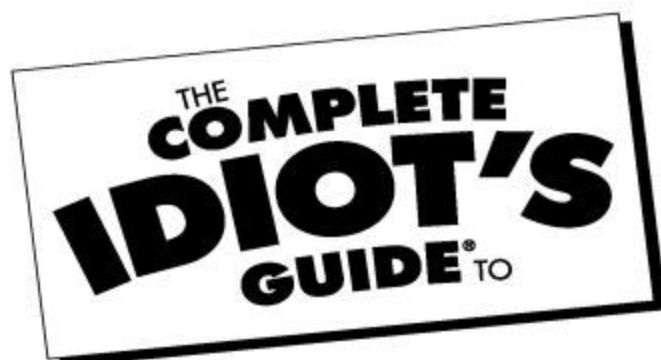


Self-Sufficient Living

by Jerome D. Belanger



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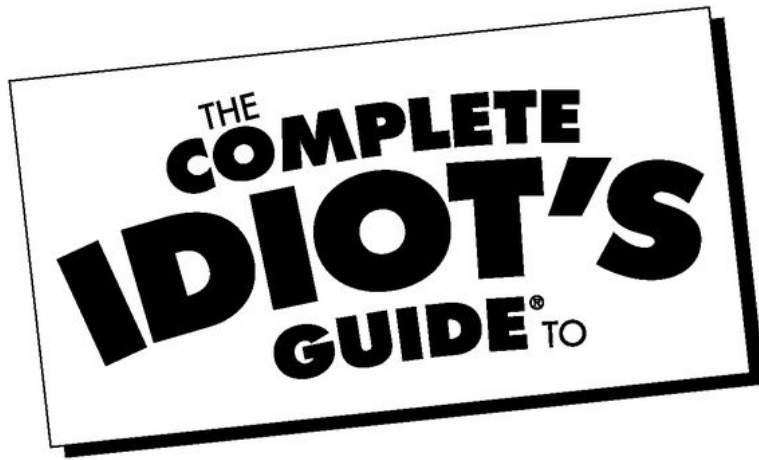
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A member of Penguin Group (USA) Inc.

*This book is dedicated to my grandchildren—and all grandchildren
everywhere—
who will inherit the Earth we leave them.*

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Introduction

In the 1960s I achieved my long-held dream of living self-sufficiently on a small homestead with a large garden, many animals, and a small print shop to pay the bills. But after raising and butchering my first pig, I realized I had a lot to learn.

As one means of learning, I put my printing press to work and started a newsletter, for “\$1 a year plus a letter with a question, or an answer to a question,” about self-sufficient living. It was like a chat room, but long before there was an Internet.

That small newsletter became a small magazine and then several small magazines on goats, rabbits, chickens, sheep, working stock dogs, and general all-around green living. All were reader-written, chat-room style. Over the years I “met” thousands of people of many backgrounds, interests, and abilities, but who had several things in common.

Primarily, they were all dissatisfied with some aspect of the world, usually having to do with the environment, business, or government, but felt powerless to do anything about it. They couldn’t change the world, but they could at least work on their little corner of it. They could become self-sufficient, each in his own way.

Times have changed. More people are dissatisfied today than 40 years ago. The world needs changing today more than ever before. What’s exciting is that more people than ever are aware of that need, even though not all of them know what’s involved and few realize how they’re connected with so many others and how they could be working together to achieve mutual goals.

Self-sufficient living today is not just an escape from the rat race, a means of eating your own homegrown organic food, or living without the power grid. We might as well admit it from the beginning: our ultimate goal is changing the world. And of course, we want to enjoy doing it, as much as possible; changing the world is hard enough without getting grim about it! But that’s the easy part.

This book is an attempt to pull all these elements together so they not only make sense but also point to some possible solutions.

How This Book Is Organized

This book is divided into six parts:

Part 1, “A Rational Approach to Self-Sufficient Living,” offers a rational approach to self-sufficiency. It’s not a fad; it’s not escapist; it’s not regressing. Self-sufficient living is a lifestyle for our times and very likely will be the way of the future.

Part 2, “The Kitchen: Heart of the Homestead,” looks at what is arguably the most important kind of self-sufficiency: providing your own food. Whether that food originates in your own garden or barnyard or comes from far away via the supermarket, your kitchen is where it meets the moment of truth.

Part 3, “The Self-Sufficient Gardener,” will get you started producing your own food, even if you have never gardened before. If you’re experienced, this will be a refresher course, but you might find a few surprises, too!

Part 4 is **“Meat, Milk, and Eggs,”** where we’ll look at these nongarden food groups. Yes, you can produce your own, even on a small place.

Part 5, “Shelter and Its Appurtenances,” brings us to the area where we spend most of our time, money, and energy. Learn how some people avoid a mortgage and decrease both their carbon footprint and their water footprint.

Part 6 ties it all together with **“A Plan for the Future.”** You might be skeptical about self-sufficient living becoming the norm in America and around the world. But these chapters will show you what has already happened (when you might not have been paying attention), what is going on right now, and where it could reasonably lead.

This still won’t begin to cover everything, so you’ll find some additional information in the appendixes, including where to go for more information.

Extras

Throughout the book, you’ll find the following four types of sidebars:





Watch Your Step

There aren't many life-threatening pitfalls in self-sufficient living aside from normal things like falling trees, but when you might encounter some trouble of one kind or another, be sure to “watch your step.”

Off the Beaten Path

Off-the-wall little snippets of information can be useful and enlightening as well as interesting. If nothing else, they'll let you impress your friends and relatives with your knowledge of little-known facts.

def•i•ni•tion

You might not be familiar with some words or the way they're used in this book. Look for definitions in these boxes and the glossary appendix.



Lore of the Land

Watch these boxes for brief tips that might make the job at hand a little easier.

Acknowledgments

No book is truly original. All the words in this or any other book are already in the dictionary; they've only been rearranged to form different ideas.

All the ideas have also been voiced, somewhere, at some time before. They are merely collected, distilled, and rearranged according to each author's biases and peculiarities.

This book is a collection of the ideas, discoveries, and experiences of thousands of people, in many areas of expertise, because self-sufficiency is especially impossible for writers.

The best personal proof of that I can offer is the one person who stands out among those thousands. She has been my best proofreader and best friend for 56 years. We have worked side-by-side for most of those, not only in the garden, field, barn, and kitchen, but in the offices and shops of the businesses we've owned. The girl who worked to get an R.N. degree left her chosen career to bottle-feed goat kids, bale hay, butcher chickens, and help put the cattle back in the pasture, often on the same day as doing the payroll and talking to salesmen or training a new employee. And then she made it a point to be at home when her children got off the school bus.

This book has a cast of thousands, but I couldn't have written it without Diane.

Special Thanks to the Technical Editor

The Complete Idiot's Guide to Self-Sufficient Living was reviewed by an expert who double-checked the accuracy of what you'll learn here, to help us ensure that this book gives you everything you need to know. Special thanks are extended to Harvey Ussery.

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Part 1

A Rational Approach to Self-Sufficient Living

The days when a man could go off into the wilderness and manage to live with nothing but a rifle and a knife are far in the past. The new reality demands a rational approach to self-sufficient living.

There are books aplenty that will show you how to plant a garden, keep chickens, and make sauerkraut or artisan cheese. But I have yet to see one that tells you why any of this is important. Moreover, why is it important *now*, when true self-sufficiency is more impossible than ever? And if it's impossible, why should you even bother trying?

A rational approach starts by discovering what it's all about.



Chapter 1

What's It All About?

In This Chapter

- Welcome to the dream
- Self-sufficiency is impossible—and essential
- Varieties of self-sufficiency
- Survival—the bottom line

Self-sufficient living is not an organized movement: there are no rules or guidelines. There isn't even a universally recognized definition. When you venture into self-sufficiency, you're on your own.

So how do you know where to begin?

You have many possibilities. The first step is to understand what's involved and know what options are available. Then you find some common threads that can help you make rational decisions.

Welcome to the Self-Sufficient Homestead

The sun slides up over the horizon as smoothly as a golden-yolked, free-range egg slips out of a well-greased frying pan. As you wake up to the crowing of a rooster and the cooing of mourning doves, you pull on your jeans and boots, eager to greet the new day.

The grassy path to the barn is sparkling with dew, and patches of mist, golden in the morning sun, still glow in the pasture beyond. You stop to pick a ripe strawberry, popping it into your mouth, squishing it with your tongue, and savoring the sweet juice with satisfaction. You grew it yourself. As you open the door to the chicken coop, the hens rush out like eager children leaving school after the final bell. The goats, amidst the rustle and

aroma of clean straw, see you coming and stand with their front feet on the board fence to baa their welcome.

Swinging the milk pail, you continue ...

Okay, hold it; hit the pause button. Is this what self-sufficient living means to you in the twenty-first century?

If so, how would you like the story to continue? Do you want to hear about the goats, the sheep, a pig, the beef steer, and maybe the horse? Or would you rather just move on to the garden to see how the asparagus is doing, check on the English peas, and get ready to transplant tomatoes?

On the other hand, maybe you could do without a barnyard or even the country setting; you might envision being self-sufficient in the city, close to museums, friends, cafés, a farmers' market, and high-speed Internet. You're thinking of going back to the land, at least symbolically, not to plow virgin soil but to help alleviate water and energy shortages and climate change.

This is why the old-fashioned ideas of self-sufficient living no longer work. It's a different world. The frontiers facing us are no longer physical. The new wilderness is psychological; the new uncharted seas are philosophical. It would be impossible, as well as irresponsible, to talk about self-sufficiency without regard for today's global and economic climate and the general state of the planet. The emphasis in self-sufficiency is no longer on the "self" but on "sufficiency" on a planetary scale.

People are pursuing self-sufficiency in different ways. Some think of it as an emphasis on alternative energy; others in terms of organic foods; and still others as the traditional homestead. In each case, they realize, or soon learn, that the old style of self-sufficient living is impossible.

Welcome to the new world of self-sufficient living, with all its variations.

Getting a Handle on Self-Sufficiency

The basic concept of self-sufficiency is simple enough: it means providing for your own needs. The main drawback is that it's impossible. Nobody can be truly self-sufficient and live anything even remotely resembling a civilized life. This doesn't prevent us from using the term, but it does demand some serious examination and clarification.

Most reasonable people realize that self-sufficiency does not mean trying to exist entirely on one's own. The more complex the world becomes, the more "civilized" we get, the more difficult it is to be self-sufficient.

Maybe, just maybe, you or I could start a fire without matches. We could probably make a crude tallow candle for additional light ... but not unless we had some hunting and butchering tools and skills to get that animal fat.

Being self-sufficient would mean we'd have to know not only how to use those tools but also how to *make* them from the raw materials of the Earth.

However, not many people could make a light bulb and then produce the electricity required to operate it, all from raw materials with no outside help. Self-sufficiency at that level is impossible, but the impossibility starts at a much earlier stage of development.

We can become self-sufficient in less strict terms. For example, it's quite possible for an individual or a nation to become self-sufficient in food, at least to some degree. Today, many are trying. Both nations and individuals can become self-sufficient in energy, and many would like to achieve that, too. (Sweden plans to be energy self-sufficient by 2020.)

Off the Beaten Path

The average car today has more than 20,000 parts—maybe many more, depending on how we count them. (Does a piston count as one part or six?) This can include as many as 50 microprocessors. No wonder "shade tree mechanics" are a relic of the past.

