORAX

Borax is a naturally occurring mineral salt.

Why might borax be good for the garden?

Borax is related to the mineral boron, which supports healthy growth of cell walls and membranes.

Where can I find borax?

Borax is most commonly mined from dried up lakes. Here I am in all my splendor hunting for salt crystals in a slimy wine-colored, brine pool. We also found several clumps of borax on this trip to Searles Lake, California. According to the Historical Society, mules started hauling borax to the newly extended railroad system in the 1870's. That area also produced potash and sodium sulfate until 1996 when all production was shut down after 81 years!

Although it's fun to search for borax "rocks" out in "no-where-land", you can save yourself the long drive, scorching heat and dusty air, and pick up some powdered borax from the grocery store. 20 Mule Team Borax® is a laundry booster product containing one of the several varieties of boron chemical compounds: sodium tetraborate.

Which plants may benefit from borax?

Many plants are sensitive to a boron deficiency. Cauliflower and celery seem to need more than what is naturally available in most soils. If you grow celery and find that the ribs have brown streaks then you might need to add some boron. Beets get black spots when they can't get the boron they need. Broccoli, cabbage kale, kohlrabi and mustard *greens* are also candidates.

Combine borax with…

Let's start with a warning. Some of the same plants that crave lots of nitrogen also need adequate boron. But there's a catch. **Boron can become less available to plants when there is too much nitrogen.** Therefore, I recommend you not use synthetic nitrogen fertilizers on soil where boron-friendly plants are grown. The laboratory-created nitrogen is too concentrated, releases too quickly, and has the potential of throwing off boron uptake.

Use a small amount of alfalfa or fish fertilizer along with the borax to gradually supply nitrogen to your plants over a few weeks. It is convenient that the timing for both nitrogen and boron applications is early in the growth cycle.

Other options include any of the fertilizers that offer trace minerals such as kelp and borage.

13. Borax Fertilizer Recipe

For an area about 2 square feet: Mix **only ½ teaspoon of borax into one gallon of water**. You can add it straight into your watering can. Water the plants and soil around your plants with this solution. Wait two weeks and apply it one more time.

For an area of approximately 3 square feet: Mix ½ tablespoon of borax into 3 gallons of water. Water the plants and soil around your plants with this solution.

The best time to apply the liquid fertilizer is in the morning and the best stage to apply is early to halfway through the growth cycle, a month before cabbage heads or kohlrabi bulbs form.

Do Not Overuse Borax!

A few weeks before publishing the book I read a forum post where a lady dumped an entire box of laundry borax into her raised garden bed next to the broccoli, cabbage and cauliflower. Everything died and her soil is ruined for an unknown period of time.

Borax Quick Tips

- Remember that you must use borax (sodium tetraborate), NOT boric acid!
- Borax is also great for sunflowers. Use the first recipe that calls for just a gallon of water. Apply the borax solution a month before flowers begin to bloom and then again two weeks later.
- If you don't have borax around, you can amend with compost to improve your chances of adequate amounts of boron. The University of Wisconsin published a paper about "Soil and Applied Boron" and it mentioned how boron deficiencies usually occur in soils that have pH ratings at 7.0 and above. As explained earlier, compost can help keep our pH to a healthy range between 6.0 and 7.0.

Coffee Grounds

COFFEE GROUNDS

Even after my stint in the Army and 10 years in corporate America, I've never drunk a cup of coffee. Weird but true. I'm into tea.

Don't hold that against me, I'll go to my local coffee shop and ask for grounds and gladly accept my husband's old filters for my worm bins, watering can and compost.

Why might coffee grounds be good for the garden?

Grounds will give us nitrogen, a bit of phosphorus and some potassium. Analysis of coffee grounds shows that **they also contain many trace minerals**.

Where do I find coffee grounds?

Get grounds at home of course or friends and coffee shops. If you receive a huge bag of grounds from a coffee house, immediately spread them out to dry because they will start to mold if left in a closed bag or a mound on the ground.

Wear gloves when handling lots of grounds because the coloring and caffeine can seep into your skin. A friend of mine who is a builder, once told me about one of his clients who had the brilliant idea of staining wood beams with coffee grounds. She had a great time using her bare hands to massage the grounds into the wood. After her heart starting racing and her body started shaking, they advised her to go to the hospital. She ended up in the hospital with caffeine poisoning! Once I learned about this potential health hazard, I kept bags of grounds away from my kids – although it is soft and tempting to play with. I know, I've done it before!

Which plants may benefit from coffee grounds?

I use coffee grounds mostly on non-fruiting vegetables such as lettuces, cabbage, spinach and other *greens*. They can also serve as a good nitrogen source in the compost pile.

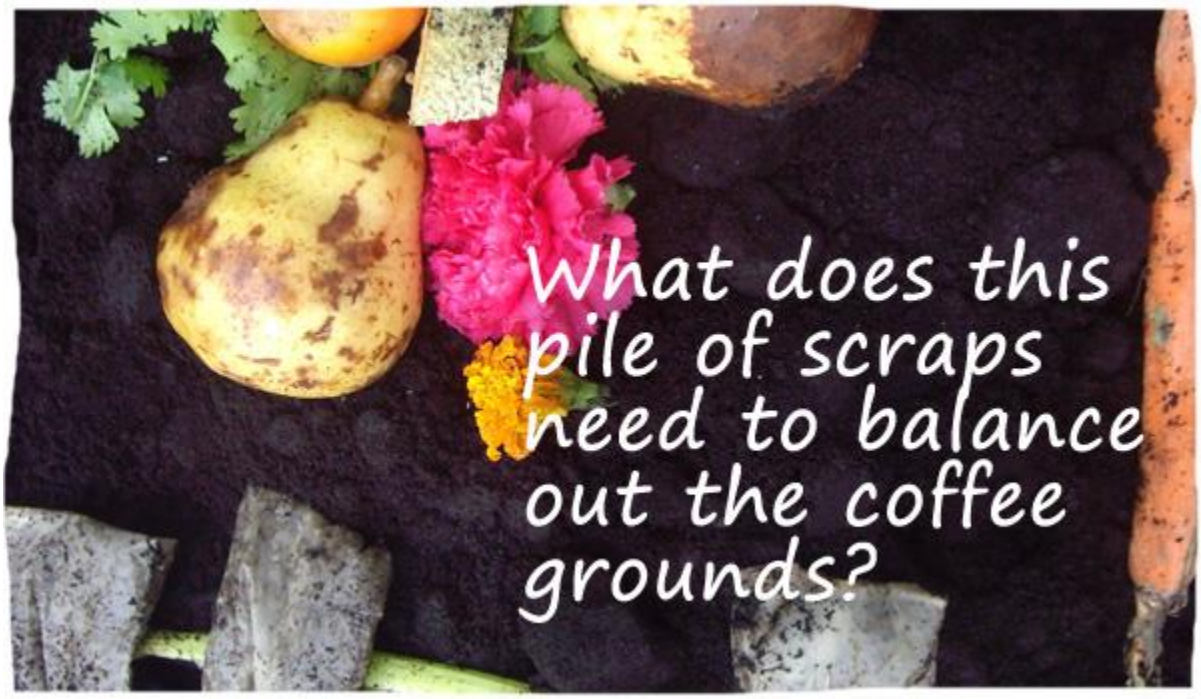
A study from Linda Chalker-Scott entitled "Coffee Grounds-Will They Perk Up Plants?" shows some evidence that grounds might enhance beets, cabbage and spinach but could **potentially damage tomatoes**. See the Coffee Grounds listing in the Bibliography if you would like to read more.

Combine coffee grounds with…

Leaving coffee grounds directly on the surface is tricky because they tend to dry up and leave a crust. I've found it's more beneficial to **mix with other ingredients**. I've combined them with crushed eggshells, kelp and compost to maximize nutrient content.

14. Coffee Grounds in Compost Recipe

Nitrogen-rich scraps help get the compost heap rolling. Add leftover coffee grounds to the pile along with an equal amount or a bit more *brown* materials (dried leaves, straw or shredded paper).



15. Coffee Grounds Liquid Fertilizer Recipe

To use coffee grounds in liquid form, let one cup of grounds soak in one gallon of water (or 5 cups of grounds in a 5 gallon bucket). Let it sit for a couple of days and then saturate the soil around your plants. I always like to water the plants first before adding any liquid fertilizer for even distribution.

16. Feed Composting Worms with Coffee Grounds

Pulverized grounds, vegetable scraps and cantaloupe/watermelon rinds get devoured quickly in my worm bin. Don't overdo it though. In my experience, coffee grounds should be no more than 5-10 percent of the mix.

- Coffee grounds applied directly to the soil don't work right away. Microorganisms need time to break them down. That is why I like to use them dissolved in water as a soil drench.
- If you score big bags of coffee grounds from a processing plant or coffee shop, and have a large garden, add a thin layer of grounds on top of the soil and water well (months before you plant).
- Coffee grounds are commonly used on plants that love acidic soils such as blueberries, ever*greens*, azaleas, roses, camellias, avocados, and certain fruit trees. However, contrary to popular belief, used grounds are not that acidic. People assume they are because coffee is considered acidic. Most of the acid leaches out into the cup of coffee. One application of coffee grounds will probably not noticeably adjust the acidity of the soil. Read more under the topic "Coffee Grounds" in the Bibliography.

Compost

COMPOST

There are many different kinds of compost - the bagged kind you get at home improvement stores, the homemade kind (my favorite), composted manure and municipal compost - you know, processed city waste (my least favorite).

To create compost effectively, use both *brown* (carbon-rich) and "green" (nitrogen-rich) ingredients. Leaves, paper, straw and other dead materials work well to provide carbon; and manure, vegetables, fruit and urine supply nitrogen. See my list of "100 Composting Materials" in the *Extras* section.

Why might compost be good for the garden?

Compost helps regulate soil pH. It also adds organic matter, supports microorganisms, improves drainage, promotes air flow, and helps microorganisms release nutrients already existing in the soil.

Where do I find "quality" compost?

A good quality compost will be made up of a variety of ingredients that provide a variety of nutrients. If you make your own, you can control what goes into it.

I see ads on Craigslist.org for free and low cost compost. Sometimes the poster reveals what the compost is made from. Go ahead and ask what went into the mix.

If you buy compost at the store, check the ingredients list to see if you have more than two or three materials - the more the better. It's common to see two or more of these items: alfalfa meal, kelp meal, bat guano, dehydrated poultry manure, feather meal, composted rice hulls, forest products, composted dairy manure, peat, ash, sand, and native topsoil.

Also check for vague terms in compost such as "compost" because compost can be created using human sewage sludge, otherwise known as biosolids. It also goes by many other misleading brand names. See "Secrets of Sewage Sludge" in the Extras section to read more about sewage sludge and how to identify it.

Which plants may benefit from compost?

All edible plants benefit from soil amended with compost. Soil bacteria, fungi and other microorganisms benefit from compost. Plants thrive in a medium that lets air in and water through. Nutrients are more effectively mineralized and made available to plants in a soil that contains organic matter.

How to Apply Compost

How much compost to add depends on your goals. Are you starting a new bed from scratch or maintaining an existing garden?

New Garden Bed

For new garden, you can take a few different approaches.

1. You can combine topsoil and compost at the same ratio, 50/50, and call it a day.
2. Or you can use a mix made famous by Mel Bartholemew, creator of the Square Foot Gardening technique. “Mel’s Mix” consists of 1/3 vermiculite, 1/3 peat moss and 1/3 compost.
3. Another option is to try “Lasgana Gardening”. This involves layering materials such as dried leaves and grass so they will decompose over time. Newspaper goes in between the layers. Check out the list of composting materials in the back of this book for ideas. Cover with an agricultural cloth that lets in water and breathes. You will need to wait several months to plant in a lasagna garden, maybe even a year so this technique is for patient people. Lasagna beds tend to warm up faster in the spring.

Maintain an Existing Bed

1. **Fall:** To keep the nutrients and organic matter at a beneficial level, in the fall add 3 inches of compost to the top and let it naturally integrate over winter.
2. **Spring:** If you missed your opportunity to amend in the fall or prefer to condition your soil in the spring, add the three inch layer but work it into the top layer of soil before planting.

17. Homemade Compost Recipe

At school, when students ask me how to compost, I scoop up a handful of rich soil and explain that kitchen scraps, leaves and more can be mixed together to create a “special material” that plants, worms and tiny creatures love. Several times a year I put on an interactive and exciting demonstration that shows how humus is made in nature. Then the students learn how people make compost. The process is simplified and it’s then just a matter of time before some of the kids rush to my side with news that they are composting at home.

The best way to learn how to compost is to do it. Here’s how:

Choose a composting technique that works best for your location and lifestyle.

Pick a location that speeds up the process or gives you a place to park your scraps for the long-term. If you live in the **country**, a compost heap makes sense. You’ve got room to tuck the pile away around a corner or anywhere you like on your property. If you live in **suburbia** like me, a tumbler or compost bin keeps the animals away and prevents issues with neighbors. If you don’t have the room or

are not allowed to have a composter, you do have options. See the *Extras* section for instructions on *How To Compost With Worms*.

Although compost will cook in the shade, and even during the winter months, the best location to speed things up is in full sun. If you don't mind waiting a year or so to harvest your compost, you can build a simple pile using fencing or pallets.

Compost everything you can and mix things up.

Combine carbon-centric materials and those that are nitrogen-rich. They'll react together to create heat and initiate microbial activity which breaks down the stuff into soil amendment.

Carbon materials, referred to as ***"browns"*** include leaves, straw, coffee filters, paper and most dried plant matter. *Browns* are usually brown in color but not always. Nitrogen-rich ***"greens"*** include vegetable scraps, freshly cut grass, melon rinds, coffee grounds, alfalfa pellets and manure.

Never use meat, dairy, plastics, glass or human, dog, cat or pig feces in homemade compost.

For a motivational list of *brown* and *greens*" see *100 Things You Can Compost* in the *Extras* section.

Chop Up Materials

You don't have to chop up the materials. **But to make the process go faster, chopping or shredding exposes more of the material to air, water and microorganisms.** You can throw an entire watermelon into the compost pile but it will take much longer to create compost. It's especially important to break up corn cobs and egg shells.

I also add any leftover cooking water to my compost.

Create a Good Compost Mix

Add the materials to your pile, bin or tumbler. Mix up the brown and green materials. If you are adding lots of fresh grass clippings, work in lots more carbon-rich materials like dried leaves. The ratio I use is 40% *green* to 60% *brown* - always a bit more *brown*. Water the contents well and keep moist like a wrung out sponge. **When you add *greens* to the pile, cover them with brown materials to keep critters away.**

Turn and Accelerate

It's optional to turn the pile but things will go faster if you do. Mix the contents of your pile each week to spread out microbial activity and ensure all the materials get a dose of what's good for them. To rev it up even more you can add materials that tend to increase the heat in the pile: alfalfa, fish waste, manure and garden soil. Care should be taken with fish and manure. See those specific sections in the recipes for safety tips.

Compost Completion

Turn the compost at least weekly if you want a finished product in months instead of years. I've made compost in a tumbler in just 2 months using vegetables scraps, paper, dried leaves and alfalfa pellets as an activator. Conditions were just right. But the weather and materials don't always cooperate.

The time it takes for compost to finish varies. Just makes sure it is actually finished before you use it.

Finished compost is dark brown and crumbly. The contents are no longer recognizable. It can take weeks or years to get to the finished stage depending on conditions and materials in the pile.

Unfinished compost still has large pieces of material in it that have not broken down. It may not smell fresh yet. **Incomplete compost is detrimental to the garden because it will tie up nutrients during decomposition.** Microorganisms will steal nutrients away from the soil to break down what's left. Unfinished compost containing manures could even become toxic because of high amounts of ammonium.

More Than One Composting System

Some folks have one huge compost pile that they continuously add materials to. Others do their business using bins and tumblers.

I have two composters. Once one composter is full, I start adding materials to the other bin. By letting one "cook" without introducing more materials, I get finished compost faster.

18. Compost Tea Recipe

Once you have a good quality compost on your hands, you can use it to make a tea for your plants. Add a few cups of compost to an old sock. Unless you're superhuman, you must have a stray sock somewhere around the house. I like to use cotton socks that can be composted when I'm done with them. Some folks use nylon and reuse the sock over and over.

Once your sock is full of compost, (not too tightly packed or it could bust a hole and make a mess), close it up with a knot or twist tie and plop it into a big bucket of water or your watering can. Let it sit for 1-3 days, stirring well once a day. Use the compost tea to water your plants. **Moisten the soil first before using compost tea to ensure nutrients travel freely.** (You're going to get sick of me suggesting that you water first before you fertilize – I apologize in advance.)

Molasses anyone?

You have the option of adding molasses to the tea mixture at the beginning. Some believe it increases microbial activity. I have used molasses several times and can't isolate whether it made a huge difference or not. If you have leftover molasses and would like to recycle it, or feel like experimenting, go ahead and add 1 tablespoon of unsulfured molasses for every gallon of water used. It does not need to be an exact measurement. Click here for more on Molasses.

Manure Tea

I don't usually add fresh manure to my compost pile so I don't have to worry about it not being composted enough or aged to kill pathogens. If you do use manures, ensure they are well composted. **If you still smell the manure, it's not ready.** Manure tea should be applied well before crops will be harvested. See the section on Manures for more tips.

Aerating Compost Teas

Lots of information exists about the potential benefits of aerating compost teas. Forcing air into the solution is supposed to increase microbial activity. You can do this with a fish tank pump, air stone or special aeration gadget. I don't do this because I'm lazy and from the research I've read, the supposed benefits are not worth the time in my garden.

Fermenting Compost Teas

Yes, I've done this and my poor neighbors know I've done this. The stench carries and it takes a while to clear your nose when you're fermenting compost teas. I am not a fan.

Fermenting has the potential of not only ticking off the neighbors, but it can create bad bacteria that are unsafe for us to breathe or to come in contact with. It also has the potential of throwing the soil off balance. Still, there are folks that ferment with fervor and love what it does for the garden.

I've tried fermenting in one bucket and using two buckets. To use two buckets, put a hole in one and sit it on top of the other. Add your materials in the top bucket and let the goop seep through to the second bucket.

There are plenty of references on the Internet that will explain how to ferment teas. I am not an expert and will defer to the brave fellows and ladies that do it well.

Compost Quick Tips

- To make compost that does not smell or attract flies, (or to stop a pile from stinking), add more brown materials, e.g., dried leaves, cardboard and dead matter.
- Some materials speed up the composting process because they create heat that stimulates microbial activity. To rev up your compost pile, try adding natural compost accelerators such as alfalfa pellets, comfrey/borage, garden soil, worm castings or human pee. Check out the urine recipes for usage and safety tips.
- Many references recommend that you only need 5-10% compost in your soil to take advantage of its benefits.
- Don't let your compost dry out. If it does, water it well, mix it up and vow to keep it moist for faster results – only as moist as a wrung out sponge.

Cover Crops & Green Manures

COVER CROPS AND GREEN MANURES

Green manures are plants that are grown to replenish the soil with organic matter and nutrients, especially nitrogen.

Most cover crops are planted in the fall and left alone all winter. The plant matter is then worked back into the soil in early spring – **"overwintering"**. Farms also plant cover crops in between production crops to suppress weeds, reduce erosion and enrich the soil for the next planting. Not all cover crops are grown to add nutrients to the soil.

To keep things simple, I'm using the term "cover crop" to also refer to green manures.