But there's another way to look at self-sufficiency. Picture the entire planet as a spaceship, with every living person either a crew member or a passenger. We don't know how long we've been gone, when we'll arrive, or even where we're going, but we do know that we have to survive on the supplies we have on board. In other words, we must be totally self-sufficient, or we won't survive. It's that simple. Total self-sufficiency is absolutely imperative for our existence.

This image hit many of us hard in 1969, after we saw the Apollo 11 pictures of our lovely blue home floating in the vast, cold, black sea of space. The message was clear: this is it; this is everything we have. There are no islands or other ports where we can take on fresh supplies of food and water. We must survive on what's on the planet now, or we don't survive at all.

We can no longer wear out the land, destroy the air and the oceans, use up all the resources, and then move on to virgin territory and new frontiers. There are no new lands to colonize. We've reached a new point in human history. Our only option for survival is to take care of what we have.

This view of Spaceship Earth is a haunting reminder that our planet must be self-sufficient: there is nowhere else to go. Everything we will ever have, except for the constant flow of energy from the sun, is right here, right now. Taking care of it and using it wisely is our only option for survival. (NASA photo)



The most frightening aspect of this realization is that while we must take care of what we have, we've already squandered much. We're already behind the starting line. The longer we delay, the more difficult it will be to keep up. We can't wait until the last drop of oil is gone to begin developing or using substitutes; we need the technology we have now, and its energy, to build new technologies. We can't wait until there is no more clean water or air to do something about cleaning them up; we can't save something we've already destroyed.

In other words, the common complaints, that alternative energy isn't cost-effective or that business can't afford to clean up the air and water, are looking only at short-term economics and using distorted logic besides. What's at stake are not profits or a standard of living, but survival. If we don't conserve and perhaps even voluntarily ration resources, the inevitable future nonvoluntary rationing will be that much worse.

The Desire to Change the World

We've just expanded the definition of self-sufficient living from providing for one's own needs to saving the world. Can I justify such a brash statement?

As the editor of a homesteading magazine for three decades, I met thousands of people in all stages of self-sufficient living. Most started out with very narrow, even selfish motives. They wanted to escape the rat race, provide a better life for their children, eat affordable organic food, and gain independence. The rest of the world was something they wanted to get away from, not something that needed their help.

Many didn't realize they were a part of something much larger than themselves. They didn't recognize that, deep down, what they really wanted was to change the world.

If you don't think the world needs changing and if you don't have a few ideas of your own about some needed improvements, you probably aren't very serious about self-sufficient living. After all, if someone doesn't mind the fast-food culture, government-encouraged consumerism, recalls of contaminated food, traffic, regimentation, ridiculous prices for ridiculous

houses and cars, global warming and climate change, credit card mentality, industrialized agriculture, dirty water and no water at all, mindless entertainment, slavish devotion to fashion (including technological)—in brief, if you don't mind what life has become in the twenty-first century, why would you want to avoid any of it by becoming more self-sufficient? It would make more sense and be so much easier to just sit back and enjoy it the way it is.

Which is what most people do, of course. If it ain't broke, don't fix it. Some of the side effects of civilization might be minor irritants or inconveniences, these people say, but they're certainly preferable to anything as drastic and laborious as self-sufficiency!

The truth is, some of the problems facing our spaceship are anything but minor. The system *is* broken. Repairing the damage will not be easy. And with so many people still unaware that there is a problem at all, progress is further hampered.

Variations on a Theme

We have established that self-sufficiency is impossible; long live self-sufficiency! If that's not confusing enough, it comes in many different forms and shades (mostly shades of green).

A quick overview of some of the more common ideas associated with self-sufficiency will ensure that we're all talking about the same things. It will also show how they are interrelated, and in addition, it will support the contention that the common thread that ties all of them together is a mission to save the world.

Self-Reliance

Some people who choose their words very carefully prefer to speak of "self-sufficiency" as "self-reliance." Being sufficient unto yourself is technically impossible, but *relying* on yourself isn't. Despite the subtle difference in meaning, we tend to use the two interchangeably.

Simple Living or Voluntary Simplicity

This describes a way of life that embraces the plain and functional, without embellishments. It can cover dress, housing, food, transportation, entertainment, and more. Being voluntary sets it apart from any simplicity imposed by outside forces, such as poverty. You can by-pass the establishment by producing some of your own necessities, or you can by-pass the establishment by reducing your needs through simple living. My Amish neighbors do both. Either one benefits the planet.

Voluntary Poverty

If so many people live in enforced, involuntary poverty and want out, why would anyone live in poverty on purpose when he doesn't have to?

I used to think this was extreme voluntary simplicity. Then I met some people who purposely limit their employment, not to buy time for activities they consider more important (which is now fairly common), but to deliberately limit their income. In most cases the limit is set in order to avoid paying income taxes that support the military industrial complex, but there can be other reasons.

People in this category are likely to be highly motivated. They provide a good example of what motivation, and attitude, can do for any situation.

Frugality

Some people hone saving money into a fine art, even while considering it a competitive sport. Frugality can mean eating from the garden and cooking from scratch, shopping at yard sales and thrift stores, and doing a lot of recycling, but the real tightwads, as they often call themselves, take it much further. Some can work absolute magic with coupons. Some take up dumpster diving. These people form wonderful mutual assistance networks brimming over with helpful ideas.

Tradition

Some people pursue simple, frugal, self-sufficient ways just because that's how they were brought up and they've never changed. Many lament they were born 100 years too late; they could easily live without the gadgets and gizmos that clutter our lives today.

Very often, these people grew up learning that extravagance was sinful or at least pretty dumb, which was normal during the Great Depression and for a long time after. They can remember parents, relatives, and neighbors being out of work, and getting a piece of candy and maybe a toy—one only—at Christmas if they were lucky.

A few years later they experienced rationing and Victory Gardens. The luckiest ones lived on subsistence farms or urban homesteads where they at least had enough to eat. You'll still hear some of them say, "We were poor, but we didn't know it because so was everybody else."

These people, born in the 1930s and before, are dying out and being replaced by generations that don't know carrots grow underground—with dirt on them—or that it's actually possible to survive without a cell phone.

One facet of this that's relevant to our discussion involves not only the scope of these changes but also the speed with which they occurred. Most of us have accepted the changes, but we still don't realize their impact on the natural world.

Homesteading

This is often the first thing that comes to mind when discussing self-sufficiency. The image of the sturdy pioneer family carving a homestead out of the wilderness is a powerful one, enforced by recurring waves of city folk going back to the land to give subsistence farming a try. I use it interchangeably with self-sufficiency partly because it's much more versatile to write with (self-sufficient has no equivalents for homestead-homesteader-homesteading). It's also a habit I've acquired over 50-some years. Mainly, it's a good word that telegraphs a vivid image.



Off the Beaten Path

The Homestead Act of 1862 gave 160 acres of land to anyone who moved onto that land and developed it into a farm, or “homestead.” By the time it ended, about 270 million acres of government land had been turned into 1.6 million homesteads. But end, it did. Don’t bother looking for any free government land today.

Urban Homesteading

Homesteading, modified for the city: a great concept for modern times. One obvious difference is the constraint on farm animals, although chickens have made amazing inroads in some urban areas. Space limitations dictate paying closer attention to intensive gardening, and water use and conservation usually assume greater importance in urban areas, often with different emphasis. For example, more water runs off urban areas—roofs, roads, parking lots—and affects storm sewers and sewage plants. Rain gardens are called for, to allow more water to soak into the ground. Most surfaces in the countryside are permeable, reducing the need for rain gardens.

Off the Beaten Path

It’s ironic and unfortunate that our image of the self-sufficient homesteader is so closely linked to the American pioneers. The Industrial Revolution, based as it was on constant growth, demanded new frontiers. Neither sustainable growth nor planetary rape held any meaning for the pioneer homesteaders who exploited the American West: they never dreamed that the vast hordes of passenger pigeons and bison could ever disappear!

They were willing but unwitting participants in the Revolution, which modern homesteaders are now rebelling against.

Green Living

The new kid on the block has quickly overshadowed the others. Of course, it must help that this one doesn't imply hardship or deprivation of any kind and has no connection with hard work.

But most of all, virtually every business of every kind that can possibly find a way to piggyback on a hot new marketing concept—on a par with apple pie and motherhood and possibly a bit ahead of the flag—has adopted and promoted it. It's impossible to avoid references to it, and nobody's going to argue with it.

In other words, it's a perfect term for how individuals can do their part to help save Spaceship Earth.

We can define green living as any action that has a positive impact on the environment, and this includes transportation. Paying four dollars for a gallon of gas got everyone's attention and focused that attention on fuel economy. Everybody wanted to be green, at least for a while.

Off the Beaten Path

Another definition of self-sufficiency is quite different from any we use. Among social workers, it refers to the income level at which a person or household no longer requires government assistance.

Recalls of spinach, tomatoes, peanut products, and other foods create added interest in food safety and focus attention on food production in general. Well-publicized water crises make it easier to accept water-saving toilets, showerheads, and other devices. Green shoppers avoid the "paper or

plastic?” conundrum by bringing their own totes. Cotton is organic; coffee is fair trade; cleaning products are eco-friendly.

Green living—being kind to the planet—is obviously a significant part of all the other forms of self-sufficiency. It’s somewhat limited for our purposes, but in general, it’s another handy term and concept we can make good use of. Most importantly, thanks to its role in marketing, its use is much more widespread and probably better understood than any of the others mentioned here. Green living is helping spread the message that Spaceship Earth needs to be self-sufficient.

On the Fringe

Many other ideas have connections with self-sufficient living or are important to large numbers of people involved in the lifestyle. Some that are readily apparent might include environmentalists and ecologists. Others might require further explanation: for example, vegetarianism and the slow food movement.

None of these actually deal with self-sufficiency, and their strongest supporters might not be the least bit interested in self-sufficiency. In the other direction, self-sufficiency involves many of them in one way or another. Most of all, they are important cogs in the machinery that is straining to save the world.

You might have noticed that planting a garden, raising livestock, and heating with wood or solar energy haven’t been mentioned much. Once, these were what self-sufficiency was all about. The world has changed. The ability to be a subsistence farmer—gardening, raising livestock, cutting wood—is not only less important to modern life but also much easier than it used to be. More to the point, it’s a much smaller part of being self-sufficient in a world teetering on the brink of self-destruction.

Think of it like sex in a marriage: it’s important, but not all that important. Not as important as some other things. We’ll get around to the sexy parts, but by then I think you’ll see them in a little different light.

Survival

Meanwhile, there is one more reason many people get involved in self-sufficient living. It's not often spoken of aloud, in polite company, but for many years it has lurked in the background, playing an out-size role. For most people, it's a little far-fetched, antisocial, and even embarrassing to admit considering producing any of their own needs as a means of survival. You aren't likely to be stranded on a desert island, so you won't need to be self-sufficient the way Robinson Crusoe was. But there are other ways to be shipwrecked in the modern world. You might lose your job. Savings can be eroded and swept away by the storms of life: unexpected medical bills and other disasters. Many mortgages are said to be "underwater," meaning the mortgage balance is higher than the value of the house. Foreclosures are common. Most people have watched their retirement savings get washed out to sea in a plunging stock market. An alarming number of people who were anticipating comfortable retirements will instead be going into survival mode.

In other words, you don't need any of the classic doomsday scenarios, such as nuclear Armageddon or a political uprising, to become a survivalist. Today that can mean merely wanting to put a little food on the table and stretching whatever money you have available to cover your basic needs.