Why might cover crops be good for the edible garden?

Cover crops are not just for large fields. They can be used in smaller garden plots and even containers - reducing the dependency on store-bought fertilizers. Plant them in raised beds and pots well before the snow falls. Come spring, the soil will be much improved.

Cover crops can reduce or eliminate the need to bring in truckloads or bags of soil amendment. Earthworms and microorganisms will use the decomposing plants as food. The organic matter improves soil structure, drainage and water retention. You could plant a less than ideal area with cover crops with the goal of using the land later on for a garden.

Examples of Cover Crops

Some cover crops such as buckwheat and mustard protect the soil, block weeds and attract pollinating insects. Plants like hairy vetch and crimson clover draw in nitrogen from the air, store it in their root nodules and release it back into the soil - a process called "fixing" or "fixing nitrogen".

Bell beans filter impurities out of the soil and send roots far beneath the surface to draw nutrients like calcium upward into the root zone. Fava beans are popular in the Pacific Northwest.

See the Bibliography for further reading on cover crops.

Where can I find cover crops?

The recipes here focus on two edible cover crops that I use in my garden: **Arugula and Mustard Greens**. I already have the seed on hand so I don't need to purchase anything special. Planted in the fall, they'll keep weeds from taking over and I can incorporate them into the soil before planting tomatoes.

I'm not a large farming operation and need to make the most of every inch of growing area, so it makes sense for me to grow edible cover crops that have short growth cycles.

How to choose the right cover crop?

Determine when and why you want to grow a cover crop. Seed companies usually have charts that show which cover crops are ideal for warm seasons and which are best for cooler weather. There are annual cover crops that you grow once and perennial crops that are meant to stay put long-term in pastureland and fields, many times used as forage for livestock.

Cover Crops for Cool Weather

If you want a cover crop that fixes nitrogen, contributes lots of organic matter, grows quickly, and is easy to establish, then the top choices for cool weather cover might be **peas** (Biomaster) or **clover** (Dryland Mix, Nitro Persian, Subterranean). Seed companies may have different brand names for their pea and clover cover crops.

Cover Crops for Warm Weather

In warmer weather, consider **black-eyed peas, red cowpeas or a cover crop mix**, for example a buckwheat and cowpea combo. Take note that legumes often need inoculants mixed in with them for best results. Inoculants are specific strains of bacteria that thrive in the nodules of the plant roots and aid in the release of the nutrients back into the soil. It's a powdery substance that adheres to the seed before planting.

Which plants may benefit from green manures?

Nitrogen-needy plants such as cabbage and lettuce benefit from cover crops such as peas, beans and clover.

Because some green manures have “wicked long” taproots, use them to loosen up the ground to ready the soil for deep rooted vegetables.

As mentioned above, I plant arugula as a cover crop and come spring, in that same space, I start my tomatoes.

Buckwheat is a popular cover crop planted before garlic.

Combine cover crops with…

You can employ different strategies depending on what you plan to grow before or after your cover crop. Here are several tips to get you thinking:

1. Plant green manures to protect and enhance the soil before you grow vegetables. Plant them after you grow vegetables to refortify the soil.
2. Do not plant vegetables directly after a cover crop from the same family. For example, do not plant cabbage or any brassicas in the spot you grew arugula or mustard.
3. Start buckwheat in spring and let it reseed and grow again, then incorporate into the soil well 2-3 weeks before you plant garlic in the fall.
4. Grow crimson clover in the fall and work back into the soil in spring or simply cut off the tops, then wait a few weeks to plant spring veggies.
5. In warmer climates, plant borage 3 months before you’ll transplant tomatoes.

19. Green Manure and Cover Crop “Recipe” using Arugula or Mustard Greens

At the school garden we grow lots of greens, especially mustards, although we renamed them “Asian greens” as a sneaky marketing ploy. (We wanted the students to take a liking right away without forming an opinion based on the name.)

Our favorites are tatsoi (mildest of the bunch and shaped like a spoon), mibuna (looks like a spear or a stretched version of tatsoi) and mizuna (a frilly, lacey leaf). You should see how fun it is to pronounce these names with the kids.

I also grow arugula as a green manure at home and in my small community garden beds. (To learn about using comfrey and borage as green manure, please see the Borage Recipes.)

I always seem to over-plant arugula and mustard greens. The seeds are so tiny. Luckily, I discovered years ago that in addition to its mild peppery flavor in salads, sandwiches and soups, **arugula makes a wonderful green manure/cover crop**. I eat some of it and the rest I work back into the soil or let sit in delayed planting areas.

How to Plant

If you live in a cold climate, you could plant arugula or mustard greens in the fall as a cover crop. The plants will be killed off by frost and naturally decompose over winter. If you're in a warmer climate like me, or like to grow greens in spring, you can plant arugula for food and green manure and then chop it down to control weeds and amend the soil.

When planting, water the soil thoroughly first. Scatter the seed lightly. Cover with just enough soil to keep the birds at bay. Water thoroughly but gently so the seed stays in place.

When to Cut

Used as a green manure (no over-wintering), let the arugula or mustard greens grow as usual, enjoy your fill at meals and just when a few plants start to flower (4-8 weeks), chop them down to soil level and let the organic matter sit on top for a month or more to decompose. Worms and microorganisms will break everything down. You can work it all into the soil but realize you won't have much left to protect the surface from sun and wind. Let a few plants remain to flower if you wish to save seed for future plantings.

If you let green manures or cover crops grow too tall, cut the tops off first and then cut again at the ground, creating smaller pieces - the smaller the material, the faster it will decompose. Water weekly if no rain is in sight.

Many greens like mustards will grow back at least a couple of times if cut about an inch above the soil line. I teach the kids at school "cut and come again" techniques. However, when growing green manures, you want lots of plant material (biomass). In that case, cut the greens down very close to the soil level.

Green Manures for Potting Soil

If you grow in containers and pots, plant green manures in them every once in a while to rejuvenate the soil, especially before winter hits. Once they reach maturity and before seed develops, cut the plants down. Work some of the greens back into the pot and leave plenty on top for mulch.

Sometimes it's best to remove tired soil from the pots. Place it all in a pile on the ground or in a large plastic tub with drainage holes. Make sure to remove old roots and debris. Add compost or worm castings to replace microorganisms and organic matter (at a ratio of 5 parts old soil to 1 part compost or castings). Mix it up, and then plant a green manure such as arugula or mustard greens. Before the plants start to go to seed, chop them up and mix into the soil. Leave some on top for mulch. Let it do its thing for a month or more, add perlite back in if needed to improve drainage and aeration and then refill your pots with the new potting soil.

Cover Crops and Green Manure Quick Tips

- Try not to be too heavy handed when you sow seed. You want lots of biomass but plants also need space to thrive.
- Cut green manure crops before they go to seed. Grow for the roots and organic matter. If you want to save seed, keep those plants in one area and collect the seed as soon as they are ready so that they don't reseed in the wrong place.
- If you keep chickens, and live in a cold climate, cereal rye will sprout in chilly weather. Plant in October and when spring comes, let the chickens crush and devour the stalks.
- Buckwheat is a popular cover crop for summer and for good reason. It can choke out weeds and grows to maturity in less than a month! You can leave some plants to flower to attract bees and beneficial insects. The rest chop down and leave as a mulch or work back into the soil, or take to the compost. So many options!

Crustacean Shells

CRUSTACEAN SHELLS

How might shells benefit the garden?

As shells break down, they slowly release nitrogen, phosphorus and calcium into the soil, adding organic matter and improving soil quality. Shells also contain trace minerals that benefit growth.

Where do I find shells?

Garden centers and online storefronts sell a variety of shell-based soil amendment products, usually packaged in large, 50 pound bags. Most are ground oyster, crab and shrimp.

Country feed stores may carry bags of crushed oyster shells used as animal feed. Check the label to ensure that there are no other ingredients in the package before using them in the garden.

If you live near the ocean, save your money and make your own shell meal in small quantities. Instead of buying a product because you lack access to the beach, save shrimp and other shells from your meals or scrounge free shells from restaurants or processing plants.

What plants may benefit from shells?

I throw crustacean shells in with my potatoes at planting time. Shells also make a great addition to planting holes and containers prepared for tomatoes.

Any plant that will eventually flower and produce edible fruits or vegetables are good candidates for shells. If I had enough, I would use them alongside all my food crops.

Crustacean shells also contain chitin, a protein-based lining of the shell (also found in the exoskeletons of insects) that stimulates microorganisms to fight off attacks from microscopic nematodes that live in the soil and damage roots.

It's important to thwart the nematode because infestations can spread by tools, boots and soil exchange. The number of vegetables, nuts and fruits that can be damaged by nematodes in California is extensive:

Beans, beets, carrots, celery, cole crops, corn, cucumbers, eggplant, garlic, lettuce, melons, onions, peas, peppers, potatoes, radish, spinach, squash, tomatoes, grape, blackberry, raspberry, strawberry, almond, apple, apricot, avocado, cherry, citrus, olive, peach, nectarine, pear, plum and walnut.

The list above was generated from an article published by the University of California, Statewide Integrated Pest Management Program. To read the Guideline, visit the Bibliography and look for the topic, Crustacean Shells.

Combine shells with…

Shells break down slowly and the smaller the pieces, the faster the nutrients will become mineralized so they can be absorbed by plants. If you are planting vegetables that need lots of nitrogen at the beginning of their growth cycle, recommend you combine the shells with a material such as alfalfa pellets so you'll be supplying the plants the nitrogen they need up front plus slow release minerals as growth continues.

Sometimes I throw kelp leaves and seaweed in with the shells to contribute growth hormones and enzymes to the mix.

20. Crustacean Shell Soil Amendment Recipe

Save and collect shells from shrimp, crabs, clams, snails and lobsters. Crush them as small as possible. I use a few handfuls of crushed shells in the planting holes of my potatoes and tomatoes. If I'm feeling lazy, I don't crush freshly collected shells - I place them under the soil beneath the transplant or seed and scatter around the root zone.

21. Crustacean Shell Liquid Fertilizer Recipe

To create a liquid fertilizer from shells, crush or grind the shells up into small pieces - the smaller the better to get the most surface area in contact with the water. Add a few handfuls of crushed shells (about a cup) to a gallon of water and let it sit, loosely covered for two days.

Some of the minerals in the shells will dissolve in the water, creating a natural emulsion to feed your plants and soil microbes. Pour the liquid around your plants, fill the container again with water if you need more, or add the shell solids to the compost or planting hole.

Crustacean Shells Quick Tips

- Add shells to your compost pile. The best position to start is in the middle of the pile where they will be subjected to the most heat.
- Wear protective gloves when you crush thin shells so you don't cut your fingers. Protective eyewear may be in order too, depending on how wild you're feeling.
- Children have lots of fun crushing shells. Please take the safety precautions mentioned above and adjust based on the child's age and temperament. A brick works great as the "crusher". Place a small amount of shells on top of a flat stepping stone. Make sure to hold the brick well away from the crushing end. Gently smash the shells. This works much better than a small rock because little ones tend to get their fingers caught underneath the stone. Once a small batch of shells is crushed, it can be easily brushed (with gloved hands or tool) into a container.

Egg Shells

EGG SHELLS

Why might eggshells be good for the garden?

Instead of adding lime to your garden, add eggshells. Eggshells are 93 percent calcium carbonate. Calcium makes plant cell walls stronger. Roots suck it up during growth. Eggshells also contain a bit of nitrogen and trace elements such as magnesium, phosphorus, boron, copper, iron, manganese, molybdenum, sulfur, silicon and zinc. **They might also be a great substitute for rock dust.** Eggshells are free and a lot lighter than crushed rock!

In heavy downpours, naturally occurring calcium tends to leach away. Eggshells could replenish some of it back.

Where do I find eggshells?

Keep shells in the refrigerator until all your eggs are used up. Ask your neighbors to save theirs for you too.

Which plants may benefit from eggshells?

Calcium will help prevent pale-colored leaves on beans, brown leaf tips on cabbage and kohlrabi, and blossom end rot on tomatoes, peppers and eggplant.

Combine eggshells with…

To mimic dolomitic lime, combine Epsom salt with eggshells. Dolomitic lime contains 4 percent calcium carbonate and 38 percent magnesium carbonate. See the recipes for Epsom salt coming up next.

Eggshells keep my worm food from getting to mushy. I pulverize them in my food processor along with melon rinds, greens, coffee and tea.

Worm castings (for trace minerals) and alfalfa pellets (for nitrogen) work well for me in planting holes along with eggshells.

22. Prepare a Planting Hole or Bed with Eggshells

Wash the shells (boiling will kill pathogens but I don't bother unless I'm using at school). Air-dry to make them easier to crush. Smash or pulverize into a fine powder. Work the pieces into the soil around the planting hole. Eggshells are 90 percent water soluble so it makes sense to keep your soil moist.

I know from experience that eggshells can take years to decompose if left whole in the garden on top of the soil. I've found that if I dry and **crush them first**, and cover with some soil, they decompose faster and work better in my planting holes too.

23. Eggshells Soil Drench Recipe

I also soak eggshells in water for a day or two and use that water on plants that tend to respond to extra calcium such as tomatoes and peppers.

After making hard-boiled eggs, I use the leftover water as a soil drench around my plants, especially brassicas such as kale and kohlrabi. I use about 3 cups for every plant and again I usually water the plants first before I apply.

Eggshells Quick Tips

- Save your washed eggshells in a plastic bag or egg carton in the refrigerator and wait until you have a large amount before crushing. Use the bottom of a cup or rolling pin to crush.

- Some folks bake their eggshells to remove moisture, kill any potential salmonella and to make them more brittle for crushing. Heating at temperature above 160 degrees Fahrenheit will kill salmonella. Freezing does not kill all salmonella.
- Keep eggshells in a bag if young children want to help you crush them. This keeps any residue off hands and protects them from cuts. I always had my kids wear gloves just in case the bag breaks.

Epsom Salt

EPSOM SALT

Why might Epsom salt be good for the garden?

Epsom salt contains about 13 percent sulfur and 10 percent magnesium. Plants need both of those nutrients. Although most soils already contain sulfur from acid rain, manures and chemical fertilizers, sulfur tends to leach down into lower layers of soil much like nitrogen does, especially when the soil is sandy and there's a lack of organic matter. Farms use synthetic forms of sulfur on crops to improve flavor and sweetness. It may even keep some pests at bay.

Magnesium deficiency can negatively impact almost all stages of plant growth from seed germination, to development of fruit. Without enough magnesium, cell walls get weak and plants find it hard to absorb nutrients, especially the primary and secondary nutrients like nitrogen, phosphorus and sulfur.

Where do I find Epsom salt?

If you take a soak in a bath of Epsom salt, take some of the water and use it on your plants!

You might already have some in the house. Lots of folks use Epsom salt to relieve muscle soreness. A box of it is inexpensive, maybe a couple of bucks, especially if you purchase it at a large department store in the health and beauty area instead of a nursery or garden center.

Which plants may benefit from Epsom salt?

I use Epsom salt in the soil and on edibles like peppers, beans, strawberries and potatoes – vegetables and fruit I know may lack sulfur and magnesium. Once in a while I treat my tomatoes with it too.

Combine Epsom salt with…

Eggshells work well with Epsom salt. Also see the Soil Drench Recipe below for ideas.

24. Prepare a Planting Hole with Epsom salt Recipe

When I'm getting ready to transplant my tomato starts (or any of the edibles listed above) I like to add a tablespoon of Epsom salt to the planting hole.

After growing potatoes in burlap sacks for a few years I discovered that Epsom salt could prevent brown spots so I try to remember to sprinkle some in the bag

at planting time. If you grow potatoes in the ground, disperse a tablespoon in the hole for every 4-5 seeds.

25. Epsom Salt Soil Drench Recipe

After planting my tomatoes I drench the soil around my plants with Epsom salt dissolved in water. I use **1 tablespoon per plant in one gallon of water**. I water the plant first, then pour the Epsom salt water on the soil around the plant - not directly on the plant. **After about a month of growth, I do it again.**

Another variation would be to add 1 cup Epsom salt and 1 cup garden soil to a 5-gallon bucket full of water. Once dissolved, stir in 1 cup alfalfa pellets. Wait a day for the alfalfa to break up and use the water around plants.

I'm concentrating on edibles in this book but I'll mention quickly that I have also used Epsom salt on my rose bushes and houseplants, especially my the fiddle leaf fig. When I bought it on clearance it looked spindly and diseased, but now it's doing fine.

26. Epsom salt Foliar Spray Recipe

Leaves contain small openings called stomata. They open and close like pores to control the rate of water evaporation. They also absorb minerals dissolved in liquids. The rate of absorption varies by plant, leaf structure, environmental conditions and many other factors. Many times, most of a mineral solution

sprayed onto the leaves stays in the leaves with only a small amount reaching deep into the plant. That's ok, the plant will still experience some benefits.

I've found the best time to foliar feed with Epsom salt is when the plant is close to developing the edible parts. If you have a lot of plants to spray, prepare a gallon of water with 1 tablespoon salts and fill your spray bottle 5-6 times. If you only have one plant to treat, use a half teaspoon of Epsom salt for each cup of water.

When my tomatoes start developing blossoms, I spray the leaves and try my hardest to spray underneath the leaves too. The undersides of leaves absorb nutrients much faster. I do not add dish detergent to make the spray stick to the leaves because I don't want to harm beneficial insects.

Epsom salt Quick Tips

- Do not overuse Epsom salt. Because Epsom salt are water soluble, they can leach out of soils quickly, especially sandy soils or those that lack organic matter.
- Nitrogen deficiency can cause a magnesium deficiency in the soil. If your plants are getting enough nitrogen, they may not need Epsom salt.

FISH

Making fish tea at home with leftover fish parts is stinkin' fun!

Why might fish be good for the garden?

Homemade fish tea is a wonderful nitrogen source. Phosphorus and potassium are quite water soluble too. This is one material that provides nutrients right away and over longer periods of time. In addition to a pleasing N-P-K value, fish adds micronutrients, organic matter, beneficial bacteria, amino acids and proteins to your soil.

When you make fish tea yourself with parts leftover from meals, it will be closer to organic than many commercial fertilizers and soil amendments. Most commercial brands of fish emulsion use fish humans don't eat. **Heavy metals are prominent in "trash" fish and if you look closely at the labels at the store, they will warn you not to use them on edible or organic gardens.** Additives, preservatives and stuff to calm the stench complicate the ingredients list. Surprisingly enough, sometimes these emulsions are beefed up with additional nutrients because they lack the natural fish oils or bone matter.

Read more in this book about Suspicious Ingredients in Fish Emulsion and Commercial Compost.

Where do I find fish to use for the garden?

Use trimmings and leftovers from your meals. Any part of the fish works great, including bones and skin. **You may even have expired cans of sardines or tuna in the cupboard – don't throw them away, convert them into valuable plant food.**

If your pet fish have swum their last circle around the tank, don't flush them down the toilet. Bury them near your plants or create a fish tea.

Which plants may benefit from fish?

Plants that need nitrogen are first on the list and almost any other plant in your garden is a good candidate for fish tea. Timing would be important because of the nitrogen. Nitrogen works great in the beginning for flowering and fruiting plants but not when plants start to blossom.

I like to use fish on tomato seedlings, peppers, garlic, eggplant, cucumbers, pumpkins, lettuce, kale, cabbage, kohlrabi, peas, beans, potatoes, strawberries, blueberries, blackberries and herbs, especially those in containers.

I fertilize asparagus with fish when it is at the fern stage.

Combine fish with…

Seaweed and kelp make a nice pairing with fish because it adds additional phosphorus and potassium plus micronutrients, growth enhancers and trace minerals. Fish already contains nitrogen, so I would use materials that offer other benefits.

27. Homemade Fish Tea Recipe

I'll start by saying that this recipe does not involve fermenting the fish to make an emulsion. I live too close to neighbors to do that plus I'm not fond of fermenting as you might have read in the Compost section. I also don't like to store homemade gunk in a bottle, if I can help it. I make the solution as needed.

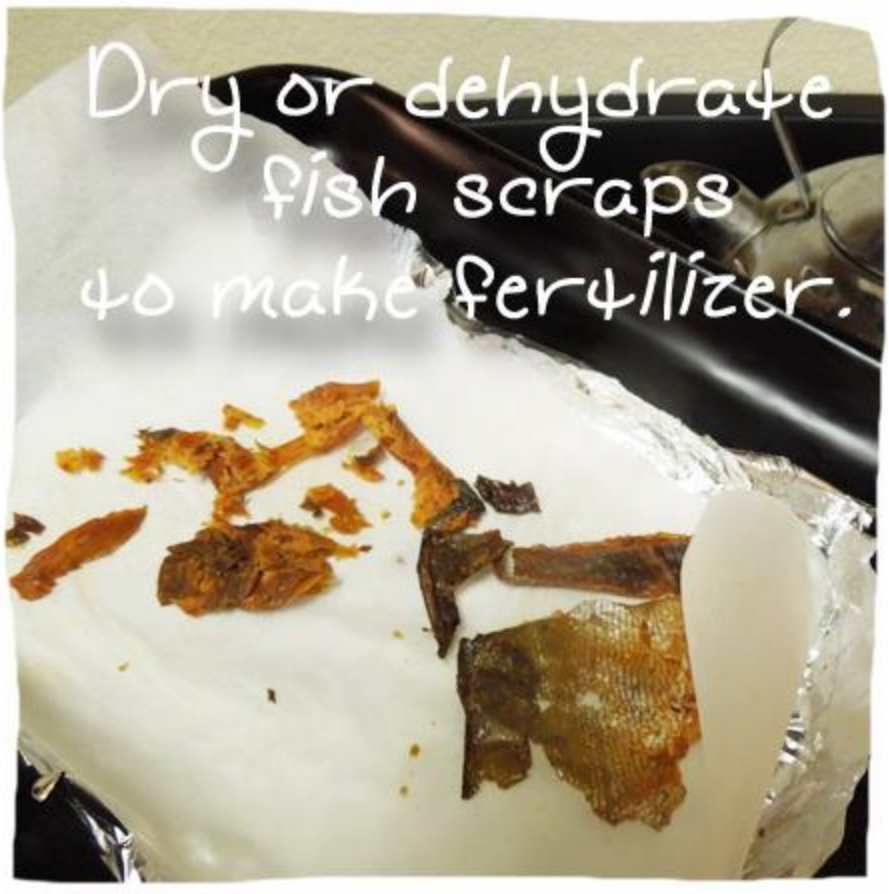
Fresh Fish

If I have fresh fish scraps on hand at the same time I want to fertilize, I simply let them soak in a bucket or bowl of water for a few hours, then water my plants with the liquid (after watering with plain water first).

Another trick that works well is simply using the remnants from packaged fish. After removing tuna from a can, I fill the can with water and dump the contents on my soil near plants that need nitrogen. If you fear a visit from wild animals or rodents, open up your compost pile and dump the fish water in the middle, then cover. The goal is free fertilizer but if you are feeling loaded and walking the aisles of a “dollar” store, you can pick up packets of fish for a buck!

Dried Fish

When I’m cooking fish for dinner I also cook the scraps in the oven. Those will be made into fertilizer. I make sure to cut up the scraps into small pieces so that they dry completely. This works great if I’m already baking fish. When I take out the fish for dinner, I set the timer for another hour and leave the scraps in until the oven has cooled off.



Just remember to take the fish out. I've gotten busy and forgotten about the fish scraps a couple of times and sniffed them out a few days later as I preheated the oven to bake something.

You can also dry the fish outside during the day in full sun if you are in a location where wild animals and vermin won't come a callin'.

Storing Dried Fish

Once the fish is completely dry and cooled off, I place it in a paper bag with a coffee filter (absorbs any leftover moisture) and store it inside am air tight plastic bag or container in the refrigerator until ready to use. I like to use fish scraps right away.

Make the Fish Tea

When I'm 1-2 days from fertilizing I place my fish scraps in bucket and add water. If you want to keep the fish from floating around, contain them in an old sock or pantyhose. Usually, I do not bag them up. For every cup of fish I add about a gallon of water.

Let the fish sit (loosely covered) for no more than a 1-2 days. Stir it every day to introduce oxygen into the solution. The compost pail in the picture below works great because the top has air holes.

If you are concerned with chlorine in city water, let the water sit uncovered for a few hours before adding the fish.

Apply the Fish Tea

Once you're ready to fertilize, water your plants first with water only. If your fish tea is a dark color, dilute it until it looks like a weak tea. Otherwise, use the tea as-is. Water around the root zone of your plants. Use 1-3 cups per plant depending on how large the plant is. Reuse the fish for another batch if you wish.

Once you're done using the fish tea, add any leftover scraps to the compost or bury deeply in a planting hole.

28. Fish Tea Foliar Spray Recipe

Add your strained and weak fish tea to a spray bottle. Early in the day or in the evening, spray the tops and undersides of leaves at least once during the growth cycle or if you think the plant needs it a few more time up until about a month before edible parts or fruits start to develop. Wait a couple weeks between applications.

To avoid leaf burn, do not spray in the middle of the day when the sun is beating directly on the leaves. Moisture on the leaves at that point will dry quickly and cause damage to the leaves. Do not spray right before a rain for obvious reasons but spraying after a rain may help nutrients soak in.

29. Fish Tank Tea Recipe

Some hydroponic enthusiasts grow plants directly in fish ponds. If you have a fresh water aquarium, next time you change the water, don't dump it down the drain or outside haphazardly. Use it on plants that could benefit from the mineral nutrients and organic matter. Worried about the ammonia in the water? Most of

the ammonia in fish waste will be converted by bacteria to various forms of nitrate.

Once the soil is moist from a regular watering, simply water your plants as usual with the fish tank water, making sure to not leave it sitting around unused for more than a day or two. I prefer to use fish tank water as a soil drench rather than a foliar spray.

Fish Quick Tips

- Most fish recipes will stink a little bit and so I don't recommend using fish on houseplants. The smell does dissipate after an hour or two if you would still like to try it.
- Storing a fermented fish emulsion doesn't appeal to me because there's a lot more going on from a microorganism and bacteria standpoint than in chemical fertilizers. I've heard several accounts of volatile fish emulsions bursting in closed containers.
- If you decide to buy fish emulsion, look carefully at the package. Some labels will state that the product is NOT intended for organic crop production. Surprising? Not as much when you discover that many brands of fish emulsion have high levels of heavy metals. Read more about commercial fish emulsion in the Extras section.

From GRASSES to MOLASSES

GRASS

Why might grass be good for the garden?

Grass clippings decompose quickly and are an excellent source of **nitrogen and potassium**. In fact, grass has more nitrogen than most natural fertilizers in this book! Used as mulch, grass keeps moisture in and contributes organic matter.

The recipes in this book focus on the edible garden but if you want to use grass clippings on your lawn, it's important to cut the grass often. When your lawn is dry, take off very little. Leave it to sink down into the blades naturally. If left too long, the cut grass won't fall through the blades as well.

Where do I find grass?

Recommend you only use grass that is free of herbicides, pesticides and synthetic fertilizers. Herbicides especially can stay around a long time and contaminate compost and garden beds.

Which plants may benefit from grass?

Grass works great in the compost, and fertilizer tea made from grass benefits lettuce, kale, cabbage, kohlrabi and peas.

Combine grass with…

Seaweed. See the soil drench recipe below for details.

30. Grass Clippings in Compost Recipe

When fresh, grass is considered a "hot" material because of its high nitrogen content and ability to create lots of heat during decomposition. Hot materials like

alfalfa, manures and grass feed microorganisms that turn leaves, straw and other carbon-rich materials into compost.

Grass is great but it has a downside. It tends to clump up, get slimy and form large masses of slime. The key is to **mix it with twice as much leaves, straw, paper and other *browns***. For a regular-sized compost pile or large tumbler, add two 5-gallon buckets of brown materials for every 5-gallon bucket of grass clippings (packed loosely).

If mixed with a variety of seaweed, the grass mixture will take on a fluffier texture with lots of air pockets.

31. Grass Clippings Soil Drench Recipe with Seaweed

I love combining ingredients to make an even more effective fertilizer. Here's a good example of a **"companion concoction"** that works great early on for potatoes, tomatoes, peppers and cucumbers.

Gather seaweed from the beach, don't bother rinsing. Dry in the sun on screening of you won't use it right away.

Fill 5-gallon bucket half way with seaweed and grass (roughly the same amount of each). Let it sit in the shade for 1-3 days and use the water to fertilize your plants, applying it around the drip line after an initial watering without the fertilizer.

Grass Quick Tips

- Cut the grass before it goes to seed so that you won't cause a weed problem elsewhere in your garden.
- Dried grass may be better than straw as mulch because it is richer in nutrients, especially nitrogen. Straw tends to rob the soil of nutrients while it decomposes.

Hair

HAIR

With three girls in the house, we produce a lot of stray hairs. They get wadded up and stuck to the shower walls and every once in a while when we finally clean our brushes, we imagine the giant clumps as desert tumbleweeds in school dioramas.

Why might hair be good for the garden?

Hair is a slow release fertilizer and when I say “slow” I mean ridiculously slow. This is the type of material you add to your compost pile, garden beds or containers as **bonus soil amendment**. Hair is made of keratin, a protein similar to bird feathers. (Feather meal is a wonderful natural fertilizer.) **Hair has lots of nitrogen in it, more than some manures! But that nitrogen doesn’t get mineralized as fast.**

Where do I find hair for the edible garden?

Hair free of colors or bleach is best for your garden. A barber shop might be a good source of hair but I would stick with what you produce at your own house.

Because the nutrients in hair take forever to become available, you wouldn't use it as your primary fertilizer for lettuce or other fast growing crops.

Which plants may benefit from hair?

Maybe the question should be, "What **soils** benefits from hair?"

Chopped hair may help fluff-up compact soils. Use its long shelf life to your advantage. Compost may be the best place to recycle hair although some folks believe human hair, scattered on the surface, will deter rats, deer and raccoons.

Combine hair with…

Soil, compost, vegetable slurry and dried leaves.

32. Hair Recipe for the Garden, Potted Plants and Compost

Hair breaks down best in extra hot compost piles versus cooler systems like compost tumblers. If you want the hair to decompose in months instead of years, **chop it up into small pieces**, ½ inch or less. Experiment with the amount of hair you use.

To use it in the garden, bury it an inch under the surface. If you have plenty of hair to spare, scatter some on top of the soil to test whether it deters pests.

For compost, keep the pile moist and mix hair with other materials such as vegetable slurry and dried leaves. If you have bags of hair to add all at once to the compost, balance that "bouffant" out with carbon-rich items such as straw, paper or dried leaves.

Hair Quick Tips

- Think twice about collecting hair from the salon unless you can pick and choose who it comes from. Healthy kids' hair is ideal!
- Medications can show up in hair samples and therefore hair from people that don't take drugs of any kind is the safest hair to use alongside edibles.

Leaves

LEAVES

Even though I no longer have trees on my property that produce lots of leaves, I use plenty in my garden. Yes, I do come off a bit weird dragging garbage bags around my neighborhood, but there could be worse things than being known as the “Leaf Lady”.

Why might leaves be good for the garden?

Leaves take a while to decompose. Their nutrient content is relatively low. So why are they so good for the garden? Three main reasons: **Organic matter, weather protection and weed control.** The key to using leaves is TIMING and PURPOSE.

Where do I find leaves?

Most any leaves will do except those from black walnut trees which release a toxin called juglone. Juglone can kill some edibles especially cabbage, eggplant, pepper, potato, tomato, apple, blackberry and blueberry. Because the roots contain more juglone than the leaves, you would never want to plant a garden near a black walnut tree.

One more warning: **Think twice about taking leaves from city streets. They tend to soak up fuel, oil and chemical residues.**

Which plants may benefit from leaves?

Leaves are not a fertilizer on their own. They protect plants from sudden changes in weather and will improve soil texture once decomposed. When converted to leaf mold, leaves work great as a seed starting medium and also a soil conditioner.

Examples of plants that benefit from leaf mulch:

GARLIC: Mulch with leaves directly after planting - November for most gardeners.

ONIONS: Mulch two weeks after planting and before shoots emerge.

ROOT CROPS: Mulch around carrots and beets after they emerge to keep temperatures consistent and protect from frost.

GREENS: Mulch around the plants with crushed leaves. Make sure the soil is not deficient in nitrogen before you mulch.

BRASSICAS: Cool weather crops can benefit from a fluffy blanket of leaves.

Combine leaves with…

Composted leaves can be combined with worm castings and perlite to create a seed starting medium.

33. Leaf Mulch Recipe

When it comes to using leaf mulch to protect the soil from weather and erosion, **timing is everything.**

Spring Warming

If you want your soil to warm up quickly in the spring, mulch with leaves in early fall so that they have plenty of time to decompose. If you mulch too late, the leaves will maintain a barrier that keeps the cold in.

On the other hand if you have a problem with rodents, you might need to delay mulching until late fall after the ground has frozen but before the coldest weather sets in. This way, the critters will have already found another place to hang out over winter.

Fall Cooling

If you need the soil to cool off a bit so you can plant lettuces and cole crops such as cabbage, kale and kohlrabi, wait until the heat of the summer passes or

right after a cold spell before you mulch. Mulching will keep the temperatures more consistent if a hot spell hits.

Winter Shelter

You can use leaves to protect plants during winter. However, **straw, hay, or pine boughs may work better for insulating plants** because they won't compact under the weight of ice and snow. The goal is to prevent extremes of freezing and thawing. Freezing nights and warm sunny days sometimes cause heaving - plants and their roots get pushed up and above the soil surface exposing them to the elements.

Lazy Leaves

Sure, it might be easier just to lay the leaves on the ground and be done with it, but in most edible gardens, a fluffy mulch is much better than a compacted matt that grows funguses.

Chopping, shredding or crumbling is your ticket to success. Smaller pieces will allow air in while giving microorganisms more surface area to work.

I manually crumble leaves with gloved hands. If you have loads of leaves, run over them with a lawn mower or place them in a garbage can and have your way with them with a rotating edge trimmer.

Prepare First Before Applying Mulch Next to Plants

For leaves to break down, microorganisms need energy and will take nutrients from the soil to go to work on the leaves. **Your soil should be in fine condition before you apply leaves.** If your soil is malnourished, amend with alfalfa, fish fertilizer or other nitrogen-rich materials before mulching.

Leave at least an inch between mulch and seeds, starts or plants, to prevent diseases from humidity and lack of fresh air.

34. Leaves in Compost and Leaf Mold Recipes

Composting Leaves

Add nitrogen-rich materials to the compost along with dried leaves at a ratio of 60 percent *browns* to 40 percent *greens*. I've found when I add a bit more carbon, the *greens* decompose faster and smell less.

Making Leaf Mold

Leaf mold is spongy, dark and smells like nature. The value is not in the nutrients but in the organic matter. Leaf mold will help you improve the texture

of your soil. Making leaf mold is easy. The hard part for some of us is finding the leaves!

Pile Method of Making Leaf Mold

Simply pile up fallen leaves in a sheltered spot and leave them to decompose. Use a simple fencing system to contain the leaves. To speed up the process even more, deploy one or more of the following techniques:

1. **Keep the pile moist,** especially in dryer conditions**.** High carbon materials like leaves will take years to decompose without water.
2. **Chop leaves** with a shredder or lawn mower and cover with a tarp.
3. **Surround leaves.** Line the outside of a leaf pile with cardboard to retain moisture.
4. **Contain leaves.** Throw chopped leaves in a garbage bag and moisten. Close up the bag and poke several holes in it for air.

35. Leaves for Worms Recipe

Dried leaves get devoured by my worms, especially if I moisten them first. Added between layers, they fluff up bedding. Combine crunched up, dried leaves with vegetable slurry.

Layer leaves and slurry like lasagna or mix in a big bowl or tub first. I've had the best luck combining leaves with pureed melon rinds, coffee grounds, bananas and other *greens*.

I don't feed my worms citrus peels, onions or cabbage scraps because they call flies, smell and I believe, frustrate my red wigglers just enough to make them go on strike.

Leaves Quick Tips

- Leaf mold will break up dense soils.

- Experiment with leaf mold as a substitute for peat in homemade potting mixes. Combine equal parts of leaf mold and compost. Add ½ part of perlite and ½ part vermiculite and mix well.
- Try leaf mold to start seeds. Combined with worm castings and perlite, you'll have a fine, airy medium that holds moisture and let's roots spread out.
- Oak leaves decompose slower than others due to their tannin content.
- As mentioned above, avoid leaves form black walnut trees.

MANURES

Animal poop is exciting stuff – always interesting to discuss with fellow gardeners.

Why might manure be good for the garden?

Manure contains lots of nitrogen and varying amounts of phosphorus, potassium and other essential nutrients, depending on the animal. The organic matter in manure does a good job of **improving water retention** in poor, sandy soils and works reliably to break up clay.

Where do I find manure?

If you keep chickens or other animals, you have your own supply. Many farms will give away their manure for free, sometimes already composted and bagged. **But check first to find out what the animals eat, if they are given drugs or graze on lands treated with herbicides or pesticides.**

Which plants may benefit from manure?

Before we match plants with "poo", it's important to understand the differences between the various manures. I've profiled several manures individually so you can learn which ones work with what plants and why.

Hot and Cold

Most of the time when I read about manures, I am reminded of the difference between "hot" and "cold" types. Hot manures are more likely to burn plants because of their high concentrations of nitrogen and tendency to release it quickly into the soil. Goat, horse, poultry, rabbit and sheep manure qualify as hot.

Cold manures, cow dung in particular, have lower levels of nitrogen when fresh. They release nitrogen slower than the other manures and still do a wonderful job to recondition poor or exhausted soils.

Manure Safety

If you want to apply manures safely there are a few important guidelines to follow.

In my edible gardens, despite what we know goes on around the world, I never use "hot" OR "cold" FRESH manure as a top dressing or foliar spray near edible crops during growth. Here's why:

All fresh manures from cows, goats, rabbits, horses and sheep contain pathogens and bad bacteria that can make humans very sick, specifically **E. coli and salmonella**.

Sure, lots of folks apply untreated manure straight to their gardens, especially rabbit beans. But that doesn't mean it is safe from a health standpoint. Most articles I've read on the Internet don't discuss how manures can make you sick. They focus instead on which ones are more likely to burn your plants.

I want to grow my edible gardens safely and effectively using manures, so I use manures as a soil conditioner and amendment only, never to fertilize crops already in full swing.

The downside to taking the safe road when using manures is that composting and aging the material can take 6 months to a year! Lots of folks just don't have the patience for this. They will continue to use fresh manure adjacent to their vegetables, fruits and herbs - and may never get sick. It's a chance you decide to take.