On the surface, it might seem brash to assume that the economic upheaval of 2008 (and continuing) would have any place in a book like this one. As of early 2009, some economists are already predicting a "recovery" for later this year. It's well known that if all the economists in the world were placed end-to-end, they still wouldn't reach a conclusion, so this isn't a sure bet. However, I'm thinking of those millions of people who watched their retirement savings melt away as the stock market ravaged their 401(k)s. I see people older than me working at Wal-Mart, and I've been retired for more than 10 years. I know of younger couples who have lost their homes, and dreams of the future, to foreclosure.

Yes, most of the unemployed will find new jobs. Some of them might pay as well as the old jobs—maybe. House prices might rise again, somewhat, but almost certainly not to their bubble highs. Stocks will recover some of their value, eventually.

But it will all be too little and too late to help the vast majority, especially those in or close to retirement. The damage that has been done to the

psyches and pocketbooks of the majority of people is irreversible. They need another approach to survival, another avenue to the good life.

I'm suggesting that self-sufficient living, in one form or another, can be the answer to their current dilemma, as well as to the long-term problems facing Spaceship Earth. It can help stretch limited resources, but much more importantly, it can give added meaning to life.

Are You a Spaceship Crew Member, or a Passenger?

It's possible, even probable, that you don't see yourself fitting into some of these categories. If you picked up this book by mistake, maybe you don't fit into *any* of them.

In that case, you are not a crew member on Spaceship Earth. You're a passenger, along for the ride, but you have no responsibilities and no control over the ship's operation.

Some passengers go beyond ignorance of the operating procedures, beyond passively watching (or ignoring) the lifeboat drill, to downright mutiny. They refuse to accept the finite and nonrenewable nature of many of the resources we consider essential to our present way of life. They don't believe everything is connected to everything else and that their actions, and inactions, have widespread repercussions. They are, in effect, mutineers. They are urinating in our ship's freshwater casks, and we have no way to replace that drinking water.

It's time, and past time, to stop these mutineers. It's time to become more self-sufficient.

The Least You Need to Know

- True self-sufficiency is impossible; long live self-sufficiency!
- Self-sufficiency on a global scale is absolutely essential.
- A self-sufficient life has many parts, all of them some shade of green.
- The core of self-sufficiency is survival.

Chapter 2

The New Self-Sufficiency: Doing Without

In This Chapter

- Cutting back is easy, today
- The Maker Movement
- Living green
- The cult of accumulation
- The art of substitution

In the early days of self-sufficiency, the emphasis was on providing your own food, shelter, clothing, tools, and whatever else was needed for survival in a particular situation. Reducing needs wasn't given a thought. What could you eliminate when you had almost nothing to begin with?

Today we have the opposite situation. Most of the things we use (computers, light bulbs, batteries) are impossible for individuals to make. But most of us could get rid of half of our stuff and still live in luxury.

Today, reducing our needs is much easier than making anything, and it's essential for saving the world. It's the place to start self-sufficient living.

Self-Sufficient Living Saves Money

If it were possible to be truly 100 percent self-sufficient, we could all sail through life without spending a penny. That's not possible. But what if we could be, say, 10 percent self-sufficient? Could we get by with only 90 percent of what we spend now? And if that would work, why not go for 20 or 30 percent self-sufficiency?

It's an interesting concept, sneaking up on the impossible. But there are so many ways to save money when you're embedded in a consumer society like ours that frugality is hardly a constraint on gracious living. A

spendthrift couldn't even consider becoming self-sufficient; it's a contradiction in terms.

You can probably see what I'm getting at: it shouldn't make much difference to your comfort level if you *produce* what you want and need, or *reduce* your wants and needs so neither you nor anyone else has to produce them at all.

If you smoke cigarettes, you could become more self-sufficient by rolling your own or even growing your own tobacco. But what would be the point of producing your own cigarettes if you don't smoke cigarettes?

If you have any bad habits that cost money, you've probably already considered quitting. If you don't have any bad habits you can think of at the moment, keep track of your spending for a month or so, and look for purchases you could defer or delete. It's surprising how often a difficult deferment later becomes an easy deletion.

Off the Beaten Path

Because consumer spending has accounted for some 70 percent of the American economy, "conventional wisdom" suggests that in a down economy, consumers should spend more, not less, to get things back on track. President Bush went so far as to encourage citizens to help avert a recession by doing more shopping. The industrial economy can't survive without constant growth, which requires constant buying.

It's tough to shop more when you're already in debt or unemployed or worrying about it. But not buying goods puts still more people out of work, and it becomes a downward spiral. This, of course, is part of the fallacy of the entire system: continuous growth is impossible.

No matter where such a scenario eventually ends, the more you can provide for yourself—or do without—the better off you will be.

Bad habits are a good place to start, but you don't have to confine this exercise to them. The idea is simply that a penny saved is a penny earned. You can cross a need or a want off your shopping list by buying it, providing it in some other way (making or growing it), or simply crossing it off because you decide you can live without it.

Reduce, Reuse, Recycle

Crossing it off is pregnant with possibilities. The bad habits are easy to spot, if not always easy to eliminate. But also remember the old Depression saying: "Use it up, wear it out, make it do, or do without."

As of early 2009, the shoe repair business is booming. New car salesmen are sitting idle while auto mechanics are scurrying, keeping older models running. People who might have been building new homes are remodeling instead, and not many are extreme makeovers. This return to frugality surprises some people; those who have been frugal all their lives wonder what all the fuss is about and why it took so long.



Lore of the Land

Many appliances and other goods are sent to the landfill simply because they don't work and nobody bothers to repair them. The next time something goes kafooey at your house, check out www.fixitclub.com to see what's involved. It might be a lot simpler than you expect. You'll save money, keep something from the landfill, and eliminate the need for making a

replacement. You might even enjoy fixing it and feel a tinge of pride as a bonus.

You aren't likely to make your own toaster, blender, or coffee maker. You aren't going to become self-sufficient that way, like the pioneers did when they made their own bullets and Bowie knives. But if yours goes on the fritz, can you at least repair it? That would be a more attainable form of self-sufficiency.

The fact that so many items are not repairable, at least not without technical school training and a king's ransom in specialized tools, is part of the problem of unsustainability.

Some people are rebelling. Their credo: if I can't fix it, I don't own it. They simply refuse to buy products they can't repair or that are made to be disposable.

Many products are designed to be discarded. By definition, then, they're junk before you even take them out of the box. Junk is cheaper to manufacture. If it costs as much to repair something as to buy a new one, few consumers are going to waste money repairing anything. This keeps both the store shelves and the landfills well supplied with junk. It's also the kind of junk thinking that fuels the economy.

The Maker Movement

Many innovations have come from tinkerers in basements and garages, as opposed to the scientists and highly trained technicians in the laboratories of multi-billion-dollar companies.

Tinkering is nothing new and certainly isn't unusual in America. Ben Franklin was a prime example, with his stove, bifocals, lightning rod, and even swim fins. The Wright Brothers built the first airplane in conjunction with their bicycle shop, and the first personal computers were built in home workshops.

It has always seemed to me that most of the goods and tools the world really and truly needs aren't going to originate in great universities and

well-equipped corporate labs. Instead, they're going to come from some farm kid tinkering in a shed, like those who made farm tractors out of Ford Model A trucks and wind electric generators out of water-pumping windmills during the Depression. But then, rare was the home that didn't have a workshop, the tools, and the skills to repair virtually anything in the house or barn. That was a part of the self-sufficient living of the times.

By the 1960s most of those shops and skills and the self-sufficiency fell victim to planned obsolescence. But today they're coming back.

A group of tinkerers who call themselves "Makers" are against planned obsolescence, which means practically everything made in a factory in the past 25 years or more. If something breaks, they want to fix it, even if it voids the warranty.

Make magazine (www.makezine.com) is credited with organizing this dissatisfaction into a movement. Most of what's in the magazine, on the web, and at their annual Maker Faire (www.makerfaire.com) seems geared more to fun and games than saving the world. One example is using an obsolete VCR motor to power an automated cat feeder. The pedal-powered snowplow is closer to what I had in mind.

Although whimsy predominates, the more serious aspects are gaining recognition and respect. One of the movement's leaders, a man known only as "Mr. Jalopy," is behind the "Owners' Manifesto" or the Makers' Bill of Rights. Among the 17 points are such ideas as "Ease of repair shall be a design ideal, not an afterthought" and "profiting by selling expensive special tools is wrong, and not making special tools available is even worse."

The ranks of the Makers are growing as is their influence on manufacturers. Some big companies are listening: they screw parts together instead of gluing them. Glue is cheaper, but then the Maker has to saw the thing apart to repair it.

Frugality and sustainability—common sense—might return to household appliances. And that will make everyone more self-sufficient.

The Accumulation Habit

Disposable stuff is a major part of the consumer culture, but so is accumulation. I can safely pick on clothing as an example because if it weren't for my wife, my clothing expenses would be next to nothing. Maybe they are, anyway, and she doesn't spend much on herself, either. How can anyone fill those walk-in closets that are larger than some people's bedrooms? Do they actually wear all that stuff? Not more than one at a time, Thoreau would remind us. The waste is worse if they paid more than thrift store prices for any of it or paid more just because of a name on the label.

Off the Beaten Path

The average American woman has 30 pairs of shoes (6 percent admit to 50-plus pairs) and an annual clothing budget of \$1,729. Of course, the "above average" woman will spend that much on a single frock or handbag.

Fashion is a \$200 billion a year industry in the United States, but it's fallen on hard times since the recession. Based on what I've heard from homestead women over the years, my guess is that most of them won't even notice.

The truly self-sufficient person might shear the sheep, card and spin the wool, and make it into a garment. Although that might be somewhat more complicated than killing an animal, tanning its hide, and making that into clothing, neither one makes much sense in the twenty-first century. Why not just go to Goodwill or a yard sale? Recycling is a much better option for self-sufficient living than making something from scratch if there's no need to make it anyway.

But just because clothes are easy to acquire doesn't mean anyone should accumulate more than any one person could possibly need to keep warm and decent. It doesn't make sense to be a slave to fashion, keeping up with seasonal changes and the whims of designers.

Once you eliminate things you don't really need, the list of things you might want to produce for yourself is much shorter. You're that much more self-sufficient.

Green Healthy Living

For some people, Green Living provides its own justification; it needs no other. In many cases, instead of saving money, they willingly pay extra.

Organic foods are a component of self-sufficiency even when purchased at a cost greater than a similar nonorganic product, if only because they are considered more sustainable. They cost more in part because they don't use the energy subsidy that keeps agri-industrial foods cheap: the chemicals and machinery that result in using more calories of energy to produce the food than the food itself contains. Ideally, organic foods help support local small farmers while closing the purse to industrial agribusinesses.

Look at it this way: your money goes to help a neighbor be self-sufficient instead of supporting big businesses that spend it on machinery and peon labor, most often with much greater carbon and water footprints. Food grown, processed, and delivered without inputs that damage the environment and social fabric are obviously kinder to the Earth and more sustainable.

Growing our own is even better, as this further reduces packaging, transportation, and marketing costs, all of which impact the environment. Happily, food production is one of the areas in which we can most easily become self-sufficient, and growing it organically is as easy as growing it the way the agribusiness industry does it. The home grower has no need for, and couldn't even benefit from, the economies of scale the giants depend on to turn pennies of savings into billions of dollars of profit. The *unsustainability* of those agribusiness growing methods is also a concern in light of their heavy use of petrochemicals and water.

def•i•ni•tion

Unsustainability is the certainty of utter collapse. Sustainability is the ability of anything to continue or to be continued.

Some people prefer organic or homegrown produce simply because they think it's fresher and tastes better. They're willing to pay for quality. If it actually promotes health, as some claim, that's another form of *sustainability*.

Somewhat related, the home gardener can often enjoy exotic or specialty vegetables that are expensive or unavailable in the markets. This little indulgence might not be very important to people who eat to live, but it's certainly a perk for those who live to eat ... who grow things and cook them. Many fruits and vegetables are delicious but don't ship well, don't have a long shelf life, or are simply too unfamiliar to be in demand. (These are also good prospects for income producers to sell at local markets.)

This might seem like the opposite of cutting back or reducing consumption, but in this case we have no additional cost or harmful effect on the environment. For those who enjoy such things, it's just a little perk that does no harm to anything or anyone and might compensate for other deprivations.

Eliminate Idleness; Increase Leisure

North Americans have very little leisure time. It's almost a cliché: breakfast grabbed in the last-minute mad dash through the kitchen, lunch wolfed at the desk or drive-through, and take-out or frozen nuked supper gobbled with the whole family seldom together before all rush off to various meetings and engagements and later fall into bed.

Whoa! Slow down and smell the flowers, the sweet smell of new-mown hay, or the heady aroma of good earth after an early morning shower. You might even enjoy the aroma and sounds of a well-kept barn while you do evening chores.

Many so-called "primitive" people, whom we usually think of as spending their dreary days grubbing for something to eat (along with building their

own homes, making all their clothes, tools, weapons, etc.) had plenty of leisure time for arts and crafts. Some made beautiful pottery and statuary or fancy beadwork, and they enjoyed making music and dancing.

How many harried people today do anything remotely like that? Our touted technical knowledge consists of being able to operate a computer (maybe), and our “culture” means little more than knowing red wine goes with meat and white wine goes with fish (maybe).

When Work Is Play

Our hectic schedules and bondage to the industrial complex leave little time for real living . But many aspects of self-sufficient living not only give us the opportunity to slow down and relax; they almost force us into it. This is especially true on a homestead.

It’s virtually impossible to hurry milking a cow or goat. The animal works at its own pace, and the milker has to follow the rhythm. And what a rhythm it is! If you’ve ever milked an animal with your forehead pressed into the soft, warm flank and listened to the animal crunching its grain and milk swishing into the bucket, maybe having some background music consisting of cackles and crows or moos or baas as you watch the sun just starting to peek over the horizon ... then you know what peace and contentment is.

Some people think weeding the garden is boring, and it can be. But then, weeders with the right attitude think sitting on the beach is boring. I don’t know what other people think about while they eliminate the lambsquarters from the lettuce, but I can tell you my thoughts are far more interesting than any rerun of *Gilligan’s Island*.

With more strenuous tasks, think golf. If I ever swung a golf club, the results would probably be the same as using a garden hoe anyway, so there really isn’t much difference. Except, in the spirit of green and frugal living, I didn’t burn gas or precious time getting to the golf course; it didn’t cost me anything to play; and when I’m finished, I’ll have a nice bowl of lettuce (or maybe lambsquarters) to show for my efforts.

This is neither producing nor reducing; it’s substituting. And it’s another part of the new self-sufficiency.

When You're the Boss

For many lucky people, it gets even better. Substitute a home business or any form of self-employment for the restrictions of a nine-to-five job, and self-sufficiency soars.

I started The Countryside Print Shop with a small offset press in the bedroom of our farmhouse. When it made enough money to support us, I quit my town job as a writer. I immediately saved the 20-mile one-way commute: time, money, wear and tear on the car, fossil fuel, and pollution. It took less time to don my jeans and boots than it previously took to put on a shirt and tie. There was less laundry, dry cleaning, shoe shining, and clothes shopping. I saved even more time by not shaving.

Instead of taking a break at the water cooler discussing last night's television shows, my breaks consisted of gathering fresh eggs or pulling a few weeds. Instead of buying lunch in town, I simply took a stroll in the garden and picked a ripe tomato or a few peas or beans. Most of these activities saved money, so that also meant I had to earn less.

Even better, my wife, children, and I partnered in all these endeavors. We had no day care. The kids learned how to gather eggs, feed rabbits, pull weeds, and milk goats at an early age. They also learned their way around a print shop, and two of them now operate a successful publishing company. If we wanted to take a day off to go to the zoo or to visit Grandma, we didn't have to clear it with anyone; we just went. The work was still there when we got back.

And which job do you suppose was less stressful, more leisurely, more satisfying and fulfilling, even though it barely paid a "living wage"?

Working from home is probably the ultimate goal and nirvana for the homesteader. But a home business isn't the only option. Many a homesteader has spurned a lucrative high-pressure career for something that pays less but offers more freedom and personal satisfaction. You've probably heard of former lawyers who now run B&Bs or tycoons who've turned their attention to baking artisan bread.

Today millions of workers are underemployed without recognizing it as an opportunity. Most probably don't have the temperament or the resources to

make lemonade from the lemon, but for those who do, it's an idea worth considering.

Even those not inclined to go into business, as such, can easily profit from their enforced leisure. Growing food, cooking from scratch, making and repairing things, mending and sewing clothes, all can be worthwhile and even valuable activities. Any of them would be better than sitting in front of the television or feeling useless.

Riding the Hobby Horse

We've had "gentleman farmers" ever since the Industrial Age began—men of means who made fortunes as captains of industry but still wanted to be associated with the land. In some cases, we are told, they were gentlemen farmers because their wives wanted to live in the country.

Nowadays, people of more modest means have hobby farms and ranchettes for similar reasons. In fact, some experts say we can trace lush lawns in cities and suburbs to common people wanting to identify with the landed aristocracy.

Those who earn their livelihood on the farm might find it hard to fathom why anyone would call it a hobby. In many cases, the farm is a normal one that loses money, that's then replaced by a job in town. It's still too much work to be called a hobby in any usual sense of the term, and it certainly isn't sustainable or self-sufficient.

Homesteads are not called hobby farms by those who live on and operate them. Hobby farms are playthings for rich folks; homesteaders are too simple and frugal to be called rich. And their quest for self-sufficiency is a mission, not play.

Yet, it's interesting and important to note the similarities. Living beyond the sidewalks in the countryside, with all its amenities and without being dependent on the farm economy, isn't just for the wealthy. Homesteaders might be deadly serious about what they do. They might be reluctant to call it a hobby, and some even resent the term. But honestly, there isn't a great deal of difference. So why not just relax and enjoy it?

Which is wonderful. Striving toward self-sufficiency needn't be a bore and a chore; it can be the equivalent of the country squire's hobby.

Off the Beaten Path

Rabbit breeders who groom and show their prize animals have often joked that their hobby is the equivalent of the rich man's racehorse stable. The same could be said for goat and poultry breeders as well as others. The challenges of using genetics to breed a superior animal, practicing good management to fulfill its potential, and then competing and hobnobbing with like-minded individuals at the shows are the same in all these cases. The main difference is the size of the bankroll involved.

“Making your own” in the twenty-first century no longer applies very much to homespun clothes and handmade tools. On the other hand, it does apply to things like leisure, entertainment, and relaxation. That includes status, whether a blue ribbon for a champion rabbit or an attractive and well-kept country dwelling others might admire. All of this can spread from many different homestead activities.

Cut the Ubiquitous Lawn!

The American lawn deserves a section of its own in this discussion. It also deserves to be reduced, substituted, or eliminated by just about every parameter of self-sufficiency I can think of. Consider these facts:

- Americans spend \$28 to \$40 billion a year on lawn care, more than the GDP of entire countries such as Vietnam and Iceland.
- The average homeowner spends 40 hours a year—one whole workweek—on lawn care.
- The Environmental Protection Agency (EPA) estimates that lawn mowers use 800 million gallons of gas per year.
- Seventeen million gallons of gas per year are spilled refueling mowers: the Exxon Valdez spilled less than 11 million gallons.

- One gas mower running for one hour creates as much pollution as eight new cars going 55 mph for one hour.

There's more, much, much more. America has at least twice as much acreage in turf as in cotton. Accidents from lawn mowers nearly equal those with handguns. Turf, including golf courses, uses enormous amounts of water.

But if you're already convinced that vast lawns are a senseless waste of resources that even the new EPA regulations on mowers and increasing restrictions on lawn fertilizers won't help much, what can you do?

One solution that has been gaining steam for several years is natural landscaping. In dry climates it's xeriscaping or using drought-resistant plants, while in many other regions prairie plants and wildflowers do the job. Prairies require a lot of input to establish, and to the indiscriminating eye they're often equated with unkempt weedy lawns, but once established, they are both carefree and highly attractive. (The fact that some places have regulations about lawn care is another indictment of our society.)

Another possibility is edible landscaping, which is self-descriptive. Front yard vegetable gardens don't have to look like vegetable gardens. With a little creativity, they can be as beautiful as flower gardens. Most nongardening passers-by won't know the difference anyway. Many varieties of eggplant, peppers (green, red, yellow, and black), and cherry tomatoes are all excellent choices.

Off the Beaten Path

The anti-lawn movement is growing as demonstrated by the number of books devoted to it. Read Ted Steinberg's *American Green: The Obsessive Quest for the Perfect Lawn* (W. W. Norton, 2006) for starters. Then there is *Edible Estates: Attack on the Front Lawn* by Fritz Haeg and others, documenting some of the gardens in the Edible Estates Project which architect Haeg launched (Metropolis Books). Activist Heather Coburn Flores takes a more radical approach in *Food Not Lawns: How to Turn*

Your Yard into a Garden and Your Neighborhood into a Community (Chelsea Green).

Ground covers are another option. Depending on the site (climate, soil, sun exposure, and rainfall) you might choose from various ivies, lamiums, sedums, or others.

In some cases, strolling paths or narrow strips of lawn curving amongst mixed borders containing trees, shrubs, flowers, and even vegetables, can create wonderfully landscaped grounds with minimal turf area. My own creation combines many kinds of conifers, other trees and shrubs, lots of spring bulbs, ornamental grasses, and both annual and perennial flowers, with a lawn area that gets smaller every year. It keeps an old man harmlessly and happily occupied for hours at a time, without mowing grass.

McMansions

For many people, reducing the size of their homes would be unthinkable. But when you consider the economic and environmental cost of some of the faux castles built in recent years, the potential is awesome.

Although we talk more about housing later, it's worth noting here that when it comes to reducing your needs, shelter offers more possibilities than just about anything else. Whether you're buying, building, or remodeling, you can consider everything from size and materials to insulation and water use. If you are already happily nestled in at a place, it's still worth checking into potential heating, cooling, and water savings.

The Least You Need to Know

- Reducing your needs often works better than trying to produce everything you need.
- If you can't be self-sufficient in an item, buying it from a local producer at least supports that person's self-sufficiency.
- When gardening and animal husbandry are pleasant hobbies, it's hard to know if you're working or playing.

- Self-sufficient living can provide worthwhile goals, with attendant psychological benefits.

Chapter 3

The Philosophy of Self-Sufficient Living

In This Chapter

- In the beginning ...
- The modern homestead era
- Communities and utopias
- Frank Lloyd Wright, homesteader
- The slow food movement
- The real bottom line

Whether you're interested in self-sufficiency because you'd like to build a log cabin from trees you cut down yourself or because you'd like to save a little money on your grocery bill, a certain philosophy is involved. Some of these ideas might or might not match yours exactly, but at least one is certain to catch your fancy.