On the bright side, there are several options for using both fresh and composted manures that reduce the time you need to wait to plant your garden. I take some of my cues from common sense and from studying how certified organic farms operate.

Organic Farming and Manures

Certified organic farms use manure carefully according to specific rules, application schedules and testing procedures. If you want to read those in detail,

see the Bibliography in the back of the book for links to references from the National Organic Program (NOP).

Raw Manures

If not treated or composted, certified organic farms can incorporate raw manure into the land but **planting must wait**.

For edible crops that come in contact with the soil, such as carrots, lettuce and potatoes, manures must be added to the soil at least 120 days before the harvest date. For crops that don't come in contact with the soil such as corn, peas, peppers and tomatoes, manures must be applied at least 90 days before harvest.

Manure Application Examples

I know that it takes approximately 60 days from the day I sow **carrot** seed to harvest and therefore I add manure to my soil at least 60 days before I plant the seed.

The **lettuce** I grow has an even shorter harvest period so I would need to use manures well in advance of planting, 2-3 months prior. **Potatoes** on the other hand, take a while to mature depending on type and so I could amend the soil about a month or less before I plant the seed.

I would never place my seed directly in fresh manure.

If you don't grow your **tomatoes** from seed, read the label to figure out how many days it takes for the tomatoes to reach maturity one transplanted. For example, it might take 80 days for a tomato to mature once you plant the seedling so you could amend with fresh manure 10 days before you plant. Just make sure you do not place fresh manure next to the roots. **It's better to side dress the planting hole.**

Heated and Composted and Manures

I'm more of a fan of composting manures first because I have young children and don't want to take a chance that anything they come in contact with or eat could be contaminated.

In general, according to the National Organic Program (NOP), **manures must be treated first to kill pathogens if they are to be used for edible crops anytime during the growing season**. The material must be heated and/or composted to reach specific temperatures for a minimum amount of time.

Heat treatments and composting are considered different processes.

Treating Manure with Heat

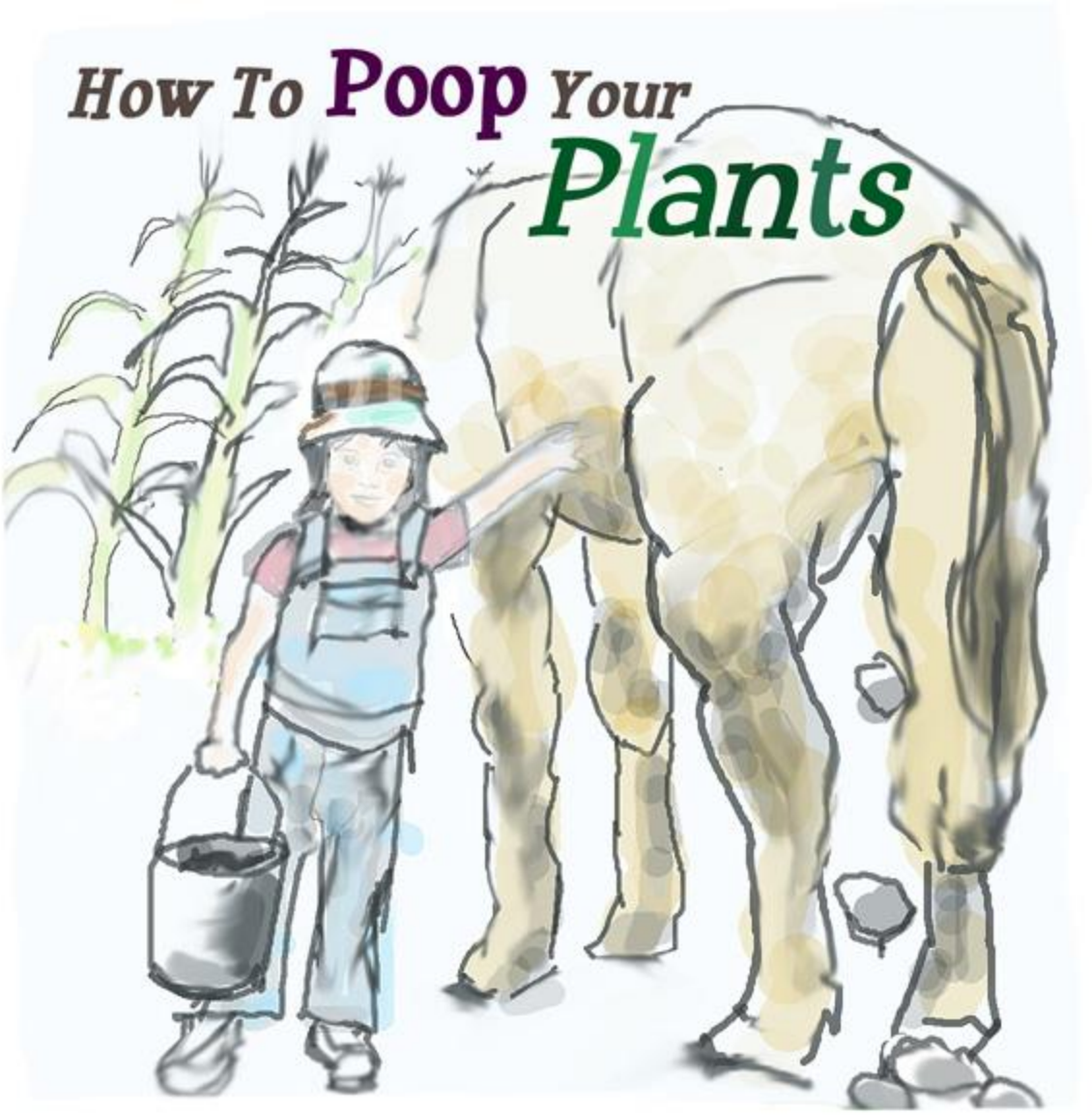
It would be difficult to process manure with heat at home to comply with the same standards used by certified organic farms. First you would have to heat all of the manure to 150 degrees Fahrenheit (65.6 Celsius), for at least one hour and then reduce its moisture content down to 12 percent or lower, then test it for both fecal coliform and salmonella.

Composting Manures

Composting involves combining plant and animal materials so that microbes can break them down into a decomposed form suitable to use as a soil amendment.

As soon as the dung falls out of the animal it starts to release nitrogen into the atmosphere. If it's left to sit around for long periods, or allowed to wash away in wet weather, nutrient levels will plummet dramatically. **Composting can preserve some of those nutrients. The sooner you can get fresh manure into the compost pile the better.**

At certified organic farms, manures processed in piles are considered done when the temperature has reached between 131 and 170 degrees Fahrenheit (55-77 degrees Celsius) for at least 3 days; then consistently heat within that range after mixing at least 2 times more.



36. Recipe for Composting and Aging Manure AT HOME

I usually get manure already composted because my primary means of composting is in bins, not large piles. My current property is not big enough and I live too close to neighbors. I have composted manures before and will do it again when we move again. Here's how I did it when I had the space:

Collect and Pile the Manure

Collect the bedding and manure together and place all of it in a compost pile. Add lots of carbon-based materials to balance out the manure, especially if you're

working with chicken manure. **Throw in more *browns* , e.g., leaves, straw, dry grass, cardboard and paper, than manure.**

Keep the Pile Moist Not Wet

Keep it moist like a wrung out sponge by spraying with a hose and mixing periodically. Mix and spray a couple times a week in warm, dry weather. Do not spray so much that it causes a runoff situation which can potentially transfer nitrates to water sources, play or pet areas, or anywhere where humans could come in contact with bacteria-laden water.

If you let it sit without mixing, or if you forget to keep it moist, it will take months longer to decompose.

Kill Off the Bad Stuff and Keep the Good Stuff

If you want to ensure that most or all pathogens are killed off during composting you need to test the temperature of the middle of the pile, mix it up and test again, several times over several months. All of the material needs to reach a range of between 131-170 degrees Fahrenheit (55-77 degrees Celsius) for at least 3 days to kill nasty pathogens. It doesn't need to get hotter than that - no need for an extra heat source. **Beneficial microorganisms need to survive the process.**

Every couple of weeks test the temperature of the middle of the pile to reach the magic temperature two more times. Eventually everything will look decomposed and the pile will take on a dark, crumbly texture and fresh soil smell. **Once composted, let the composted manure cure, loosely covered for 45-60 days.**

Aged Manure

Aging manure reduces its water content significantly making it easier to handle. It also gives you another chance to get rid of harmful pathogens that might have survived composting. Aged manure looks powdery. Professionally aged manures are usually heat dried using temperatures of at least 160 degrees Fahrenheit for several hours at a minimum.

To age it yourself, without taking temperature readings, you can let the manure sit alone in a thin layer, in a sunny place that gets plenty of air flow for at least 6 months - a year would be better. Even after undergoing all that heat stress, the manure will remain nutrient-rich - and it won't stink.

Get It Already Composted and Aged for FREE!

You'll save time if you can find a free source of manure that has already been composted and aged. Composting can take months, even years if you include the time it takes to age it.

Where Do I Look?

I regularly check out the "Farm and Garden" and "Free" sections on Craigslist.org to score all kinds of materials for the garden including furniture, used raised beds, tools, plants and composted manures.

9 Pallets of Best Cob Dried Corn Cob Bags

9 Pallets of Best Cob LLC Corn Cob Bags

40 lbs bags/50 per pallet / 9 pallets

10-14 Grit Grind

Free by the pallet

CL > los angeles > san gabriel valley > ...

Posted: 6 days ago

contact

Free Aged Horse Manure Fertilizer (El Monte)

We have FREE aged horse manure.

This makes a great fertilizer for your Organic Garden, Vegetables, Fruit,

We can help you load. Access for a pickup truck is good.

Local delivery for larger quantities may be available.

Speak to local farms, zoos and pet centers. Just make sure the manure is not mixed with that of other undesirable manures from animals such as pigs, monkeys or lions. You might laugh at that but we live near several zoos.

The other option as mentioned above is to find fresh manure from a trusted source and apply that raw manure to your garden plot prior to harvest according to the 120/90 day rule explained earlier.

Matching Manures with Your Edible Plants

Some manures are higher in nitrogen than others. Some have more potassium and phosphorus. Most release their nutrients quickly and should be composted first to prevent root burn and plant shock. All stink up a storm but a few are a little less noxious on the nose.

Knowing the characteristics and the nutrient strength of the different manures (compared to each other) can prevent problems in the garden.

Although I think pigs are fun animals, I would never use their poop in my garden. It has loads of nitrogen, but also contains awful strains of bacteria. They eat meat and their waste is primed for pathogens! Also, the nitrogen in pig manure releases much slower than the other manures. It's just not worth the risk or trouble.

Manure Profiles

Below are the most common kinds of manures you might use in the home garden, along with a few recipes and my recommendations for use with specific types of edible plants.

CHICKEN MANURE

Let's start with the most noxious manure - that of chickens. Chickens don't urinate. Everything that is excreted comes out in the same blob. One chicken produces about 1 cubic foot of manure every six months according to a fact sheet published by Washington State University. See a link under *Manures* in the Bibliography to access the online article.

Fresh chicken manure has the highest nitrogen concentration of all the other livestock manures and a relatively small amount of phosphorus and other essential nutrients. The levels of nutrients, especially nitrogen, vary greatly depending on the type of bird and the feed consumed. The age of the manure, its moisture content, as well as environmental conditions and storage practices also impact nutrient values.

Most of the nitrogen in chicken manure immediately starts turning to ammonium. Ammonium is a potent form of nitrogen. It is taken up rapidly by the atmosphere. **Even with this loss of nitrogen, fresh chicken manure is too strong to be added directly to the garden near planting time, especially near the root zone. It's best composted before use.**

Which Plants Benefit from Chicken Manure?

When composted chicken manure is applied before growth begins, plants will get that nitrogen boost they need for a good start. In the edible garden, **composted chicken manure works best with crops that crave nitrogen and do not flower**. Corn and brassicas (cabbage, kale, kohlrabi, etc.) are a good fit for poultry poo.

If applied near edibles that flower, including tomatoes, high levels of nitrogen will encourage lots of green growth but the fruiting process will suffer. Also, if you like to grow giant pumpkins recommend you use cow or horse manure instead.

37. Recipe for Using Composted Chicken Manure in Home Vegetable Garden

Recommend you always use composted chicken manure in your edible garden as a soil amendment. It is less likely to burn your bounty. Because it's nice and dry, it's easier to handle and gentler on your nose and your plants.

How to Gather and Store Chicken Manure

With a dust mask and gloves on, scoop, shovel or rake up the manure along with the attached shavings or bedding. **Until you can get it into the compost pile, store the chicken manure away from chickens and keep it covered to reduce nutrient loss and prevent rain from washing it underground, potentially polluting water.** The sooner you can compost it the better. See the recipe above for instructions on how to compost manure properly.

When to Apply Chicken Manure?

When using composted chicken manure, incorporate it into the soil at least a month before you plant, not during growth.

If you live in a cold climate and time it right, you can lay a 2-3 inch thick layer of fresh fowl manure on top of your garden plot in the fall so it will compost naturally over winter. Come spring, your garden will be in great condition for planting. If your soil is in bad condition, work the manure into the soil instead of leaving it on top.

How Much, Where and How Deep?

For a raised bed measuring 8 feet by 4 feet, work approximately 2.8 gallons of composted chicken manure into the top 4-6 inches of soil and water well. A slightly smaller 8 feet x 3 feet bed would benefit from 2 gallons.

If you have a larger garden plot, for example 100 square feet, use 50 pounds of composted chicken manure. That's about 8.3 gallons depending on water content and age.

Another way to loosely measure is to apply a 1 inch thick layer on top of the soil and then work it into the top layer.

Make sure not to over-apply chicken manure because too much nitrogen not only can contaminate the soil with nitrates, it can weaken your plants, making them more susceptible to disease and pests.

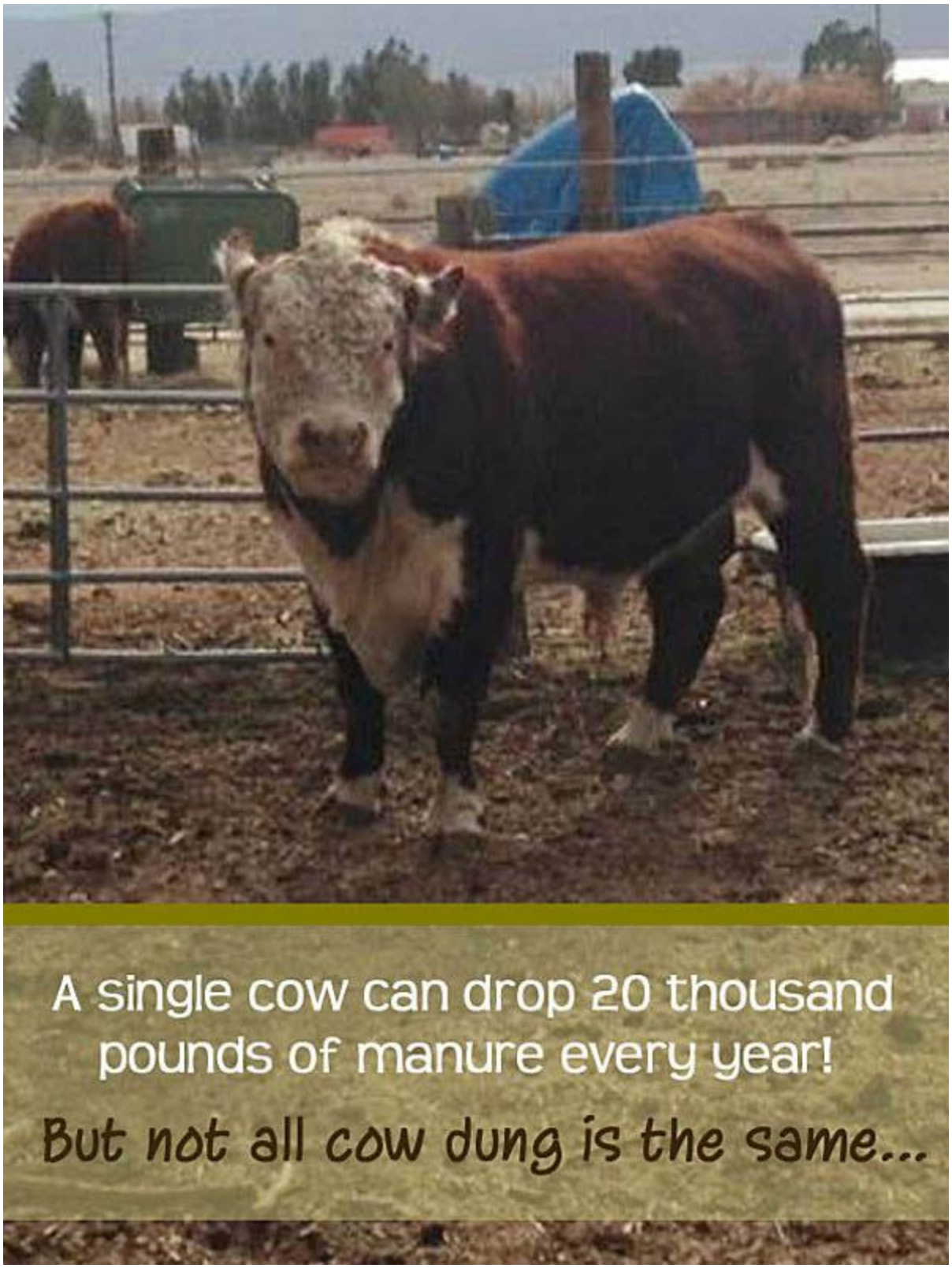
If chicken manure is over-applied year after year, copper and zinc levels can reach levels harmful to your soil and plants. Once under the surface, nitrogen sticks around a long time until used by plants and microorganisms - and they can only gobble up so much. Excess nitrogen can also travel underground and contaminate sub soils and ground water.

COW MANURE

Cow manure has the least amount of nitrogen of all the manures profiled in this book but it happens to be a great choice as a soil amendment because of several reasons. **It improves soil fertility, is easy to find, is unlikely to burn plants, contains less weed seeds than horse manure, and is less apt to stunt flower or fruit development.**

There's plenty of cow poop to go around. A single cow can put out twenty-thousand pounds of manure every year! But not all cow dung is the same.

Although cow manure might be the easiest manure to collect, I stay away from farms that use hormones, herbicides or synthetic fertilizers, or plump up their cows in crowded, corn-based feed lots (there will be undigested feed in the manure).



Which Plants Benefit from Cow Manure?

Because cows produce less potent manure, most all edible crops can benefit from their waste, especially those that flower or fruit. It's the organic matter that is most beneficial.

If you have sandy soil, cow manure can convert it to a spongier medium that holds more water. Clay soil will loosen up nicely if amended with cow manure.

Proud pumpkin growers swear that cow manure plays a huge role in growing award winning pumpkins. They amend the planting holes months prior to planting.

38. Recipe for Using Cow Manure as Soil Amendment in the Edible Garden

Think of cow manure as a way to replenish organic matter and a tool to get your garden into great shape for planting. It will condition the soil - especially sandy or clay soils; and will improve the efficiency of everything going on underground including nutrient utilization.

How Much, Where and How Deep?