In the Beginning

In the beginning, all living was simple, and everybody was pretty self-sufficient. People had no infrastructures and few others to rely on.

It didn't take long for some independent types to find even the simple living of those times a bit much for their tastes. When most of their contemporaries lived in huts, they went back to the caves or out into the desert to get away from it all.

These hermits were often on spiritual quests. Although generally rejected now, the tradition of Jewish asceticism goes back thousands of years. Christianity, Islam, Jainism, and certainly Buddhism, also have long traditions of enduring harsh living conditions in order to progress spiritually. ("What doesn't kill you makes you stronger.")

But many examples have nothing to do with religious spirituality. The Spartans practiced severe physical self-discipline, not for religious reasons but to prepare for battle. Ignoring their motivations and subservience to the state, we still use “Spartan” to refer to a rather harsh lifestyle.

Closer to our own times, Friedrich Nietzsche, Vincent Van Gogh, Vladimir Lenin, and most famously, Henry David Thoreau, were all involved in asceticism to one degree or another because they felt it allowed them to attain mastery over themselves. It freed them from compulsions and increased both mental and physical strength and well-being.

It often appears that today’s self-sufficiency is more closely related to these philosophers than to the pioneers and homesteaders more commonly associated with the lifestyle. The goal isn’t just to live off the land or the homestead; it’s not just to escape the maddening world. The aim is to live life better, which usually involves circumventing established society, perhaps even pointing out its flaws, and certainly trying to live without them.

Off the Beaten Path

It’s ironic that self-sufficient living is so often linked with the American pioneers and homesteaders. Self-sufficiency wasn’t their goal; on the contrary, they were the exploiters we now rail against! They plowed the prairies, creating the Dust Bowl; they welcomed the railroads and civilization; they set the stage for vast irrigation projects and others that now endanger Spaceship Earth’s ability to be self-sufficient. In so many ways they were the very opposite of our ideals today.

This suggests that our true spiritual forebears were not rugged pioneers but rather philosophers.

Communities and Utopias

In many instances throughout American history, people with ideas that went against the norm gathered together in like-minded communities—hundreds of them. It might surprise you to hear there are even more today, and that's without counting such groups as the Amish.

It's much easier for a community to be self-sufficient than it is for a family or individual. Many jobs require more than one person, and some take a village. Almost all are more fun, and sometimes more efficient, when shared. And then we have division of labor, along with specialized skills. Most of all, there is strength in numbers. The question and problem is, what's the optimum? How many is too many, and how big is too big?

The most famous and arguably successful communities of the past are no longer in existence: Oneida and Amana, for example. Nevertheless, some of those played important roles in the evolution of self-reliance and are certainly part of the history.

The majority, and the best-known, were religious and utopian. However, their basic purpose and daily functioning were closely aligned with what today we could call voluntary simplicity. They were formed, and people joined them, in reaction to real or perceived shortcomings in the outside world.

In the modern era, this came to the fore with the hippie communes of the 1960s and 1970s. While it's possible that most of those people had no real idea what it was all about, the movement was rooted in the feeling that civilization had somehow gotten off the track. That suspicion persists and is behind many a quest for self-sufficient living today, individually and communally.

Off the Beaten Path

Some historians say the first “hippies” were part of a German youth movement between 1896 and 1908. *Der Wandervogel* (migratory bird) rejected rapidly spreading urbanization and embraced the pagan back-to-nature spiritual life of their ancestors. They also emphasized amateur music, creative dress, and communal outings.

Shortly after, numerous Germans settled in the United States, many bringing the spirit of Wandervogel with them, especially to California.

The religious fervor of historical intentional communities was replaced by an equally strong desire to save the planet. Some might say there isn't much difference. Although no two communities are alike, organic farming and ecological concerns were, and are still, a common bond.

The Fellowship for Intentional Communities listed about 900 communities in 2007, with an estimated 100,000 members. According to one source, in the 1840s 100,000 people were living in more than 150 socialistic/utopian communities; an interesting comparison. Some, such as The Farm, Twin Oaks, and Ecovillage at Utica, have been around for decades and are still thriving, but new ones are appearing and disappearing constantly.

There seems to be at least a trace of asceticism in many of today's seekers of self-sufficiency. At any rate, they don't have much use for what the consumer society considers luxuries. One homesteader told me a luxury is a new set of guitar strings, a new chain for the saw, or new underwear. It doesn't take much to make a simple person happy.

But self-flagellation is hardly the goal. The raw, deep-down ultimate prod is the suspicion—or conviction—that The Establishment is missing something important, that there's a better way to live.

We can take a closer look at this in two quite dissimilar examples: Frank Lloyd Wright and the anti-McDonald's driven slow-food movement.

Frank Lloyd Wright, Architect and Homesteader?

Most readers are probably familiar with the name and maybe the work of Frank Lloyd Wright, called by some "the greatest architect who ever lived." Fewer will know of his interest in homesteading.

Of course, he was born and grew up on a homestead, which is what a small farm in Wisconsin would have been in 1867. But his Taliesin, in Spring Green, Wisconsin, was as much a homestead as a school of architecture.

The students spent nearly as much time in the gardens and fields as at the drafting tables.

The Architect's Root Cellar

Wright was much in the news during my youth and, in fact, sparked a brief interest in architecture as a career. But what I most remember is his poetic description of a root cellar. (He designed many homes with root cellars.) In his 1943 autobiography, he wrote that they had put up (in 1942) one thousand quarts of tomatoes, along with many hundreds each of green beans, peas, and other vegetables. His description must have made quite an impression on me because I've loved root cellars ever since and consider them a natural extension of the garden and an integral part of a home.

The cellar at Taliesin was accessed by a tunnel leading to an arched door in a masonry wall, where you switched on the light. The sight that met the eye, he said, was "a treasure-filled cave, not unlike Aladdin's."

To the left, potatoes, squash, beets, carrots, cabbage, onions, parsnips, and rutabagas were piled on the sand floor. Dried herbs hung from the ceiling.

To the right were bushels of apples and jugs of cider and vinegar as well as rows and rows of jams, fruits, marmalades, jellies, sauces, pickles, vegetables, and sauerkraut, and his wife's wine casks: rhubarb, elderberry, dandelion, and potato, as well as both tame and wild grape. There was also plum brandy and chokecherry mead.

Broadacre City

More than 500 of Wright's designs were built, including the well-known Johnson Wax Building in Racine, Wisconsin, and the Guggenheim Museum in New York, neither of which have root cellars. Many were "Usonian" homes, but many more were not, including his most ambitious dream, Broadacre City.

Broadacre City wasn't designed for a specific site; it was more like a developer's plan for the entire country. Neither was it a city. Wright firmly believed that every man deserved one acre of land and an automobile. The

land was for growing his own food, some of which he would, of course, store in the root cellar.

The plan included community gardens, walking trails, parks, and green spaces. Property lines and building sites were dictated by the contours and natural features of the land, not according to the Jeffersonian surveyors' grid. Each town would be self-sufficient, with growth limited by the water supply and tillable land.

The homes—Usonian, nobody seems to know where that word came from—were designed to be owner-built at a cost of under \$5,000 (in 1935). Everyone living in them would have the time and skills to be a part-time farmer, a part-time mechanic (worker), and a part-time intellectual. Wright used the term homesteader to describe these people. A mix of physical and mental labor would be a part of everyone's daily experience. On his own land, a man could “never be unemployed or a slave to anyone.”

Small factories, owned by entrepreneurs or the workers themselves, were an integral part of the city, as was the Roadside Market. This was a permanent country fair, where each producer had his own stall, selling locally made products for local use. With restaurants and cafés, it would be a social, business, and educational center.

Off the Beaten Path

The first Usonian home was built for a Madison, Wisconsin, newspaperman, Herb Jacobs. He also wrote a book on country living and was teaching at the University of Wisconsin School of Journalism when I was a student there in the 1950s. The house cost \$5,000, including Wright's fee. Because he was a low-paid journalist and Wright was a famous architect, Jacobs partially paid for the house by charging 50¢ admission.

A Plan for the Future?

It might be tempting to say that in the depths of the Depression, Frank Lloyd Wright predicted the suburbs, shopping malls, and superhighways that wouldn't actually be built until after World War II. That wouldn't be accurate, although some of his philosophy must have had an influence.

He was in many ways an odd character and an abrasive one with many enemies. These included J. Edgar Hoover, who had no use for people with socialistic tendencies and who probably saw that the world's greatest architect never got a single government contract, not even during the height of the Public Works Administration. Wright once said, "Early in life I had to choose between honest arrogance and hypocritical humility. I chose the former and have seen no reason to change."

Nevertheless, his Usonian homes were among the earliest environmentally sensitive designs, making use of passive solar heat, natural cooling and light, radiant heating, and an L-shaped floor plan embracing a garden terrace.

Except for his introduction of the living room and carport, the open design concept, and a few other snippets of the Usonian home, Wright's ideas simply didn't take off. Many architects and others have wondered why.

And except for his love of the automobile, which played a large role in Broadacre City, the general plan and the philosophy behind it is one most people involved in self-sufficient living could easily accept if it were revived today.

On the Fringe

There is more to self-sufficiency than providing for your needs by growing your own food and some of the other activities we've mentioned. Just as importantly, other activities contribute to the interest in self-sufficiency, to its realization, or both. As such, they are links or stepping-stones leading in both directions.

One is the Slow Food movement. As an organization, its political objectives raise some eyebrows. It is said to be anti-technology and anti-globalization, but that could probably be said about self-sufficiency in general. Its broader objectives, however, would fit into almost any homesteader's agenda. These

include the use of local, traditional, organically grown foods; teaching gardening skills in schools and prisons; and preserving heritage plants and livestock. It's against biotechnology and genetic engineering, chemical pesticides, and factory farming in general.

The name itself appeals to the homesteader. Slow food suggests the opposite of fast food, and indeed, it started as a protest against a McDonald's being built in Rome, Italy. That in turn implies fresh, home- or locally grown products, lovingly prepared by caring individuals in a home kitchen or its equivalent, and consumed by a closely knit and convivial group in a leisurely fashion. It's hard to argue with that. Just picturing it makes me feel warm and cozy and a mite hungry.

As with so much of self-sufficiency, the point is subtle and multifaceted. There is the eco consideration of consuming food that hasn't traveled thousands of miles, probably from an area of intensive irrigated monoculture and its attendant chemical usage. There are the social considerations: eating locally usually benefits small family farmers, keeps money close to home, and doesn't exploit workers. Such food is often purchased at farmers' markets or through CSAs (Community Supported Agriculture), and therefore promotes interaction between the producer and consumer.

Off the Beaten Path

Closely associated with slow food is eating locally. Some have taken "the 100 mile challenge"; that is, they endeavor to eat only what is produced within 100 miles of their home. And according to those who have done it, it's neither difficult nor a problem. (People in northern Wisconsin who enjoy bananas and olives might differ, but only to a degree.)

Getting to the Bottom Line

If self-sufficiency is so great, why isn't everybody doing it?

One obvious reason is that not everyone is attuned to the ideals involved. Those who feel called to serve humanity by laboring in the fields of the Wall Street gambling establishments (sometimes formerly known as investment firms) probably aren't very interested in simple living. Taking home tens of millions or even hundreds of millions of dollars a year doesn't indicate an interest in frugality. Neither is the average MLB player who gets over \$2 million a year for working—playing?—part-time likely to find fulfillment in homesteading.

A far larger number of people don't have nearly that much money but wish they did. The only form of self-sufficiency that has any appeal for them is the kind that might come with winning the lottery so they could quit their jobs.

The System Makes It Difficult

But something far more pervasive, foreboding, and insidious keeps people away. That is The Industrial Establishment or Complex or The System. It's the embodiment of Pogo's famous saying that we have met the enemy and he is us. It can discourage people from even thinking about self-sufficiency and thwart those who try anyway. Here's how it works.

Self-sufficiency on a family or clan scale was fine for hunter-gatherers. But when agriculture advanced and specialized skills and trades were developed, self-sufficiency became not only less necessary, but more difficult. Farmers grew the grain; millers ground it into flour; bakers made the bread. Everyone depended on many others for even their basic needs, and as the definition of "basic needs" expanded, even the possibility of self-sufficiency contracted. Today it's virtually impossible.

By the time the Industrial Revolution was in full flower, these interactive webs were so thick that tracing any one of them was beyond comprehension. Just making the attempt inspires awe of the marvelous complexity of it all. And to think it just happened without a master plan or grand design of any kind is truly astounding.

For example, consider how a box of cornflakes arrives on your breakfast table. A farmer plants and harvests corn and hauls it to a mill; there the corn

is processed into flakes, packaged, and sent to the grocery store where you drop it into your shopping cart. It's simple.

But how was that farmer able to plant that corn? Rest assured it involved more than a mule and a one-bottom walking plow. His tractor might have cost \$100,000, so you know it wasn't a simple machine made in a blacksmith shop. It might be referred to as Big Iron, but it's also made of copper, various other metals and alloys, many kinds of plastic (made from petroleum), glass, rubber, fabrics, and paints, all of which required miners, smelters, engineers, designers, and accountants. Every step along the way, we need salesmen, truckers, and paper: paper for ads and orders and sales slips, for owner's manuals and legal contracts, and for bathrooms.

And bankers! Don't forget the bankers. Just mentally add them in at every one of the steps I mention.

But we haven't left the farm yet. The farmer needs more than a tractor. A combine alone will add another \$100,000-plus, and he can't get the crop in the ground without some form of tillage equipment and a planter, all with the same web strands that we attached to the tractor. He'll use hybrid seed, developed by crop geneticists, which he cannot grow himself. That requires another farmer entirely.

Then add fertilizers, pre- and post-emergent herbicides, and insecticides, along with all the diesel fuels and engine lubricants, gear oil, hydraulic oil, and grease.

A truck takes the harvested corn to market by traveling on a highway. The highway is designed, built, and maintained by workers sitting at desks, driving trucks and graders, or wielding everything from shovels and brooms to gigantic backhoes and bulldozers to lane-painting machines. The police patrol the highway to promote safety, and if that fails, the nearest EMT is usually only minutes away.

And all these use paper, too, and computers and telephones.

The Fallacy of Constant Growth

You can imagine how far we could drag this out if we hadn't already made the three points behind it:

- The economic system is an awesome web of complex interrelationships.
- It's easy to see why self-sufficiency is impossible today.
- With all that involved, how in the world can they sell that box of cornflakes for a paltry 21¢?

Oops, that was a slip! I always think of cornflakes costing 21¢ a box because I can still envision marking them with a purple rubber stamp when I worked in a grocery store. But that was in the early 1950s. Today a box of cornflakes costs more like \$5.00, and that introduces another problem.

The system requires constant growth in order to survive. Since the 1950s, farmers have been told, including by a secretary of agriculture, to “get big or get out.” Company mergers have become commonplace and even seem to be essential for survival. We’ve come to take annual raises for granted. Of course they are necessary! Annual increases in the cost of living also are taken for granted.



Watch Your Step

When a politician says a business is too big to fail, beware: the real meaning is that it's too big to be *allowed* to fail without disrupting the webs that hold The System together. Eventually, artificial props and crutches must collapse. The longer it takes, the bigger the crash.

Throughout the entire system the mantra has been growth; to stagnate is to perish. I heard this constantly in every business I was ever involved in, including printing, publishing, retail, mail order, advertising, and, of course,

farming. I didn't *want* to have the biggest magazine on the newsstand; I just wanted to get my message out with a small number of helpers, all of us making a comfortable living, without sacrificing our personal lives. "No, no, no," the experts said, "if you stand still, you're going backward. Go backward and you're dead."

As a homesteader, I know nothing can grow forever. Oak trees get bigger than plum trees; standard chickens are larger than bantam chickens; beefsteak tomatoes weigh more than cherry tomatoes, but every category has limits.

The only thing that grows unchecked, at least for a while, is a cancer. The cancer dies when it kills its host. The cancerous growth that is our economic system has depended on a never-ending supply of resources to feed it. When those resources are gone, the cancer will also perish.

The trouble is, depleting the resources will not only stop the economic system, but the rest of society and civilization as well. We can devise another economic system, but we can't exist without Earth's resources. Therefore, our only hope for survival is to stop the cancer before it depletes the resources that feed it, and us. The world must learn to thrive without an economic system that depends on constant growth.

Constant growth is not sustainable. Sustainability is the keystone of self-sufficiency. Therefore, some form of self-sufficiency could cure the cancer. Just as there are limits to growth, there are limits to economies of scale (called *diseconomies of scale*). There is no such thing as too big to fail. That's a political invention and a fallacy. If we haven't reached the limit yet, we will. It's part of the natural order.

The problem is that as those limits are stretched, self-sufficiency becomes more and more difficult.

The Faulty Accounting System

"Nobody buys garden tillers anymore," a tiller dealer complained to me a few years back. "Why bother planting a garden when you can buy a can of vegetables for under a buck?"

Why, indeed. If you actually figure all the input costs involved, not many homegrown products can compete on price with store-bought. This is what

the industrial agri business complex holds up as a shining example of the wonderful job it's doing: food is ridiculously cheap.

The problem lies on the other side of the equation. The industrial agribusiness complex does *not* honestly account for all involved input costs. Bean counters tally only the dollars they can measure, quantify, and record on an artificial and arbitrary balance sheet. That leaves out some massive costs that affect the planet and its future.

To list a few relevant things, the price of a head of California-grown iceberg lettuce or a pound of beef doesn't reflect the real cost of the California water problem. Nobody measures the cost of air pollution or the trendier carbon footprint of transporting food an average of more than 1,000 miles from producer to consumer. No space on any balance sheet shows the cost of soil erosion, depletion, or degradation; the loss of biological diversity due to agricultural chemicals; the insect and weed pests becoming increasingly resistant to increasingly more powerfully toxic pesticides. The balance sheet doesn't touch on the cost to human society of thousand-acre mono-cultural mega-farms that have replaced tens of thousands of small family farms and the communities they supported: the schools, churches, and small businesses of the now-deserted countryside.

Corporate and governmental balance sheets do not count the destruction of the planet as a cost of doing business. The companies selling the products neither pay nor charge for these things. Today's consumer doesn't pay for them either, directly. They are being charged to future generations. The bill for our so-called cheap food will come due when the planet runs out of water, breathable air, fertile soil, and cheap energy. The payment will not be exacted in higher prices alone, but in widespread famine and disaster.

This, too, could go on, but the point is, part of the reason self-sufficiency is impossible is that it's not cost-effective, according to current and conventional accounting practices. It is subsidized by future generations that will face survival in a degraded, more hostile—and perhaps even uninhabitable—world.

Homespun Economics

If you've made a study of economics, you probably get upset by people like me who have not and yet have so many opinions about it, most of them wrong. I know they're wrong according to the books because I did have several econ courses in college as a journalism school requirement. A journalist is supposed to know just enough about everything in order to ask intelligent questions but not enough to argue with the authorities. My problem was, I didn't believe half of it even then. The half I believed included wise sayings like Milton Friedman's "Inflation is taxation without legislation," and Henry Kauffmann's "The economy depends about as much on economists as the weather does on weather forecasters." *Wealth of Nations* just didn't seem very pertinent to my own situation. Everything I need to know about economics I learned from my parents and grandparents. Some examples are:

- A penny saved is a penny earned.
- You can't spend it if you don't have it.
- You can't spend your way out of debt.

If everybody had been following that advice since the last Depression—including presidents and chairmen of the Federal Reserve—the world might have been much different today.

Why aren't more people self-sufficient? Because they can't afford it. They can't afford it because the economic system is tilted against it, in favor of specialization and size. Specialization and size can only compete in terms of dollars that can be shown on balance sheets. Such items as clean air and human well-being do not show up on balance sheets. An economy running on accounting that misses out on some of the most basic needs of planetary life is not sustainable. If it is not cured, like the cancer it is, it will kill its host.

The Least You Need to Know

- The early pioneers and homesteaders were exploiters.
- Frank Lloyd Wright designed a "city," which most people interested in self-sufficiency living today would be delighted to live in.
- Philosophies such as the Slow Food movement play a role in self-sufficient living.

- Business accounting doesn't accurately value many goods; it ignores the cost to society.

Chapter 4

Bloom Where You're Planted

In This Chapter

- The place and space
- Begin by reading
- Learn by trying
- Do it now!

“A Little Land, A Lot of Living.” That was the headline on a 1940s magazine ad I clipped when I was a preteen and kept in my journal for many years afterward. The ad was for *The Have-More Plan* by Ed and Carolyn Robinson, a booklet that covered everything that came to be called homesteading.

It was a small ad, one column by two inches, but it had the most inspiring illustration of a Garden of Eden I've ever seen: a bird's-eye view of what appears to be little more than a large city lot, but with fruit trees, a fantastic garden, and best of all, chickens and goats! Some 60 years later I still envision that scene as The Ideal Homestead.

You probably have your own version of the vision, or you soon will. But how will you turn that fantasy into reality?

The Question of Size

As an all-knowing magazine editor (at least some readers seemed to think so), I was often asked how much land it takes to be a homesteader. My answer usually started with a question, “How long is a piece of string?”

Along with *The Have-More Plan*, one of my early inspirations was *Five Acres and Independence* by M. G. Kains (1934, but still in print). Five acres always seemed about right. Even though I'd personally find five acres

rather confining now, our first real homestead, on the edge of a small town near Madison, Wisconsin, was exactly one acre. On that lot we eventually had not only the requisite garden, fruit trees, grapes, and berries but also chickens, rabbits, geese, goats, sheep, a pig, and a beehive. It was a cool small town. One neighbor kept a cow in his garage, and another had the mother and siblings of our pig in his garage. Alas, now it looks like any other suburb. Our acre was obviously modeled after the Have-More Plan, and in fact, in a picture taken from the roof it looked almost just like it!



Lore of the Land

In the North Central states, five acres of well-managed woods will provide a family's annual supply of firewood on a sustainable basis. The new, fast-growing hybrid poplars will decrease that acreage requirement substantially. In most places today there is an excellent market for surplus firewood, so establishing a well-managed woodlot is a worthwhile priority.

There are many variables. The amount of land you need obviously depends on what you plan to do.

A cow needs more space than a goat, and a goat, more than a chicken. If you grow feed for any of these, the requirements increase. And even two places with the same numbers thus far will have different real estate needs, based on the fertility of the soil, the availability of rainfall or irrigation water, the length of a growing season, and such things as terrain.

But what if you have no land at all? Don't despair! All is not lost.

Bigger Is Not Better

Remember two things when you think about land. Even though you might enjoy the space and privacy afforded by acreage, you can achieve a great deal of self-sufficiency even as a landless peasant. That's because, first, today we know a great deal about growing plants in very small spaces; you can even grow vegetables in pots or containers. And second, many aspects of modern self-sufficiency don't involve land or food production at all.