1. **FALL:** In fall mulch your garden bed with cow manure at a depth of 1-2 inches. Let it decompose and naturally work itself into the soil over winter. Once spring comes and soil can be worked, fold it into the top 4-8 inches of soil.
2. **PRE-PLANTING:** To amend the soil before planting, layer manure an inch deep on top and then work into the soil 4-6 inches deep. Wait the recommended time period before planting root crops (120 days) and other edibles (90 days).
3. **SIDE DRESS:** To side dress a row or planting hole, place a 1 inch thick band under the surface, 2-3 inches deep at the edge of the root zone. Again, do this well before planting according to the 120/90 day rule to prevent health hazards.
4. **RAISED BEDS:** For a raised bed measuring 8 feet by 4 feet, work 3 gallons of composted cow manure into the top 4-6 inches of soil and water well. Use the 120/90 day rule.
5. **100 SQUARE FOOT GARDEN PLOT:** Use approximately 55 pounds of composted cow manure - a little over 9 gallons. Use the 120/90 day rule.

In my own garden, plants that seem to love a pre-application of composted and aged cow manure include pumpkins, corn and pole beans.

39. Cow Manure Tea Recipe

My favorite way to use cow manure as a soil amendment is in liquid form - a manure tea. I would call manure tea a fertilizer as well because it will feed plants right away. I prefer cow over horse manure because horse manure tends to contain more salt.

To make your own, put **composted and aged cow manure (never fresh)** in a small muslin bag and let it steep in a 5-gallon bucket for a couple of days, no longer, then drench your vegetable beds.

To use composted and aged cow manure tea during growth, follow the 120/90 day rule. Drench the soil at the drip line of the plant. Use one gallon of manure tea per large plant. Do not apply manure tea to young seed starts.

Most any composted manure will work well as manure tea if you keep in mind the nutrient value and benefits of the specific manure you're using.

GOAT MANURE

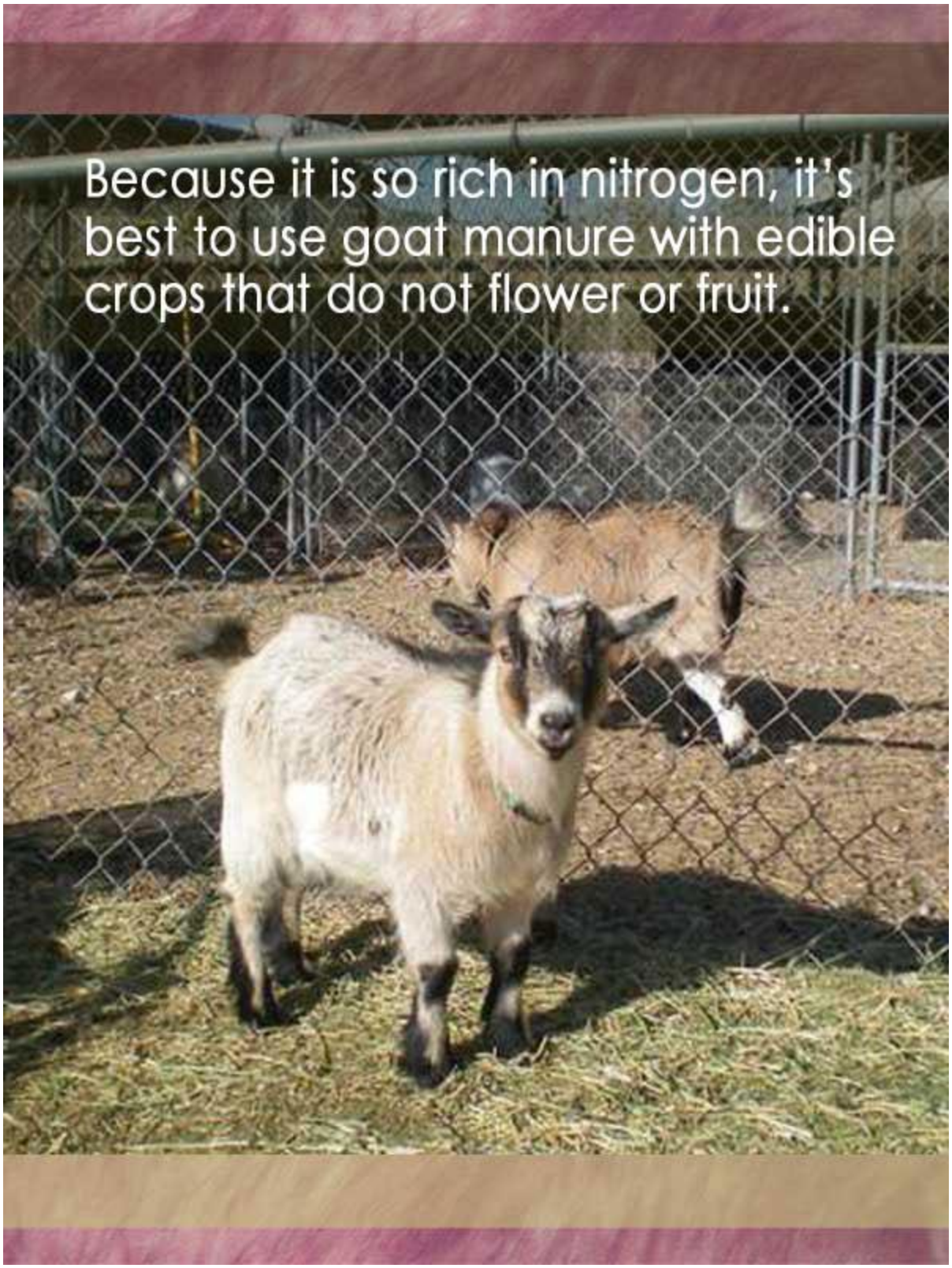
Goats, as well as rabbits and llamas produce convenient poop pellets. These "beans of the bum" enter the atmosphere dry enough for hassle-free collection. They're drier than horse manure, and a lot easier to handle than thick cow patties.

Goat manure contains more nitrogen than horse manure and double that of cow manure. Goat urine mixes with the feces and makes their waste even more

potent. Utilize the 120/90 day rule mentioned several times above if you want to use it fresh.

Just as with any manure, to apply it close to planting time, it's best to compost and age it first to reduce the chances that it will damage your plants or infect you with a nasty sickness. Just because you've never known of anyone falling ill from fresh applications of manure, doesn't mean it's never happened. Why take a chance with your health? And in my case, why risk my kids' health?

Goats eat grass and hay, and like horses and will excrete lots of undigested weed seeds. Composting also saves you from a lot of weed pulling.



Which Plants Benefit from Goat Manure?

Because it is so rich in nitrogen, it's best to use goat manure on edible crops that do not flower or fruit.

Recipes?

Refer to the recipes for chicken manure above.

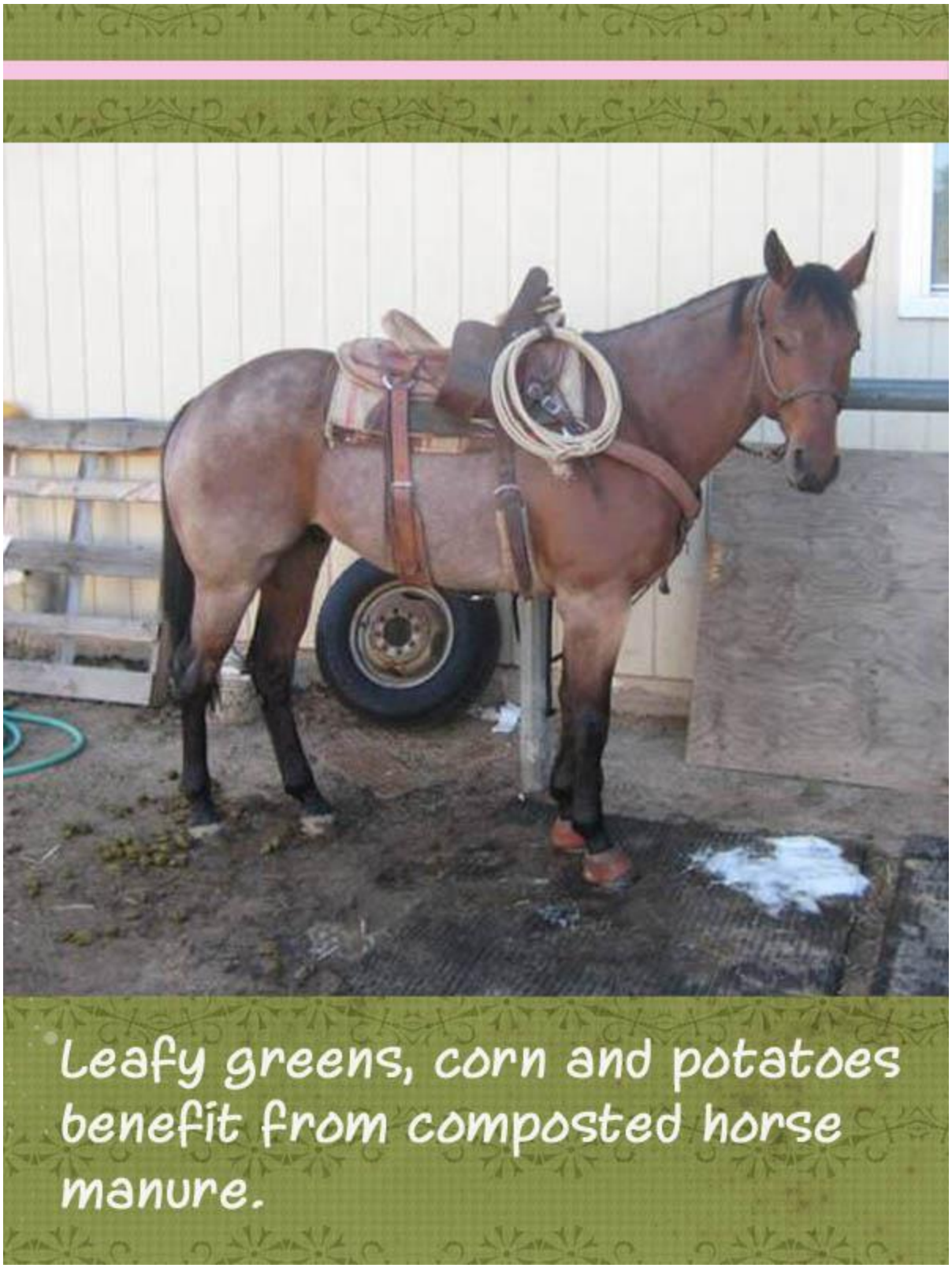
HORSE MANURE

One horse creates about 50 pounds of manure a day. That's 9 tons every year, enough to fill 27 raised beds measuring 8 feet x 4 feet - each a foot deep! HOLY COW!

Horse manure is lightweight, rich in nitrogen (more than cow manure) and does a great job of loosening clay soils. To get the healthiest manure possible, find out if herbicides are used on the meadows where the horses graze and if the animals are given antibiotics or other medications. If so, seek out an alternate source of horse manure.

The safest way to use horse manure fresh is to incorporate it into the soil in the fall and let the snow cover and cold temperatures naturally blend it into the soil. If you cannot let it overwinter, apply it at least 120 days before the harvest date for crops that touch the soil and 90 days for all others.

Wood shavings mixed with horse manure can rob your plants of nutrients because the microbes must take nitrogen from the soil to break the wood down. To solve that problem, compost the manure, and in the process you will also eliminate most weed seeds and pathogens. See the recipe on Composting Manures above.



Which Edible Crops Benefit from Horse Manure?

Because horse manure is low in phosphorus and potassium, it is not the best choice for flowering plants, tomatoes or peppers. Use it instead on leafy, nitrogen-needy plants such as corn, potatoes and lettuce.

Garlic seems to grow really well in soil amended with composted horse manure.

Recipes?

Consult the cow manure recipes above, keeping in mind that horse manure is more potent and may contain more salt.

RABBIT MANURE

Rabbit fecal pellets are small, compact, dry and nearly odorless unless they're mixed with urine - then they take on their own unpleasant bunny bouquet. Rabbits also release beneficial good bacteria and fungi called cecotropes. These are shiny, moist and resemble a long cluster of rubbery, dark brown grapes. Rabbits eat the cecotropes to stay healthy!

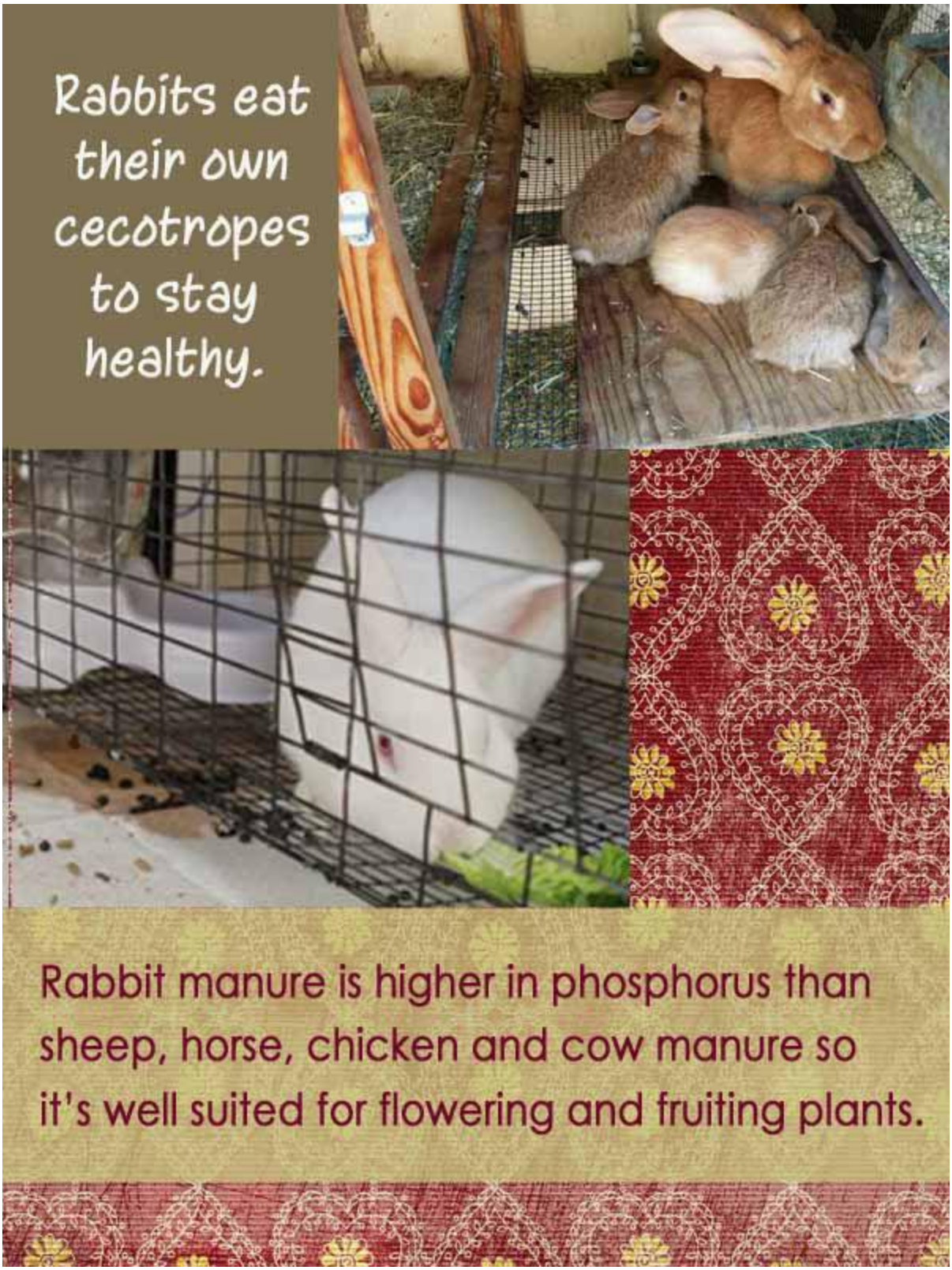
Rabbit manure is higher in phosphorus than sheep, horse, chicken and cow manure so it's well suited for flowering and fruiting plants. Phosphorus plays a vital role in how the plant utilizes the sun's energy to create seeds and fruit.

Rabbit droppings also have the highest nitrogen content of any of the commonly available barnyard manures, including cow, horse and sheep. Even with all this nitrogen, rabbit manure doesn't seem to burn plants. The reason is that the nitrogen in rabbit waste releases slowly. This encourages gardeners to add it fresh on top of the soil, in planting holes and as a liquid fertilizer.

But what about pathogens and the risk of contamination?

It's still there. You can get sick from handling fresh rabbit manure or contaminated food. That's why many university studies recommend that we compost all manures first, even rabbit manure.

Once again, if you are determined to use it fresh, count back 120 days (root and other edible crops that touch soil) or 90 days (all other edibles) from the harvest date to determine how soon you can incorporate it into the soil.



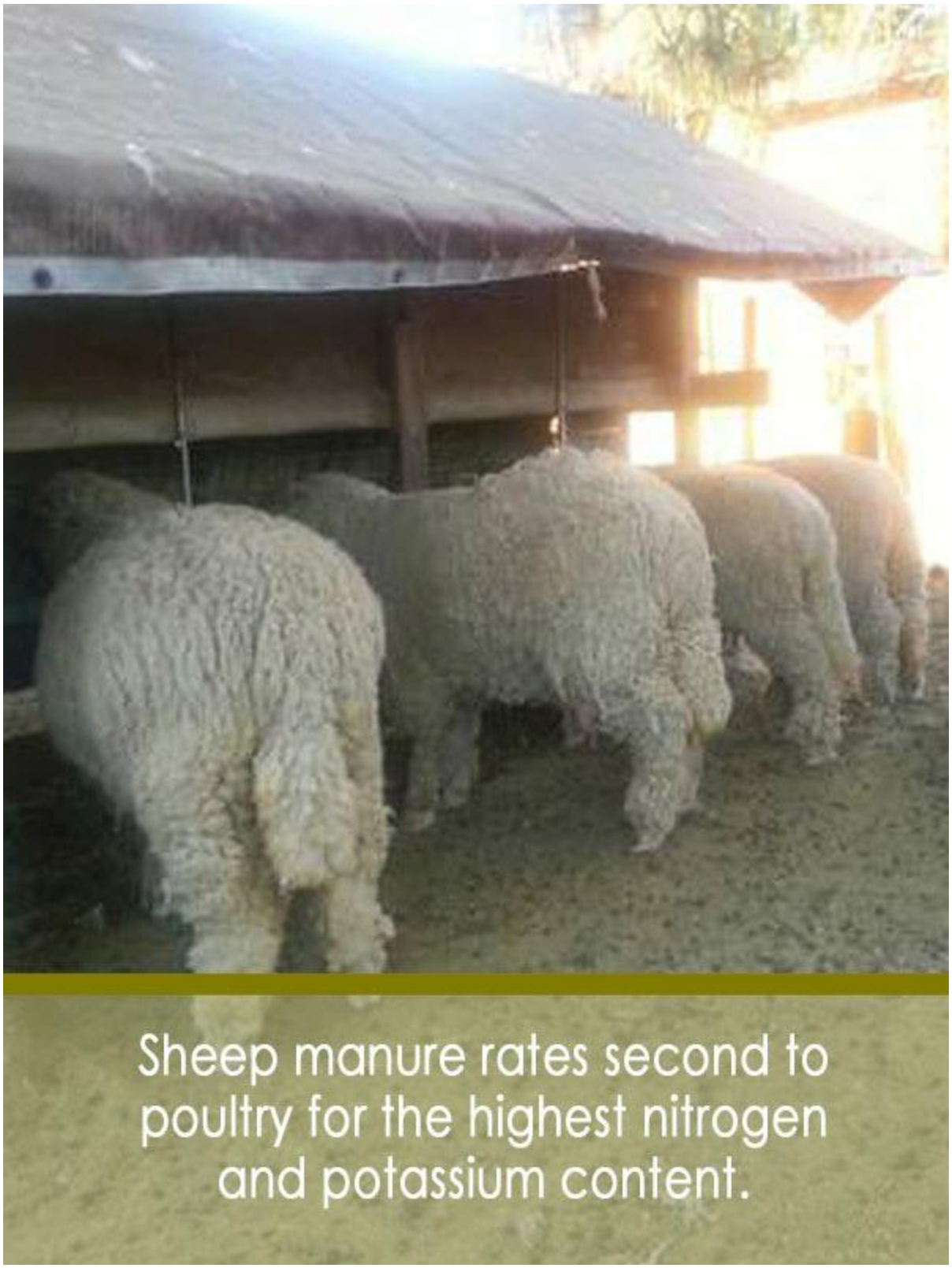
Which Plants Benefit from Rabbit Manure?