We talk about gardening, including container gardening, in Part 3, but for now just realize that you can practice self-sufficiency, including at least a limited amount of gardening, even in an apartment with or without a patio or balcony.

The Landless Peasant

Just as importantly, if you hope to have a piece of heaven in the countryside someday, it makes perfect sense to start practicing right now, no matter what your address or circumstances.

Many aspects of self-sufficiency don't require any land at all. Television mogul Ted Turner, the nation's largest private landowner with some two million acres, doesn't have any advantage over the studio apartment dweller when it comes to recycling and conservation.



Lore of the Land

You can garden without so much as a teaspoon of soil. Seed sprouts are actually tiny plants you can produce anywhere at any season of the year. Mung beans are the best known, but also try alfalfa, radish, and onion seeds to spice up salads and sandwiches.

Place the seeds (be sure they're untreated and sold for sprouting) in a clean recycled jar; rinse thoroughly with cool water and drain well. Keep them in a cool, dark place. Rinse and drain twice a day until the sprouts appear and grow as long as you want them. Bonus tip: keeping sprouts in the sun for a day or so at the end will make them develop little green leaves.

On even the most self-sufficient homesteads, much self-sufficiency takes place in the kitchen. If you don't have space to grow tomatoes, potatoes, or wheat, buy them at a farmers' market or co-op and process them in your apartment kitchen, no matter how tiny. As you'll learn in Chapter 9, you can make yogurt and cheese, bread and peanut butter anywhere and anytime.

Where?

It's important to be self-sufficient no matter where you live because where you live right now is the place to start. "Bloom where you're planted."

If you're already on your dream acreage, that's great. If your dream still seems a distant fantasy, start practicing for it right now. And naturally, if you have no such dream but simply want to be more self-sufficient in a city, town, or suburb, that's no problem. If you're just starting out, the first steps are the same no matter which category you fit into. In any case, take baby steps before you learn to run.

By the way, no matter where you are, at nearly any stage of development, there is always a "better" place just over the next hill. Try to ignore it, unless there's a darn good reason not to. No place is perfect.



Watch Your Step

A new homestead is a blank canvas. Beware the temptation to look for the perfect place, because it doesn't exist. You have to create your own place, based on your own dreams, preferences, abilities, and resources. Of course you will never finish or achieve perfection, but so what? There's an old saying, "When the garden is finished, the gardener dies."

Many people have the notion they have to be somewhere else in order to be self-sufficient. If they're up north, it's too cold; down south, too hot; east or west might be too dry, too crowded, or too expensive.

But self-sufficient homesteads exist in every one of these locales. Where you live is based on many personal factors; suitability for self-sufficiency is among the least of them. If you move, you're most likely just trading one problem for another. Milder climates have a longer growing season. They also have more bugs, which don't survive winter in harsher climates. Take your choice: no-see-ums or fire ants, cold weather or kudzu, peaches or rhubarb, palm trees or white birch.

Taking the First Steps

Self-sufficiency starts with being aware of the concept and deciding to learn more about it—or it starts with the realization that, "Gosh, I've been doing this all my life and didn't even know it had a name!"

That's a common reaction from people who have always grown their own vegetables, baked bread from scratch, raised chickens, or sewn clothes. It might also come from people who live frugally: clipping coupons, buying

in bulk, shopping sales, etc. Even those who conserve water and recycle can qualify.

It follows, then, that these are the things to start with. After all, it wouldn't make much sense to be self-sufficient in food and energy but wasteful of water and recyclables.

First Stop: The Library

Once you become involved, the very simple steps aren't nearly enough. Your imagination is fired up, and you want to try everything you read about. Reading is good for at least three things:

- It's the best way to get a broad overview, discover possibilities you didn't even know existed, and find out what's out there that might appeal to you and fit your situation.
- It's the fastest and cheapest way to learn a great deal about any specific topic.
- It's a good way to stay out of trouble, by doing things vicariously!

What is there to read? Good heavens, where do we start!

The Classics

I've already mentioned how *The "Have-More" Plan* by Ed and Carolyn Robinson and *Five Acres and Independence* by M. G. Kains inspired and influenced me way back in the 1940s. Both are still in print and therefore presumably still inspiring and influencing people. Both are so quaintly outdated that they're fun to read for their historical value, and yet I'm sure today's new readers can get as much practical information from them as I did when I started out. There are dozens of others, but I consider these two must-reads.

Off the Beaten Path

Ed Robinson, who wrote *The “Have-More” Plan*, was actually a New York advertising executive, which obviously helped promote his homestead ideas. Carla Emery was also quite a promoter.

Carla and her van full of children stopped at our farm on her first cross-country book tour in the mid-1970s. She went on to appear on the Johnny Carson Show and other national television programs, had a busy schedule of speaking engagements, and became the *grande dame* of homestead gurus. She was still on the road when she died, in 2005. Her book, with more than 500,000 copies in print, has undoubtedly inspired thousands of people to try homesteading and then helped them along the way.

General Overview

Actually, Carla Emery’s *Encyclopedia of Country Living: An Old-Fashioned Recipe Book*, is as much a classic as a general overview and comes as close as anything to a complete treatise on homesteading. Originating as an occasional newsletter, *The Guinness Book of Records* listed the completed work as the largest mimeographed book in general circulation (700 pages, although the latest edition—no longer mimeographed—is 922 pages).

Back to Basics: How to Learn and Enjoy Traditional American Skills rather amazed us when it appeared in 1981 because it came from The Reader’s Digest Association, Inc.! The Countryside crew took that to mean homesteading was becoming mainstream, but that didn’t happen. In any event, this book covers a lot of ground in the Reader’s Digest style; some people enjoyed it, and used copies are still available.

Cookbooks

There must be thousands of them, a few of which are very helpful for cooking from scratch. Look for older ones, the kind that don’t call for a can

of mushroom soup and a package of frozen broccoli. Anything about peasant-type cooking, from any country, can provide idea-starters. There are cookbooks aimed not only at home gardeners but also at growers of tomatoes, beans, potatoes, and other specific vegetables.

And, of course, you'll find books devoted to making cheese, sausage, wine, beer, bread, and tofu; cooking beef, pork, and chicken; as well as giving advice and instructions on drying, canning, freezing, and root cellaring.

My two personal favorites are any *old* editions of *Joy of Cooking* by Irma S. Rombauer and Marion Rombauer Becker, first copyrighted in 1931 by the Bobbs-Merrill Company. (Yes, it's another Depression-era book.) It was still okay in the 1950s, but the 1997 rewrite was a disaster for homesteaders. The very best cookbook written specifically for homesteaders is *Craft of the Country Cook* by former *Countryside* cooking columnist Pat Katz, published by Hartley and Marks in 1988 and unfortunately, long out of print. However, as of this writing Pat still has a few copies left, and it does show up at Amazon with some regularity. Contact her at www.boxcarfarm.com/id14.html.

The *Ball Blue Book of Preserving* is essential. Once devoted to canning (it's been in print since 1909) it now includes freezing and drying as well as low-sugar and low-salt recipes. It's a basic course in canning and freezing and much more. We refer to it often during harvest season.

Gardening

There aren't as many gardening books as cookbooks, but there are still more than any normal person would want or be able to read. Most are on ornamentals, of course: flowers, shrubs, trees, landscaping, and such. But vegetable garden writers aren't slackers either.

And to complicate matters, whole books are devoted to soil and composting, insects and diseases, cold frames and hot beds, heirloom seeds and companion planting, to name a few. There are books for raw, green beginners who've never planted a seed and for long-time master gardeners who still learn something new almost every day. Browse at a local garden center, a bookstore, the web, or a library to see what suits your particular needs.

Rodale's Illustrated Encyclopedia of Organic Gardening tops the list of books on gardening if you can have only one. It covers everything and, obviously, from an organic perspective.

For more in-depth information on square-foot gardening, you'll want Mel Bartholomew's *All New Square Foot Gardening*; on four season gardening, Eliot Coleman's *Four Season Harvest*; and on companion planting, Louise Riotte's *Carrots Love Tomatoes: Secrets of Companion Planting for Successful Gardening, 2nd Edition*.

While magazines are also good sources of information on many topics, this is especially true of gardening. Like the books, most concentrate on ornamentals; however, *Organic Gardening* is one that gives vegetables more than a passing nod.

Livestock

There are several general books on livestock, but one often referred to as a classic is *Homesteader's Handbook to Raising Small Livestock* by Jerome D. Belanger, from Rodale Press, 1974, currently in print as *Raising Small Livestock* from Dover. A newer one is *Small-Scale Livestock Farming* by Carol Ekarius. These books can be interesting and helpful if you're still evaluating animal husbandry in general. But if you know what you want, head for the specialists—you'll find plenty of them.

The number and scope of books on poultry has mushroomed in recent years. Start out with some good general titles, of course, but then find others on coops, breeds, health, nutrition, pastured poultry, and marketing, as well as on ducks, geese, turkeys, guineas, and anything else with feathers.

Two to begin with are *Storey's Guide to Raising Chickens* by Gail Damerow and *Chickens in Your Backyard* by Rick and Gail Luttmann, Rodale Press.

For just plain insight, information, and entertainment (as opposed to how-to), my favorite chicken book is still *The Chicken Book* by Page Smith and Charles Daniel, back in print thanks to the University of Georgia Press. This is a wonderful overview of the role chickens have played throughout human history.

The hands-down winner in the rabbit category is *Storey's Guide to Raising Rabbits* by Bob Bennett, another former *Countryside* columnist. The pet rabbit people who review this book at Amazon are appalled by the description of butchering—as some will be by that subject in this book—but obviously if you're raising rabbits for meat, butchering is essential.

One of the main problems I encountered as the editor and publisher of a rabbit magazine, and one reason I let it die, was the division of rabbit raising into commercial meat production, home meat production, and pets. You'll find the same thing with books. For self-sufficient living, Bob's book is just fine.

Books on goats cover dairy, meat, angora, show, and pet goats. There are books on goat health and about parasites, poisonous weeds, and diseases, and, of course, on making cheese. For self-sufficiency, start with a general-purpose volume on dairy goats.

The one I wrote in 1975 must have helped a few readers get started, because it's still in print. The 2001 updated version is called *Storey's Guide to Raising Dairy Goats*. Gail Luttmann's *Raising Milk Goats Successfully*, Ideals Publishing, is another one to look for.

Storey is the leader in sheep, too. So the choice here is *Storey's Guide to Raising Sheep: Breeds, Care, Facilities* by Paula Simmons and Carol Ekarius.

We can end the shameless self-promotion, because *Raising the Homestead Hog* by Jerome Belanger (Rodale Press) is long out of print. But we still can't escape Storey. Storey's *Guide to Raising Pigs* by Kelly Klover and *Small-Scale Pig Raising* by Dirk Van Loon, an older Storey book, are both highly recommended.

Most books on cattle raising are for big operators. Once again, we must turn to Storey with Storey's *Guide to Raising Beef Cattle* by Heather Smith Thomas and *Raising a Calf for Beef* by Phyllis Hobson.

Alternative Energy

Here's another widely diverse and fast-growing segment of the book world. Choose from volumes on alternative and renewable energy in general to see what's available and might work for you. Or you can get more specific with

books on both active and passive solar heating as well as voltaics and power from wind, water, and alternative fuels.

I recently read and can recommend *Natural Home Heating* by Greg Pahl, Chelsea Green Publishing Company. This covers active and passive solar, firewood, biomass, and geothermal with enough detail to make you an informed consumer but not so much as to make your eyes glaze.