Edible plants that require adequate levels of phosphorus to thrive include corn, potatoes and tomatoes. Fruits and grains respond well to soil amended or mulched with rabbit manure. Not all phosphorus will be available immediately. Most of it has to be broken down first by microorganisms during the first year.

SHEEP MANURE

Sheep rate second to poultry for producing the most nitrogen and potassium-rich manures. In composted form, sheep manure contains more potassium, calcium and magnesium than the other types; and about as much phosphorus as cow manure. People comment that it smells less than cow or chicken manure but it usually takes longer to dry out.

Like horses, sheep do not digest weed seeds very well. That combined with the need to kill pathogens gives good reason to compost it before use.



Which Plants Benefit from Sheep Manure?

Because you have more potassium to work with in sheep manure, use it to prepare beds for potatoes and planting holes for pumpkins.

Manures - General Quick Tips

- Chemicals can stick around in the manure and kill beneficial microbes. Look into your source of manure. Fly larvae are a big problem at some farms. Pesticides are sprayed on manure piles to kill the larvae. Another worry is that grass sprayed with herbicides can survive inside the animal's body and eventually its manure. Do you know if the cows or horses were treated with drugs? Those drugs don't kill all the bacteria found in animal manure. Medications can also be present in manures.
- Fresh manures must be stored carefully, handled safely and applied judiciously to avoid runoff and contact with skin. Non-woven, thick rubber/vinyl gloves and boots are probably the best defense when handling fresh manures to prevent sickness from E. coli, salmonella and listeria. Make sure to wash tools thoroughly and clean your hands well after you're done moving manure. Store manure in a safe place, preferably in a loosely covered container or pile away from children, pets and water sources.
- Dust particles from dried manure are unhealthy to breathe. In my family we have a girl with asthma and eczema so it's smart to watch what we bring around.
- If you use manures in your garden, always wash veggies and fruit before serving.

Milk

MILK

Why might milk be good for the garden?

I would consider milk **both a fertilizer and a soil amendment**. It initially supplies plants with calcium and also provides microbes fuel to break down organic matter in the soil.

In one preliminary study conducted by the University of Nebraska and highlighted in the Minnesota Farm Guide, raw milk applications increased crop yields better than chicken manure. Four months after the tests, the researchers discovered the soil was in better shape.

Where do I find milk?

Use any milk you have on hand, even sour milk. Raw milk may work better than pasteurized. I have yet to read a scientific study using pasteurized milk products but that doesn't mean it's not worth a try.

Which plants may benefit from milk?

I've found melons, peppers, squash and tomatoes respond well to milk applications. Used as an antifungal foliar spray, milk might ward off powdery mildew on cucumbers and squash.

Combine milk with…

Milk and Epsom salt make a great combination, especially for tomatoes. See the recipe below for instructions.

40. Milk Fertilizer and Soil Amendment Recipe

Use it raw, pasteurized, fresh, expired, evaporated or powdered. Mix at a ratio of 1 part milk to 1 part water. In this recipe, milk is applied as a soil drench. My favorite plants to treat through the soil are peppers, tomatoes, eggplant and lettuce.

In my home garden I use about ½ cup of milk water (¼ cup milk + ¼ cup water) for every square foot of planting area. If I have one tomato planted in a large grow bag I use ½ cup milk water and pour it around the plant at the drip line. I would use ½ gallon of milk water for an entire raised bed measuring 8 feet x 4 feet.

To combine milk and Epsom salt, add 2 teaspoons of Epsom salt to ½ gallon of milk water (1 quart water and 1 quart milk).

41. Milk Soil Drench and Foliar Spray Recipe

Foliar sprays work well for crops that tend to get fungal diseases such as squash, cucumbers, eggplant and melons. Use the same ratio as the previous recipe - mix 1 part milk and 1 part water. Add to a spray bottle. The milk will absorb into plant leaves more freely if the leaves are already moist so try and water your plants before you apply the milk. Pre-moistening opens up the pores in the leaves.

Spray the tops and **undersides** of the leaves early morning or late afternoon after the sun subsides. If the weather report calls for rain, wait until after the rain stops.

You can keep any unused milk water in the refrigerator until you need it again. Suggest you rinse the spray bottle nozzle out before you store the unused milk to prevent it from clogging.

Milk Quick Tips

- Lack of water could be the reason why your tomatoes are inflicted with blossom end rot because the plant cannot obtain calcium from the soil.
- Milk applications won't work very well if your soil is not moist. Plants need water to absorb nutrients so water plants consistently and deeply to get the best results.

Molasses

MOLASSES

Why might molasses be good for the garden?

Molasses is a simple sugar in syrup form, derived from the process of refining sugarcane.

It is believed to benefit the garden because microbes and bacteria will consume the sugar (carbohydrates) and then release organic matter back into the soil.

Where do I find molasses?

Molasses is not frequently used at my home. I usually have a bottle in the back of a cupboard, leftover from making gingerbread cookies. It takes a long time (years maybe) for molasses to go bad. I read if you store it in the refrigerator, you can extend its shelf life considerably.

If the smell of your molasses is fermented or bothersome, you can recycle it in the garden. Just don't dump it straight onto your soil.

What is the best type of molasses to use?

All types of molasses contain nutrients and sugars that could serve as a soil amendment ingredient or microbe stimulator. After lots of research I recommend

unsulfured blackstrap molasses because it is not exposed to chemical sulfur dioxide during processing. It also is believed to contain higher amount of nutrients than the other varieties. Organic molasses is fine because it won't have synthetic preservatives but will probably be less concentrated than blackstrap because lower temperatures are used during processing.

How do I use molasses in the garden?

Add 1-3 tablespoons of molasses for every gallon of water used. It does not need to be an exact measurement. However, do not over apply.

Combine molasses with…

Alfalfa and molasses work well together. Add 1-3 tablespoons of molasses for every gallon of water called for in the Alfalfa Recipes. Molasses is a carbon-rich material (a "brown" compost ingredient), and therefore you should balance the carbon with nitrogen-rich materials such as alfalfa or fish. See the list of *brown* and *green* composting materials in the Extras Section for more ideas.

Try adding 1-3 tablespoons of molasses to each gallon of compost tea made from worm castings.

Molasses Quick Tips

- I rarely use molasses in my liquid concoctions because I'm not convinced it makes much of a difference and there have been studies that show it might increase bad bacteria such as E. coli and Salmonella, especially in fertilizer teas left for weeks, aerated or not.
- **Unsulfured molasses** is minimally processed from mature sugarcane that has been allowed to ripen in the field. **Sulfured molasses** is processed from green sugarcane. It is exposed to sulfur dioxide fumes to preserve it until it's processed. The chemical sulfur used to treat the sugarcane is not the same as he naturally occurring sulfur nutrient. **Blackstrap molasses** is boiled three times (processed the most) and contains naturally occurring micronutrients including sulfur; and higher amounts of iron and calcium than the other varieties. Blackstrap is used as a nutritional supplement for humans and as an additive in animal feed.

From NUTS to WORMS

Nut Shells

NUT SHELLS

Recycle your almond, peanut, pecan, pistachio and walnut shells by adding them to your compost.

Why might nut shells be good for the garden?

They help improve soil porosity, especially heavy clay soils, allowing air and water to move through efficiently.

If possible, grind them up first to speed up decomposition. If this is too much trouble, add them whole and keep the compost moist. Later on, when your compost is ready, if you see that the nut shells have not fully decomposed, you can screen the compost. Screening works especially well if you'll be using some of the compost for potting soil.

Nut Shells Quick Tips

- Use plenty of nitrogen-rich compost materials along with the shells to balance out the carbon.

- Common English walnut shells are fine in the compost. However, do not use the nuts from the BLACK walnut tree. Every part of a black walnut tree contains juglone. As explained earlier in the section on leaves, juglone is toxic to many plants in the garden. If you have one of these trees, it's recommended that you plant 50-80 feet away since leaf drop and root invasion could contaminate the soil with juglone. Cabbage, eggplant, peppers, potatoes and tomatoes are especially prone to black walnut poisoning.
- Rinse salted shells before adding to the compost.

Pet Food

PET FOOD

Dry pet food contains proteins and nutrients. Even the cheap stuff contains micro-nutrients. But beware of additives. Look at the ingredients list on the package. If there are excessive chemicals, fillers, salt or corn products in the mix, it might not make sense to apply it to your plants or the compost. Small amounts of dehydrated meat are ok. Grains are good.

Why might pet food be good for the garden?

Dry pet food is usually a source of nitrogen and micronutrients. It can be mixed with water to make the nutrients more water soluble. **Using pet food in the garden is more of a recycling exercise and compost acceleration method, rather than a soil management best practice.**

Where do I find extra pet food?

There are many reasons why pet owners end up with leftover food. Sometimes pets simply don't like the food offered to them or it goes stale.

Combine pet food with…

Compost. Pet food in the compost will break down quickly and help heat up the pile for faster decomposition. Make sure that the food is combined with lots of *brown* materials like dried leaves and other dead, organic matter. You can add an entire bag of pet food to a pile or large tumbler if combined with other materials to encourage decomposition. Just make sure to cover the food to prevent animals from being attracted to your pile.

Pet Food Quick Tips

- Your pet food soil amendment may not be organic depending on the pet food you use.
- Sometimes grain stores will sell pet food for cheap or give away spoiled grains.
- To discourage wildlife from foraging through the compost for pet food, position it deep within the pile until the food decomposes. Keep moist.

Pine Needles & Straw

PINE NEEDLES & STRAW

Why might pine needles and straw be good for the garden?

I use pine needles as a mulch for my containers and grow bags, and as an ingredient in compost. If you're on a quest to improve your clay soil, adding pine needles may break it up, allowing more air to flow through.

Where do I find free pine needles?

I gather them from holiday trees or collect a small bag while I'm at a park or on a hike.

Pine Needles Quick Tips

- Pine needles will probably not make the soil more acidic. After studying the subject, I found there's plenty of evidence showing that it would take several yearly applications to make a noticeable difference to your plants.
- I would not recommend adding pine needles to an active garden bed. Microbes will steal nitrogen from your soil to break the needles down.

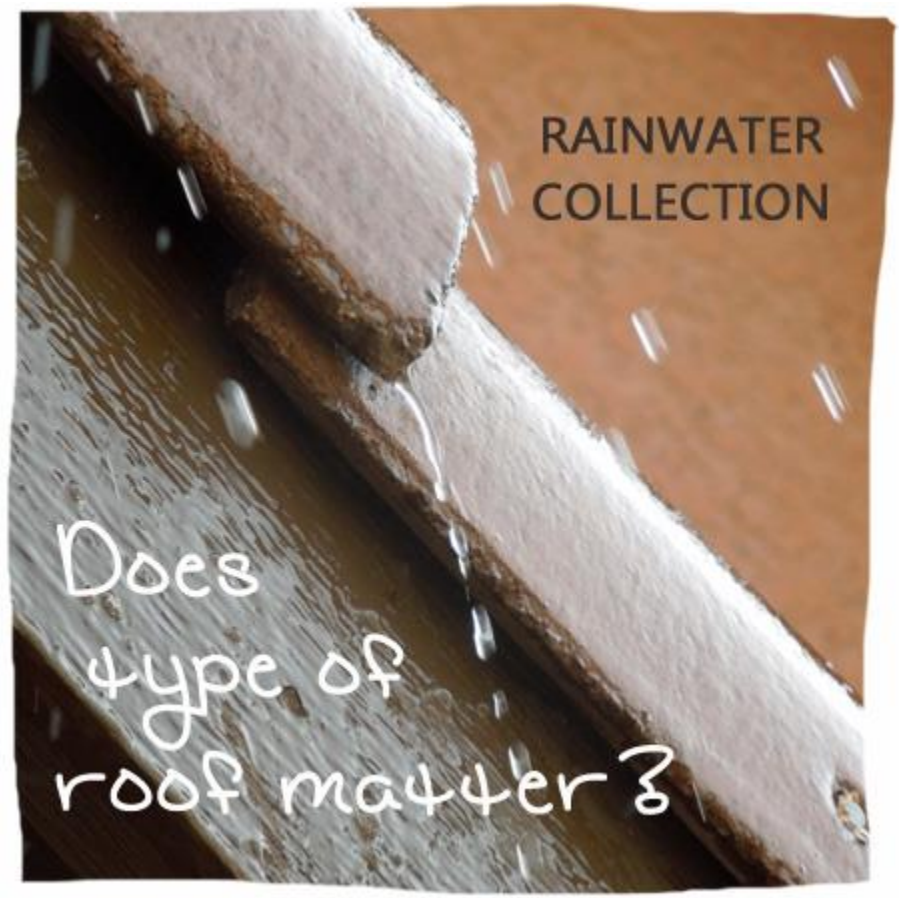
Rainwater

RAINWATER

Why might rainwater be good for the garden?

Unless you live in an area where the air is highly polluted with excessive amounts of nitrates or sulfites (acid rain) or chemicals from industry, rain is a good thing for the garden. **For the most part it will contain chloride, nitrates, sulfates and some phosphate.** During runoff into your container of the nitrates will be converted to a gas that will be released into the atmosphere. If stored uncovered for a few hours, some of the chloride will also disperse.

Although I have no recipes for rainwater, I do want to discuss its makeup and compare it to city water.



Both city water sources and rain can contain a variety of nutrients, naturally occurring chemicals and bacteria from human and agricultural activities.

In areas of the world where large amounts of wood are burned for fuel and agricultural practices manage tons of fertilizers and livestock manures, rain can contain higher levels of contaminants.

A Carleton College study on *Rainwater Chemistry Across the United States,* found that rain on the East and West Coasts usually has higher concentrations of chloride from ocean water evaporation. Go to *Rainwater* in the Bibliography to read the study.

Rainwater must be stored carefully to reduce bacteria levels and potential contamination by heavy metals. How stringent your safety methods should be depends on what you'll be using the water for. If you'll be drinking the water, seek out official resources to ensure you're employing safe procedures.

If you're using rain to water the garden, it's important to keep it covered so that mosquitos can't use it as a breeding ground. Use it as soon as you can to avoid bacteria buildup.

Rainwater Quick Tips

- Rainwater that runs from your roof into a collection barrel can contain contaminants. If you are concerned about this, see the Bibliography in the back of the book for a link to a 2012 study published in the International *Journal of Engineering and Technology*. The researchers compared different roofing types and their impact on the composition of rainwater.
- We don't get a lot of rain in Southern California. At the school garden, our water comes from a hose. We devised a primitive way of cutting down on the chlorine by filling buckets with water and letting them sit overnight. After several hours most of the chlorine evaporates. You can do this at home too.

Rock Dust

ROCK DUST

Rock dust, rock fines and rock flour are powdered, grainy or sand-like materials originating from deposits caused by glacial activity, rivers, volcanoes and the sea. Basalt, granite, limestone and dolomite formations also offer up their own natural rock dust compositions.

Why might rock dust be good for the garden?

Despite its heavy weight, high shipping costs and limited evidence that it works in the backyard garden, many folks add it liberally to their soil annually or more often to **replenish trace minerals**.

Depending on the source, rock dust can contain varying amounts of calcium, iron, magnesium, potassium and trace minerals.

Where do I find rock dust?

Commercially available rock dust products contain different mixes. For example, Azomite® contains a combination of seawater minerals and other minerals found in volcanic ash. *Greens*and®, a potassium-rich marine sediment, is valued for its ability to improve water retention. Gaia Green® offers calcium, iron, magnesium and potassium plus trace elements and micronutrients. (All of these brand names are registered trademarks – just in case the symbols don't show up in this eBook.)

Finding My Own Rock Dust

Since I'm determined to find free sources of soil amendments, I'll concentrate on showing you how I forage for small amounts of rock dust to amend my raised beds, containers and potting soil.

If you live near a quarry, uncontaminated river, lake or desert, inspect the sand and soil in that area and **if allowed**, take a small bag back home to test in your garden.

If you know a gravel pit operator and have permission to collect the leftovers from around the crusher and conveyers, you may have a fine source of rock (as long as it tests safe for agricultural use - ask for test results). **Not all the tailings and piles of sand at a gravel site will benefit your garden.**

When we go camping in the desert, especially in areas of prior volcanic activity, I might bag up a gallon of dust to bring back to my garden. As amateur rock hounds, our family likes to hunt for all kinds of interesting minerals and crystal specimens.

Which plants may benefit from rock dust?

Berry and potato farmers sometimes use rock dust to improve soils and supply plants with added potassium. I have also heard of great pepper harvests credited to applications of rock dust.

Combine rock dust with…

Rock dust is a good companion for other organic fertilizers, including compost. Add it to the compost pile or mixing it into the finished compost will fortify it additional nutrients and improved texture.

42. Rock Dust Recipes for Raised Beds and Containers

1. **LARGE GARDEN PLOTS:** I have not used rock dust on a larger plot but have done research. Use 14 - 25 pounds of rock dust for every 100 square feet of garden area.
2. **RAISED BEDS:** For a raised bed measuring, 8 feet x 4 feet, cover the bed with ¼ inch rock dust and work it into the top 4 inches of soil. Best time to do this is in the spring, before planting.
3. **CONTAINERS:** Use ½ cup of rock dust for every gallon of soil. If I were growing in a 5 gallon container, 2.5 cups of rock dust would be included in the homemade mix or amended into the soil before planting.

43. Rock Dust Top Dressing Recipe

Sprinkle the dust around the plant at the drip line and water in. Use ¼ cup for every gallon of soil.

Recommend you treat only some of your plants to see just how well it works, especially if you are not sure of the mineral content. **Success with rock dust will depend on lots of factors including watering consistency, temperature, plant type and existing nutrients in the soil.**

Rock Dust Quick Tips

- Heavy metals and other contaminants could be present in the rock so be careful and ask first if you want to get free product from a local quarry or commercial stone company.
- Be careful not to add sand to heavy clay soil. It will not improve texture. Instead, it might make it more cement-like.

Seaweed & Kelp

SEAWEED & KELP

Why might seaweed and kelp be good for the garden?

Seaweed and kelp contain potassium, loads of trace elements, growth hormones and enzymes. It is believed that seaweed helps free up nitrogen in the soil that could be stuck from a lack of nutrient balance.

Where do I find seaweed and kelp?

At the seashore, at the grocery store or Asian market.

If convenient, I always try to collect a little seaweed after a trip to the beach. Once dried it stores wonderfully. Now that I'm caring for the school garden, I can always use seaweed for anything we're growing.

Have you tried a healthy snack of dried seaweed? I thought my daughter would love it at school and failed to test it before I put it into her lunchbox. She hated it so I used it on my plants.

Which plants may benefit from seaweed and kelp?

I have a favorite – potatoes. Any plants that flower or fruit will get a kick out of seaweed's growth enhancers and trace minerals. The image below shows potatoes at school planted in inexpensive polypropylene grow bags. The row closest to the raised bed was amended with seaweed and kelp. The four bags lagging behind did not have seaweed added at planting time.

I also like to fertilize my asparagus with seaweed. Asparagus has three stages of growth: harvest, fern and dormancy. In spring before spears emerge, I top dress the soil with kelp or drench it with kelp tea. Later on when it's in the fern stage, I use fish. See the Fish Recipes for more advice.

Combine seaweed with…

Fish fertilizer or other materials rich in nitrogen such as alfalfa and composted chicken manure work well alongside seaweed. Do not over-apply nitrogen on plants that are about to blossom or go dormant.

Salt Content

There's a misconception that seaweed contains too much salt to be put in the garden without rinsing. The salt in the seaweed contains nutrients and unless you are collecting truckloads of it and concentrating application in one area, year after year, the salt will not harm your garden - **it may actually help.**

Environmental Concerns

Scientists have concluded that collecting a shopping bag of seaweed on the beach will not harm the environment or upset the ecosystem. **The best place to collect seaweed is below the high tide line.** The stuff sitting on drier land, up on the berm for example, gives wildlife protection and therefore should be left alone. That's why I collect newly emerged seaweed and kelp. And I only collect small amounts at a time from areas that I assume are not polluted. To read more

about the impact of large-scale seaweed and kelp harvesting, visit the Bibliography and look under the topic *Seaweed*.

44. Seaweed and Kelp Soil Amendment and Mulch Recipe

Collect a small amount of seaweed and/or kelp on the beach from below the high tide line. Use it fresh or dried, both types will improve our soil and feed microbes. **Unless you know your soil is too salty, you do not need to wash seaweed before use.**

Chop or cut it up if possible - the smaller the pieces, the more surface area available for soil microbes to work. I use 3 handfuls in every planting hole - that's if I have enough.

Another option is to use it as a mulch. Large kelp leaves should be chopped or cut up first, otherwise the leaves won't let enough air in.

Here's a picture of one of my amazing tomato plants grown in an inexpensive plastic (polypropylene) grow bag. I got over 25 heirloom fruits from one plant. That's incredible to me because heirlooms usually need a lot more space. I added kelp and eggshells to the planting hole, and amended with alfalfa pellets (alfalfa early in growth only).

45. Seaweed and Kelp Soil Drench Recipe

Let seaweed sit in a container with water for a day or two. If you want to contain the seaweed for ease of use, place a few handfuls into a mesh bag or place whole pieces on the bottom of a bucket with a brick or rock on top.

For a 5-gallon bucket, I would use 4-5 handfuls of seaweed or kelp. Add water and let it steep for a day or two. Water your plants as usual around the drip line and put the solids in your compost or a planting hole.

You have the option of drying seaweed in the sun to keep for future use.

Seaweed and Kelp Quick Tips

- When applying liquid fertilizers as a soil drench, it's best to water the soil first so that when you use the soil drench it will disperse properly into the soil.
- I never soak seaweed or other materials for weeks because I don't think the stench, growth of bad bacteria and potential health concerns outweigh nutritional benefits. A solution created in two days may be weaker than one created in a couple of weeks, but in my opinion it's still beneficial and a lot safer.

Urine

URINE

May sound disgusting to some, but urine is considered sterile if the source is healthy and free of viruses and infection. Urine is mostly water and urea. Urea is a chemical compound produced by the processing of protein in our bodies.

Why might urine be good for the garden?

High in nitrogen, urine also contains more phosphorous, potassium and trace minerals than many of the fertilizers we buy at the store! Urine from drug-free, healthy people could end up one of your favorite fertilizers.

Where do I find urine?

Stupid question? Well, not really…

Natural Urea

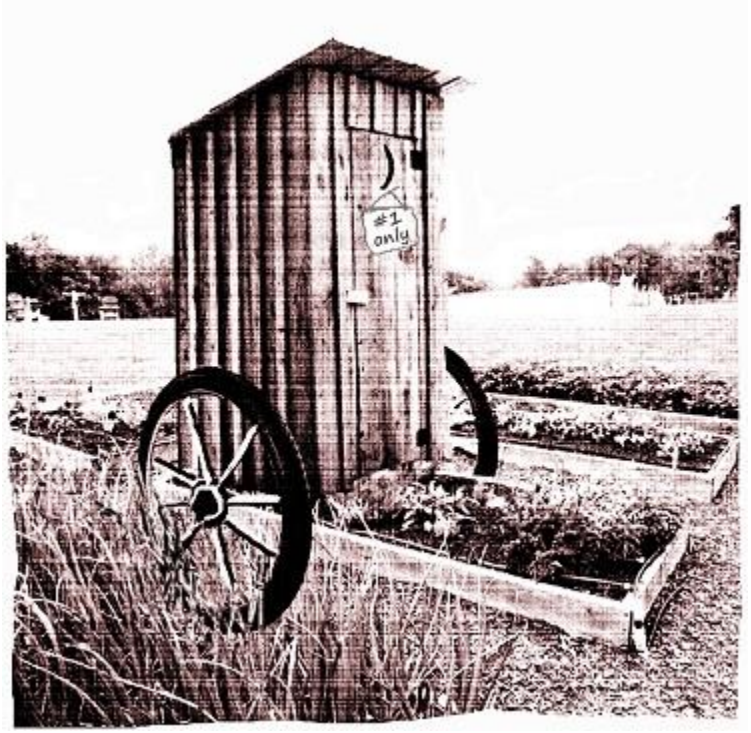
Humans, mammals, amphibians and some fish create the natural form of urea. The urea in our blood gets processed by our kidneys and also through our sweat glands before it's converted to urine for easy exit.

Synthetic Urea

Synthetic versions of urea can be created in liquid or solid form. It's colorless, odorless and a prime ingredient in many fertilizers.

Synthetic urea-based fertilizers do almost nothing to improve the organic matter of the soil and their high concentrations can actually throw your soil off balance.

Learn more about the differences between synthetic and natural urea above in the section on the *Differences Between Natural and Synthetic Fertilizers*.



Safely Collecting Urine

My kids have a healthy diet and usually don't take medications. They are an entertaining source of free fertilizer. When asked to pee in a bucket, they usually laugh and think it's fun, especially as they pretend to spill it on the way out of the bathroom. If you have boys, well, the process may be easier.

The chance that urine from your immediate family will spread disease is slim.

Human feces are a big safety risk in the home garden. It can wash away with the urine. Feces contain bacteria and pathogens that can make you awfully sick.

If you've ever supplied a urine sample at the doctor, they always provide a sanitary wipe to use prior. If you thought it was to clean up the area after you make a mess, then you've been doing it wrong all these years!

As my grandmother used to say, "kids are busy" and if you think about it, kids don't take the time to ensure they are squeaky clean after a bathroom visit. **It's best that kids clean themselves properly before peeing in a cup.** That may take all the fun out of it, sorry!

Which plants may benefit from urine?

Any plants that need nitrogen will benefit from urine. Because urine offers other nutrients beyond nitrogen, it is a good choice for tomatoes if diluted well and applied early in the growing season. Apply urine at least a month before harvest. If serving tomatoes that have been fertilized with pee gives you the "willies", try it in the compost pile.

Combine urine with…

Compost.

In my wildest garden dreams I never envisioned myself stirring a cauldron of nutritious pee soup for my soil. I can be a witch sometimes but that's another book. My advice would be to forgo mixing anything with urine.

Some folks apply wood ash at the same time in small quantities. See the wood ash recipes for recommendations.

46. Recipe for Using Urine in the Edible Garden

Once I've watered my plants, I then water with the diluted urine. Man, I'm a pain about watering first. Sorry to be so repetitive but it really does make a difference. Moist soil will enable any fertilizer to disperse more uniformly. **Try not to contact the leaves or fruits when pouring diluted urine near your plants.**

A good ratio of urine to water would be 1 part urine to 8 parts water. It's fine to dilute it even more. No need to be precise, if you think you have about a cup of urine, fill a gallon jug half way with water and then add the urine.

A little less than a half-gallon of urine would work well in a 5 gallon bucket of water. **Fertilize at least a month before harvest of edible crops.**

Urine Quick Tips

- Storing undiluted urine pee for more than a day will create a smelly situation but it should not grow harmful bacteria if the product does not

contain feces. **In fact, pathogens should be killed off in 1-2 months if urine is stored in warm temperatures and exposed to the sun's rays.** There is a good article online about the use and storage of urine on the Permaculture Research Institute's website. Check that out and more in the Bibliography. Go to the topic *Urine*.

- Nitrogen produces lots of leaves and green growth so be careful not to over-apply urine to flowering or fruiting plants.
- I do not use urine near lettuces or other leafy *greens* because not enough time passes between application and harvest. I also do not use urine on soil where root crops are growing unless I apply it 120 days prior to the harvest date.
- Urine works well to heat up your compost pile. If your anatomy and housing arrangements allow, pee straight into the pile and turn it under or cover with carbon-rich materials to balance out and react nicely with the nitrogen.
- In some parts of the world, human fecal matter is dehydrated and used in agriculture. I'll leave that up to the experts for now!

Weeds

WEEDS

Weeds soak up nutrients from the soil. Now we've got a compelling reason to pick them! With the potential to sprout in compost, weeds never make it to my compost pile. I throw weeds out or use them to make a fertilizer tea.

Why might weeds be good for the garden?

Dandelions, stinging nettles, oxalis, chickweed and clover suck up minerals and nutrients from the soil and air - nitrogen, phosphorus, potassium, boron, calcium, cobalt, copper, iron, magnesium, molybdenum, zinc and more.

Where do I find weeds?

In my backyard…and a few million other places.

Which plants may benefit from weeds?

Use weed tea to fertilize your vegetables, fruit and herbs. It's best used on plants that need nitrogen.

If applied to edibles that blossom, a one-time feeding early in the growth cycle is best. If you over apply nitrogen-rich fertilizers on tomatoes or other plants that blossom and fruit, you'll get more leaves at the expense of fruit.

Repeat every month for vegetables that do not flower or fruit.

Combine weeds with…

Nothing. They work great all by themselves. If you want to get real fancy, and make a more complete fertilizer, add kelp or worm castings in with the weeds. **Stay away from combining weeds with nitrogen-rich materials such as manures, alfalfa pellets, fish, etc.**

47. Fertilizer Weed Tea Recipe

Gather Weeds

The best weeds for tea fertilizer are the ones that have not gone to seed yet. If your weeds have gone to seed, look for an old t-shirt or old pair of pantyhose that you can use to contain the plant matter.

Pull up the roots too to prevent them from growing back and to take advantage of their nutrients. Immediately place in a container, not on the ground where seeds can drop.

Make Tea

Use any size bucket as your guide. I use a 5-gallon pail or anything I can grab at the time.

Fill your bucket halfway with weeds. Cut up the weeds to expose more of the surface area of the plants. If you want to contain the weeds to save trouble later (especially if they have gone to seed), place all your weeds in an old pair of pantyhose or a t-shirt tied at both ends. Make sure you can untie the sack easily so it can be reused. If the cloth is compostable, you might decide to bury the entire used bag of weeds or compost it.

Steep the Tea

With your weeds (or bag of weeds) in the bucket, fill the bucket with water and let it steep for just a couple of days. Now here is where the t-shirt or pantyhose come in handy. Pull the bag of weeds out and your weed tea is ready to use.

If you put loose weeds in the bucket to steep (that have NOT gone to seed), strain the weeds as you pour by holding them back with a gloves hand or pour the tea through a fine sieve.

Fertilize

I don’t use precise measurements with weed tea. If the color of my tea is vibrant, I dilute a bit to arrive at a faint colored liquid then moisten the soil first with just water, and apply the weed tea at the drip line.

If you are concerned that the leftover plant matter contains weed seeds, create a compost area just for weeds and cover with cardboard and a brick or rocks to hold the cover in place.

Weeds Quick Tips

- Don’t use weeds infested with aphids or other pests or diseases.
- Stay away from areas sprayed with pesticides or herbicides.

Wood & Plant Ashes

WOOD AND PLANT ASHES

If you have spare ashes lying around from a backyard fire pit, recycle some of it into your soil.

Why might ashes be good for the garden?

Depending on source, wood and plant ashes contain varying amounts of potassium, phosphorus, magnesium and micronutrients. **Calcium is the most abundant element in wood ash** so it acts somewhat like agricultural lime. In fact, **it is stronger than lime**. You would think the obvious use for ashes then would be to adjust soil pH.

As I explained earlier in the book, I don't test my soil's pH because if I have enough organic matter in the soil, the pH should be at a range that supports most all edibles that I want to grow. Another key for worrying less about pH is MODERATION. Keep the soil in balance by not overdoing any one material.

My goals for using ash in the garden are long term only. I get to recycle the ash and it will improve soil fertility over time. **I believe ashes help keep water in the soil which in turn helps nutrients work more efficiently with each other.** I've also added ash to the compost pile.

Where do I find wood and plant ashes?

Ashes from hardwoods (oak) and softwoods (pine) can be used in the garden. Hardwoods will contain more nutrients than the same amount of softwood ashes.

Do not use ashes from treated, stained or pressed wood products. Particle board contains glues and formaldehyde. I would also not use wood ashes from wood that had any kind of fire starter poured on it.

Charred plant matter can be used in the garden as well. I tend to forget things in the oven so I'm a veteran of burned plant matter - otherwise known as dinner at my house!

I've used burned kale chips and citrus peels, both the casualties of too much going on. My daughter harps that multi-tasking is unhealthy. So I ask her with a smile, "Would you like to eat dinner tonight OR get help on your science project?"

Which plants may benefit from wood and plant ashes?

Cabbage, broccoli, kale, kohlrabi and collards may benefit from soil amended with ash. **Young plants or newly emerged seedlings could be damaged by ash. It's best added to the soil before planting.**

Combine wood and plant ashes with…

Compost in small amounts. Maybe urine - go to the Bibliography and topic of Wood Ash to access a reference from Science Daily and the American Chemical Society on the use of wood ash and urine together.

48. Recipe for Using Wood or Plant Ashes in the Edible Garden

I can't stress enough that if you use too much ash in your garden, you risk killing your plants and damaging your soil. So, please use it in moderation and when in doubt use less than more.

I place the ash in a plastic bag and crush with a brick or rock. Smaller pieces will make it less concentrated and easier to disperse.

Use gloves and a dust mask unless you can be super careful not to touch it with your bare hands or breathe in dust particles. **Don't work with ash on dry, windy days.**

Three cups of crushed ash works well for a raised bed measuring 8 feet x 4 feet. **The nutrients in wood ash leach out faster than lime.**

The best time to apply ash is before you plant, at least a couple of months out. This could mean late fall or early spring. Disperse it evenly and rake it in under the surface.

If using ash in tandem with urine, work the ash into the soil first. Click here to go to the Urine Recipes.

Wood and Plant Ashes Quick Tips

- Two hundred years ago, ash was processed for use as a potash fertilizer source. Eventually, the production became more costly and new methods to produce potash were developed.
- Avoid leaving ash on the surface. It is more effective when it contacts the soil.

- Fresh ash could still be “live”. Only use ash that is cool and completely burned-out to prevent skin burns and a fire hazard.

Worm Castings

WORM CASTINGS

Instead of sending food waste to the landfill or grinding it down the sink, let red wiggler worms recycle your scraps into soil amendment. I am a HUGE fan of composting with red wiggler worms - a process known as **vermicomposting**.

Why might worm castings be good for the garden?

Worm castings, also referred to as compost, vermicast, worm humus and worm manure, contain nutrients that are easily taken up by plants: especially magnesium, phosphorus, potassium and calcium. Red wigglers filter out pathogens and aerate the soil. The trace minerals, beneficial bacteria and fungi in castings make them an ideal soil conditioner and growth enhancer.

Vermicomposting produces results much faster than traditional compost bins or piles. Several university studies show that the resulting product can be significantly more beneficial to the garden than traditional compost, even compost containing animal manure (depending on what was fed to the worms).

I credit worm castings for many of my garden success stories. The summer before publishing this book I grew loofah gourds. People will tell you they need to

be planted in the ground in lots of space. I planted one seed in a medium-sized grow bag filled only 8 inches deep. It produced three good-sized gourds. Adequate water, warm temperatures and sunshine helped but an occasional sprinkling of worm castings probably made them grow to their potential.

While I wouldn't use pure castings as a growing medium, this is the one ingredient you can use liberally in the garden.

Where do I find worm castings?

Worm castings off the shelf are not cheap. A small bag from a farmers market vendor could run you $20! People purchase worm castings from professional worm farms, individuals, garden shops and online retailers. I've loaded my truck with 50 pound sacks of worm castings. You can also get it by the square yard!

Instead of opening up your wallet, open up your mind to keeping worms as pets and compost generators.

To start composting with worms, you will need to acquire red wiggler worms. Red wigglers perform differently than the earthworms you find out in your yard. Earthworms won't like being your pets and they won't eat your scraps as efficiently. I created a guide for you that simplifies the process of setting up your bin – the same method I use today. See "How To Compost With Worms" in the *Extras* section.

If you're lucky, a worm farming friend will give you some for free. If you don't have connections in the gardening underworld, **look on Craigslist.org, purchase over the Internet or visit your local garden center**. You will be surprised how easy it is to acquire a starter set of red wiggler worms. Don't worry if you get mostly tiny worms in your starter batch. The younger they are, the more resilient they'll be when trying to get used to their new "digs".

I keep several worm bins going all the time and love to give away homemade worm systems to excited families. **Red wigglers are probably the easiest pet to take care of. You can leave them for weeks and come back to find premium soil amendment for your garden - or more bait for fishing!**

Which plants may benefit from worm castings?

All plants will benefit from worm castings. Even though the ratio of nitrogen, phosphorus and potassium are much lower than other materials, **the nutrients are both fast and slow release.** In my own garden, I add worm castings to my homemade container soil and always start my tomato seedlings out right with an initial dose of castings in the planting holes plus liquid feeds throughout growth.

Combine worm castings with…

Sometimes castings come mixed with other ingredients such as rock dust, peat moss, pumice and oyster shell lime. I like to use straight castings so that I have the freedom to apply them as I wish: amend my soil before planting, apply soil drenches throughout growth, or spray on leaves for nutrition and pest management.

Worm castings are not considered a significant source of nitrogen. Therefore if you're growing vegetables that are nitrogen-hogs, pair castings with weed tea, alfalfa pellets or fish ingredients.

I could go on and on but will cut to the chase and give you my favorite ways to use worm castings in the garden. For more details on how to set up your own worm bins, see the Worm Composting Guide near the end of the book.

49. Worm Castings Soil Amendment Recipes

Worm castings can be mixed into planting beds or used as a top dressing. **For every square foot of planting area I try to use at least one cup of castings.** Sometimes I don't have enough on hand - a little is better than nothing.

50. Worm Castings Tea Recipe

Worm tea is easy to make. It doesn't stink and fortifies the soil with water soluble nutrients and organic matter that makes microorganisms happy and productive.

Find an old crew sock and fill it with worm castings, secure the end and use it like a tea bag in a big bucket of water. Two cups of castings works great in 2 gallons of water. That's the size of a large watering can. Add the sock directly to the watering can.

Let it sit for 1-3 days, stirring well once a day, and use that solution to water your plants. For larger containers and beds, I like to water the garden first before applying the compost tea to ensure nutrients can travel easily.

If I'm not in the mood to bag up the castings, I simply put the stuff in the bucket and add water. I dump everything out, castings and all.

If you're in a hurry or can't find a pail, put some worm castings in a bag with a small hole in the bottom. Add water and drizzle the liquid around your garden. Works for me!

Worm Castings Quick Tips

- Worm castings contain chitin, a protein-based lining that is food for beneficial soil bacteria.
- Worms love rabbit droppings. If you keep rabbits, consider placing your worm bins under their cages. Just be aware that manure should be fully

composted and aged (or added according to the 120/90 day rule) to be applied to edible plants during growth. See the Manures section for details.

- Use worm castings that are finished. Unfinished vermicompost can contain bacteria that could damage your plants. **The liquid that drains from a worm bin during active composition is usually not a worm tea. It is leachate much like the toxic runoff from a landfill.**

EXTRAS: LISTS, GUIDES AND HOW-TOs

Suspicious Ingredients in Fish Emulsion and Commercial Compost

Click here any time to return to the Compost Recipes earlier in the book.

Be aware that lots of companies claim their products are organic without stating they are “OMRI” listed. Some may be unsafe. Products that contain a wealth of nutrients can also contain harmful substances.

Fish emulsion is considered an organic fertilizer although not always OMRI listed (officially certified organic). It can contain synthetic ingredients and commonly has higher than allowed **heavy metal content.**

I decided one day to do some hands-on research so I took a trip to my local garden center and started reading the information on the bottles of fish emulsion. All of the products I reviewed stated in various terms that they might contain high levels of heavy metals and to **NOT use them on organic gardens**.

I was surprised to read those warnings and now it makes sense. The fish used for most commercial fish emulsions are the ones we don’t eat because they are not safe to eat.

Some fish emulsion products on the market do use uncontaminated fish. Even better, we can make our own fish-based fertilizer with our own food scraps. Click here to visit the Fish Recipes.

Secrets of Sewage Sludge

Sewage sludge is a by-product of water treatment plants and as you can imagine is readily available. It is commonly used on pastureland where cows graze and on soil where edible crops are grown commercially. Waste from animals is organic but **sewage sludge is not allowed on USDA certified organic farm lots.** Here's why:

Sewage sludge not only has human fecal matter in it but can also contain heavy metals, pathogens and pharmaceuticals, and hundreds of contaminants that are not fully removed even after treatment. It is regulated but only 13 contaminants are tested and controlled. **Hundreds more contaminants with unknown impact on our soil and health go unverified.**

There is evidence that adding lime to soil containing sewer sludge can actually increase the availability of harmful chemicals.

These are just a few of the many reasons why sewage sludge is not allowed for use on USDA Certified Organic farms.

If you get compost from a local recycler of municipal waste, you may end up with some form of sewage sludge.

In 2010 there was outrage in San Francisco as people discovered that the municipal compost that was being given away for free contained sewage sludge. It was labeled as “organic biosolids compost”.

Dehydrated sewer sludge is sold by major cities in the United States and branded with the following names: Los Angeles-Nitrohumus, Milwaukee-Milorganite, New York-Granulite and Chicago-Nu-Earth.

I personally would not use any form of sewage sludge in my garden. There are too many unknowns. This topic is highly debated and lots of statistics are thrown about on the Internet. I’ve seen discussion threads where representatives of major companies defend their sludge products, while activists chime in with statements that seem valid, and soil scientists attempt to educate us with compelling points for and against the safety of biosolids.

My Own Investigations Into Sludge

In an attempt to check on some of the information I was reading, I took a trip to my local home improvement center. What I found was surprising and **encouraging!** I expected to see bag after bag listing vague ingredients with marketing terms for sewage sludge snuck in the middle of the list. (I read so many warning stories on the Internet. I now know lots of them are hyped but it did increase my concern.)

What I found was that almost every bag was OMRI listed. When did that happen? Of the 10 bags I checked, only one listed “compost” without explaining what was in the compost.

Irresponsible writers on the Internet are to blame for scaring us into thinking that most all amendments sold at home improvement centers are tainted with sludge.

How to Compost with Worms

Click here to return to the Worm Castings Recipes.

Use this guide and you'll be well on your way to composting with worms!

Why Compost?

Vegetable, fruit and paper scraps rot in the garbage and eventually cause pollution that runs into our water sources and places where animals live. If we recycle food and paper products properly, we keep our landfills cleaner and prevent dangerous gases and liquids from releasing into the air and seeping into the earth.

In addition to taking better care of the environment, composting allows you to make your own soil amendment for your garden – a natural and organic fertilizer and soil conditioner.

What Can Worms Do?

Worms eat our garbage! They like to eat watermelon, lettuce, apples and even paper. After they eat, they produce worm castings. **Castings are safe to handle, make the purest form of plant food and repel bugs and fungus.**

Red wigglers are the most highly recommended composting worms. Other worms that you find in your garden may not survive for these purposes.

Where Do I Keep Worms?

There are many types of worm farms available for home and commercial use. Some cost hundreds and even thousands of dollars. An inexpensive and effective method employs a **plastic storage container**-something you probably already have in your home.

Using a Simple Plastic Tub for a Worm Bin

Bin size depends on the amount of food scraps produced. For example, a family of four that eats lots of fruit and vegetables should use a large plastic storage container. Make sure you cannot see through the tub. Worms don't like bright light. **Because worms seem to prefer more horizontal surface area, a rectangular tub works better than a bucket or tall container.**

An adult should drill many air holes in the tub on the sides and the bottom so that air circulates around and through the bin. Worms need oxygen to breathe. **I use a wood burning tool to melt clean holes in the plastic. It smokes a bit but works wonderfully.** Make sure an adult operates the tool.

You can cover the holes with circles of screening to keep the worms in the bin. I stopped doing this years ago. If the worms are happy, they will not try to escape. Most of my bins do not have screening.

Preparing the Bin

Lay down three inches of shredded cardboard on the floor of the bin. Shredded paper also makes a good bedding but it tends to create a soggy mat. **Cardboard is best.** The worms will eat the cardboard along with the food scraps. The bedding also increases air circulation throughout the bin. **Keep the bedding damp like a wrung out sponge. Water shouldn't be pooling at the bottom of the tub.**

Sprinkle a **cup of garden soil** over the shredded cardboard. The grit in the dirt helps the worms digest the food. It also introduces beneficial microbes that help breakdown food scraps.

Temperature and Air Flow

Keep the bin indoors or out. However, **DO NOT place the tub in the sun**. If your worms live outside, bring them in during the colder months. When the temperature drops below 50 degrees Fahrenheit, relocate the worms to a warmer location. If the temperature rises above 80 degrees Fahrenheit, it's too hot. The best location is a cool, dark garage or room where **air can circulate**. I have never had luck keeping a worm bin under the sink in a stuffy cabinet.

Add a tray or another bin cover underneath to catch any liquid that might drain from the bottom. You can keep the top of the bin cracked open and elevate the bin with bricks to improve air flow. If you see worms crawling up the side of the bin, the conditions are not ideal. A good way to keep the bin moist is to add water with a squirt bottle.

Worms and Feeding

Add the worms on top of damp shredded cardboard in the container and then add another 3” of damp shredded cardboard over the worms to keep them cozy and cool.

Always keep a few inches of bedding over the food and worms. This prevents fruit flies and bad smells; and creates a healthy environment for the worms to thrive. You can feed 1 pound of worms a half a pound of food a day. They can eat 50% of their body weight every 24 hours. Therefore, you could feed 2 pounds of worms a pound of food every day.

You do not have to measure the food. I don’t.

Be careful not to overfeed. Start with less food at first and remember to cover it up. Scatter the food under the top layer of shredded bedding. The worms will eventually get to it and start eating. **Worms will compost faster if the food scraps are cut up into small pieces.** The more they eat, the more they grow and reproduce. For a large worm bin add 5-6 cups of chopped up food each week. Add more or less after observing how the worms react. I recommend the largest, shallow, opaque plastic bin you can find, even if you have a small family.

What Worms Love, What Worms Hate

Worms love all kinds of food scraps including vegetable peels, tea bags, egg shells and coffee grounds. Fruit is good but **limit citrus fruits** because the material will become too acidic and this could kill your worms. Also limit starchy foods like

rice, pasta, potatoes and bread. You have carbon for your compost already in the form of the cardboard bedding.

In general, composting involves brown and green materials. Brown materials contain carbon. Green materials contain nitrogen. When combined, they make organic matter that consists of energy (carbon) and protein (nitrogen). The best balance of carbon/brown and nitrogen/green matter will produce fertile, earthy-smelling compost. **In your worm bin, shredded cardboard, paper and dried leaves act as brown ingredients for fiber and food scraps work as green ingredients for protein. More brown materials are best.**

Warnings, Problem Solving and Tips

The following materials and conditions are **NOT good for worms: Heat, extreme cold, light, meat, dairy products, oily foods, plastic, metal or glass**. Your tub should not smell badly. Feed your worms a variety of food, don't overfeed and cover the worms and food scraps with fluffy bedding. Crushed, dried leaves work well as bedding too.

Moisture

Make sure to keep the contents moist like a wrung out sponge, not dripping wet. To avoid fruit flies, limit citrus fruits to only peelings or eliminate citrus completely. You can leave a bin alone for 1-3 weeks if it is moist enough inside and in a location that is cool and dark. Make sure there is enough food to munch on while you're away.

Harvesting Worm Castings

Worms will make compost everyday but it might take approximately 2.5 months to start harvesting the compost. You will know that you are ready to harvest when most of your original bedding is gone. The contents of the bin will be dark and earthy, almost like coffee grounds.

Mountain Method

There are several methods that work to separate the worms from the castings. The most popular method is to wait until most of the bedding is dark in color and the food has been eaten. Lay out a waterproof tray or tablecloth and form large cone-shaped hills of the material from the bin.

Expose the piles to sunlight and wait 10-20 minutes. The worms will burrow deeper into the pile to avoid the light. **Skim off the top layer of castings** and use

them to feed your plants. If you see paper scraps or uneaten food, place that aside to add to the new bin later. When you start seeing worms again at the top of pile, wait another 10-15 minutes and harvest again. Repeat until you end up with mostly worms. Reserve a cup of castings to put into your bin to start the whole process again-this will make the worms feel at home.

Migration Method

As the years have passed, I've learned to separate the castings without forming piles in the sun or sorting through the compost by hand. In just a couple of minutes, I divide the bin into two areas. I push all the existing contents to one side, and then create a new area with fresh, ground up food and bedding. Over a few weeks, I let the worms migrate over to the newly created side. They leave the worm castings behind for the new food. If you would like to see a video showing how this is done, visit my YouTube channel: HomeGrownFunFamily.

Look for Worm Cocoons!

Worm babies hatch from little lemon-shaped cocoons. They are the size of a small seed and turn from yellow to red depending on age. A cocoon may turn red when it’s ready to hatch.

Using Castings in the Garden

Mix the worm castings in with potting soil or put it directly in the garden. Before planting a garden, work the compost into the top layer of soil or add a 1-2 inch layer on top and water as usual. Generally speaking, 3 ounces of worm castings will fertilize a medium-sized potted plant.

Checklist for Soil Success

This is a general checklist but a good one for keeping on track with your soil.

□ KNOW my soil. Feel it, work it and inspect it.

□ IDENTIFY what my soil needs to be healthy.

□ RECYCLE natural materials into compost and soil amendment.

□ AMEND the soil with organic matter well BEFORE planting.

□ ELIMINATE synthetic chemicals and additives from my gardening regime.

□ CONSIDER the long-term effects of my actions on soil, water and air.

□ SELECT disease-free plants compatible with my climate and soil.

□ FEED plants a variety of nutrients depending on their needs.

□ WATER thoroughly and according to plant type and conditions.

□ ROTATE my crops to reduce disease.

100 Things You Can and Cannot Compost at Home

Nitrogen-rich materials contain protein and we know them as *greens*.

Carbon-rich materials provide energy and are referred to as *browns* .

Compost accelerators help heat up the compost for faster decomposition.

GREENS

□ Alfalfa Feed COMPOST ACCELERATOR

□ Beans and Spent Bean Plants

□ Beer/Spent Grains (Wet)

□ Coffee Grounds

□ Comfrey Plant Matter (fresh or dried) COMPOST ACCELERATOR

□ Crustacean Shells (shrimp, crab, lobster, etc.)

□ Dog or Cat Food (dry, including rawhide dog chews) COMPOST ACCELERATOR if made from corn and soybean meal

□ Dog Hair (break up clumps)

□ Feathers

□ Fish Food

□ Fish parts (chop up small) COMPOST ACCELERATOR

□ Flowers (from floral arrangements)

□ Fruit Scraps

□ Fur (from the dog or cat brush)

□ Grass (fresh)

□ Hair

□ Jelly, Jam and Preserves

□ Leather Products, e.g., belts, gloves, etc.

□ Leaves

□ Manure (cow, sheep, chicken, rabbit, horse)

□ Nail Clippings

□ Pine Needles (evergreen wreaths and garlands)

□ Plant Stems (soft)

□ Pumpkins (uneaten and leftovers from Halloween)

□ Seaweed and Kelp
□ Shrubs (chopped and shredded)
□ Urine COMPOST ACCELERATOR
□ Vegetable scraps
□ Vitamins
□ Worm Castings COMPOST ACCELERATOR

BROWNS

□ Baby Wipes (used, no feces)
□ Bamboo Skewers
□ Banana Peels
□ Bread and Tortillas
□ Business cards (no glossy)
□ Candy and Sugar Packets
□ Cardboard
□ Cereal
□ Cereal Boxes (tear up)
□ Coffee Filters
□ Corn Stalks (best shredded)
□ Cotton Balls and Swabs (100% cotton)
□ Cotton Cloth (t-shirts, socks, jeans - shredded)
□ Crackers and Pretzels
□ Crepe Paper Streamers
□ Crumbs
□ Dryer Lint
□ Egg Shells
□ Envelopes (no plastic window)
□ Glue (white, non-toxic)
□ Grass (dried)
□ Grains (wheat, pasta, rice, quinoa, etc.)
□ Gum (chewing)

□ Dried Houseplants (and their soil)
□ Latex gloves or balloons
□ Leaves (dried)
□ Loofah Sponges
□ Masking Tape
□ Matches (used)
□ Molasses
□ Newspapers (no glossy pages)
□ Nut shells (no black walnut shells)
□ Paper Bags (ripped up)
□ Paper Bills and Receipts
□ Paper Cupcake Cups
□ Paper Egg Cartons
□ Paper Napkins and Tissues (used)
□ Paper Party Decorations
□ Paper Parchment and Wax
□ Paper Plates (wax coating ok)
□ Paper Scrap (sticky notes, labels, subscription cards, no glossy)
□ Paper Table cloths
□ Paper Towel rolls
□ Pencil Shavings
□ Peat Moss
□ Pizza Boxes (ripped into smaller pieces)
□ Pizza Crusts
□ Play Dough (non-toxic)
□ Receipts
□ Rope (natural fiber)
□ Sawdust
□ Soil (used potting)
□ Straw

□ Tea Bags
□ Toilet paper rolls
□ Toothpicks
□ Vacuum Cleaner Debris
□ Weeds (dried up is best)
□ Wine Corks
□ Wood Chips
□ Wool Cloth
□ Yarn

OTHER

□ Wood and Plant Ashes (small amounts from untreated wood) CALCIUM
□ Milk and Ice Cream (small amounts only)

DO NOT COMPOST AT HOME

□ Meat
□ Plastics and other non-biodegradable materials including metals
□ Glossy and Colored Paper (large amounts)
□ Fat, grease, oil, butter, cheese
□ Cat, dog or pig waste
□ Lime

School papers are a popular compost item at my house!

Rotate Your Crops So Your Soil Doesn't Flop

If you grow crops from the same family in the same spot season after season you will deplete your soil of certain nutrients and increase the chance of plant diseases. **Some plants take a lot from the soil. Lettuce, cabbage and tomatoes are heavy feeders and use lots of nitrogen. Peas and beans on the other hand put nitrogen back into the soil.**

I recently drove a few hours south to visit some friends. My old neighbors had a knack for growing tomatoes but my girlfriend commented about how they must have had a bad year. I asked her if they were planted in the same spot by the fence and they were. Who knows why she had a tomato-less summer but chances are her soil was not prepared for the task.

Amending that same soil might have helped but the best move would be to change the spot despite past successes. I guess it's human nature to stick with what works. However, when it comes to growing locations for edibles, change is good.

Crop Rotation Meets Companion Planting

One of the best strategies for crop rotation is to grow plants that add nutrients to the soil before growing plants that take nutrients away. A perfect example of this is to plant peas one season and tomatoes the next since tomatoes suck up lots of nitrogen and peas return it back to the ground.

To make crop rotation even simpler, choose a plant from a different family for the next planting. See the Cover Crops and Green Manures Recipes for more tips on how to improve your soil with edible crops.

How to Recycle Old Soil

After you've grown something, especially in a container, the soil will be laden with roots and will feel less fertile. It might not absorb water very well because the organic matter is gone.

If you find yourself saddled with a bunch of old potting soil that looks lifeless and doesn't absorb water, recondition it so it can be used again to grow food or flowers.

Clean-up the Soil

A great way to reuse your potting soil is to dump it all in a large pile or container (with air holes) and add organic matter in the form of compost or a balanced combination of organic materials. While you're gathering up all your old

soil, remove old roots and other debris that will take months to decompose and add those items to your compost pile instead.

I eyeball how much old soil I have and then add about 20% of organic matter or compost back into it, water it, stir it up and then let it sit for 30 days, adding more water periodically to keep it moist.

MORE HOME GROWN FUN

Look for Home Grown Fun on Facebook, Twitter and Pinterest. I also enjoy making videos and sharing my experiences on YouTube at HomeGrownFunFamily.

Website: HomeGrownFun.com

YouTube.com/HomeGrownFunFamily

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Use the links under the topics here to access citable references mentioned in the book, as well as suggested reading. You can click on the headings to go back to the recipes!

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Cindy Rajhel is married and a proud Mom of two daughters. She enjoys adventures with her family, organizing garden programs at school and walks with her husband. Cindy is a U.S. Army veteran. Post military, she consulted for more than 10 years as a project manager, business analyst and managing consultant for several Fortune 500 companies.

The information in this book and the Home Grown Fun Garden Series is a product of over 15 years of research and experimentation. In 2010, Cindy started Home Grown Fun, an initiative that inspires people to enjoy nature and gardening. She created the first farmers market booth in Southern California featuring unique, homemade seed papers, gardening gifts and kits.

Cindy volunteers countless hours at the school garden and donates to outreach programs. Her husband is an officer in the United States Navy. The family relocates every few years and this gives Cindy a chance to explore many different gardening challenges and ecosystems. She shares new discoveries with you online at [HomeGrownFun.com.](HomeGrownFun.com)

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