Rex A. Ewing has written several informative books: *Got Sun? Go Solar* and *Power with Nature: Solar and Wind Energy Demystified*.

Paul Gipe has been involved with wind power since 1976 and has written six books. The updated version of his classic *Wind Energy Basics, Second Edition: A Guide to Home- and Community Wind-Energy Systems* was scheduled for Spring 2009 publication. Another classic, *Wind Power*, has been extensively revised and greatly expanded and is now *Wind Power: Renewable Energy for Home, Farm, and Business*.

Housing

In the 1970s the man to see about owner-built and green housing was Ken Kern. His pioneering books, *The Owner-Built Home* and others with similar titles, are still worth reading but were self-published in limited editions and are now hard to find.

Rob Roy, who's been around almost as long, is still going strong with 15 books on housing (mostly) at last count. While he's famous for cordwood masonry construction, which uses sections of logs like bricks or concrete blocks, his *Mortgage Free!* is packed with information that's valuable no matter what building method you use or even if you already have a house. He and Jaki, his wife, also conduct workshops. Check them out at www.cordwoodmasonry.com.

Other

What flavor of self-sufficiency do you want? Whether it's a comfy place in the country and just enough self-sufficiency to help you get by on Social

Security or a full-blown gun-totin' survivalist form of lifestyle, there are books and magazines and certainly websites just for you.

Learn all about your septic system, or read about "humanure." Get an education in pond building, road building, straw bale or timber frame building, or maybe you'd rather know how to dismantle an old barn. Raise fish, tan hides, start a business; no matter what you want to do, somebody has already done it and has written either a book or a blog about it.

And of course, there are magazines. Have I mentioned *Countryside & Small Stock Journal*? Or *Backyard Poultry*, *sheep!*, and *Dairy Goat Journal*? Then there is *Backwoods Home*, *Back Home*, and *Mother Earth News*.

I anticipate some critics will complain that this *Complete Idiot's Guide to Self-Sufficient Living* doesn't tell enough about *how* to do it. This much-abbreviated list of information sources on just a few things pertinent to self-sufficiency ought to be ample proof that an entire set of encyclopedias, let alone a mere guide, couldn't begin to cover the topic. My own library contains somewhere north of 5,000 volumes. Three of the four walls are devoted to topics dealing in some way with self-sufficient living. If you want information on anything, it's available, in detail.

Speaking of how-to, we haven't even mentioned the philosophers, such as Wendell Berry—poet, essayist, novelist and farmer—who delight and inspire many homesteaders with ideas on how to *live*. Gene Logsdon, "the contrary farmer," also fits into this category even though he is well known for such titles as *Small-Scale Grain Growing* and *Organic Orchardring*. And there is Henry David Thoreau.

While it's possible to simply plunge in and learn from your mistakes, there are so many possibilities and nuances and so much accumulated wisdom and experience to draw upon, that it seems rather silly to reinvent the wheel. However, all the reading in the world isn't as good as actually *doing* it.

You could spend the rest of your life just reading about self-sufficiency, but don't do it. At some point decide you know enough to get started, put the book down, and get your hands dirty.

Even then, you don't have to plunge. Take a few baby steps before you try to run. It will pay off later, because this is where the real learning begins.

Off the Beaten Path

I butchered my first pig with the help of a booklet from the Morton Salt Co. But after I had the carcass eviscerated, scalded, and scraped, and started cutting it into pieces, they didn't look anything like the pictures in the book. Diane had a fit when, instead of labeling the freezer packages "chops," "roast," etc., I wrote "pig meat" on all of them. We had some interesting surprise meals, but they were all delicious.

Start with the ABCs

If you have a place for a garden, start gardening. Don't make it too big, don't accumulate a lot of equipment, and don't spend too much money. Learn enough to know when and how to plant a few easy crops—lettuce, beans, maybe carrots. Buy a few started tomato and pepper plants from a local garden center. If you have questions, that's a good place to get the answers. If you have a special yen for eggplant or okra, beets or broccoli, cabbage or cucumbers, try some of those, too, but remember to keep it small and simple at first. A small plot, well-tended, will produce more—both food and satisfaction—than a large plot that gets away from you and winds up being a neglected weedy mess that leaves you disillusioned.

If you don't have a place for a garden, you have two choices. First, check with the garden center or the county agent's office to see if there are any community gardens in your area. A community garden, usually located on public land, rents plots of various sizes to local citizens for their own use. In most cases the site is prepared and ready to plant, and water is available. You'll also find help and inspiration from the community of fellow gardeners you'll encounter there.

If that's not an option, you can fall back on container gardening. Check out Chapter 11 for the basics, and if you need more info, you'll find plenty on the web. Growing vegetables in containers provides excellent experience

for gardening on a larger scale, but it can also be a valuable technique on its own.

If farm animals are in your plans for the future, but you're not yet in the country, see if you can raise a few chickens where you are now. Many urban areas do allow them. Butchering might be verboten, but fresh eggs are reward enough. The experience in animal husbandry will be good preparation for other livestock, whether rabbits, goats, or cattle. If nothing else, you can probably raise earthworms. They'll eat your garbage!

Learn to Cook—from Scratch

The kitchen shouldn't present any problems at all. You can start doing now whatever you hope to do when you get your "real" homestead. The only difference is that you'll have to buy what you can't produce yourself.

Start with learning to cook from scratch. I've heard there are people today who have never cut up a chicken and wouldn't know where to begin. Go to www.gourmetsleuth.com/cutupchicken.htm. for instructions; then buy a whole chicken and try it yourself. If you've never made soup from scratch, it's time to correct that deficiency. By all means, learn how to bake bread, whether you grind the wheat yourself or buy flour. Buy a package of dry beans and bake them, following the recipe on the package. Sure, you can grow dry beans and wheat, and maybe you will someday. But that won't do you any good if you don't know how to use them. The way to learn is by doing, and the time is now.



Watch Your Step

Some people have 20 years' experience. Others have one year's experience 20 times. Be sure you know the difference before taking advice from an "expert."

Move on to canning and freezing; it makes perfect sense to buy produce in season at a farmers' market and preserve it. Now you'll start accumulating equipment as well as experience, which provides another leg up on your homesteading adventure. If you are a raw novice in the kitchen, consider starting out with something simple, such as jelly or icebox pickles. But you can obviously can, freeze, or dry anything a totally self-sufficient homesteader can. Just buy it instead of producing it yourself. When you do produce it yourself, you'll have the equipment and skill to process it, too.

While it might not make economic sense to make cheese or sausage from store-bought milk and meat, it's certainly possible. You might want to try it just for the experience. And some people say their homemade cheese and sausage are far superior to the factory-made products, even when made with store-bought ingredients.

In the realm of sewing and other fabric arts, the homesteader has no advantage over the apartment dweller. In fact, the apartment dweller might even have the advantage because sewing shops in the city often offer classes and other types of help not always available in rural districts. Of course, you can always turn to books and magazines for advice.

Woodworking is similar, although the possibilities might be limited in an apartment. A garage or basement workshop can be a great place for rainy-day and off-season projects ranging from bird houses and planter boxes to fine furniture. Any familiarity with wood and tools can be helpful on a homestead, where there are always construction projects of one kind or another.

Off the Beaten Path

Experience equates to learning, and we all learn as we go along. Even after you get your first goat, don't spend a bundle on what

someone else tells you is the ideal setup for a goat dairy. Start out small, learn as you go, and then plan and build your own goat facilities based on your own knowledge and experience as well as that of others.

Just as the rich get richer, the smart get smarter. Although a little knowledge can be a dangerous thing, you need that first little bit to build on, so start acquiring it right now. And don't forget: you can learn from mistakes!

As a related idea, remember little things add up. In the realm of self-sufficiency, we might note that pennies become dollars, minutes become hours, and flimsy plastic bags become mountains of trash. Likewise, knowing how to grow a tomato in a five-gallon bucket is good preparation for growing a few dozen in the ground for self-sufficiency, which in turn might lead to growing hundreds to provide a little income or to feed a village. Much of our knowledge is transferable, thus multiplying its value. The total is equal to more than the sum of its parts.

Time for an Attitude Check

Attitude counts. Your attitude toward self-sufficiency makes all the difference in the world.

If you are a fanatic about the environment, you'll have a different agenda than someone who thinks we'll never run out of oil and that global warming is a crock. You'll take recycling and conservation much more seriously and be more diligent about your daily activities and their effects on the planet. If you earnestly believe that the only place life is worth living is in the countryside and if you aren't interested in going to heaven if there are no animals there, you'll do almost everything differently than a vegetarian or city dweller whose skin crawls at the mere thought of all those ticks, chiggers, and mosquitoes running rampant out in that wilderness beyond the city limit sign.

But there's more. With the proper attitude, you'll be looking for opportunities: even more ways to save money, clever ways to recycle stuff,

and new ideas on saving energy. And remember: little things add up to big things.

If you decide what your attitude *ought* to be to reach your goals and then hone and nurture that attitude until it becomes second nature, your progress will amaze even yourself.

The Least You Need to Know

- You don't need a lot of land—or any at all—to be self-sufficient.
- Don't go into it; *grow* into it.
- Learn the basics, and build on that foundation.
- Watch little successes add up.
- Fine-tune your attitude.

Chapter 5

Your Homestead Business

In This Chapter

- Not just a hobby!
- A business needs capital
- Learn to manage your money
- Retained earnings
- Invest wisely—in yourself

One of the favorite sayings among my early-day homesteading cohorts at the Countryside General Store was, “You have to be rich to live in rural poverty.” And we were only half kidding. (A corollary was, “We sell stuff nobody wants to people who don’t have any money,” which might be why we quit.)

The truth is, an honest-to-goodness productive homestead requires start-up money. That money is not an expense; it’s a capital investment. That makes it a business. A business must be operated on sound business principles. Here’s how economics work in the context of a self-sufficient homestead.

Your Self-Sufficient Homestead Business

In the United States alone, more than 24 million households spent about \$128 each on mail order seeds, bulbs, and garden tools and supplies in 2006 (latest data available from the Mail-order Gardening Association). That’s more than \$3 billion! And that doesn’t include the same products sold in local retail outlets, including big-box stores such as The Home Depot, Lowe’s, and Wal-Mart.

For the vast majority, gardens are a hobby: an enjoyable pastime, a nice way to beautify their surroundings and maybe get a bit of mild exercise,

with a portion of the expense devoted to putting a few salads of leaf lettuce, tomatoes, and radishes on the table. They don't even think in terms of getting a monetary return on their investment unless it's increasing the property value.

Self-sufficient people can treat their activities as hobbies, too. After all, we have as much fun digging in the dirt as those with no self-reliance expectations, and we can appreciate a beautiful environment as much as anyone.

But it's better to treat gardening—or any other homestead activity—as a *business* for several good reasons.

- It makes major buying decisions easier to justify. Is this an expense or an investment?
- It focuses attention on needs rather than wants.
- It helps track results. Are we making any progress? Did the investment pay off? Should we do it again or try something different?

Let me hasten to reassure you, I'm not talking about getting into accounting and bookkeeping and things like that. I'm only suggesting you think in business terms to do a better job and increase your chances for success.

A business must be more efficient and less wasteful than a hobby. Self-sufficient living cannot tolerate waste. A business must set higher goals than a hobby does and measure its progress toward them. Basically, a business must make a profit in order to continue, while a hobby is supported by discretionary income. A hobby is an expense; a business is an investment.

The profit on a homestead can be elusive, but it's a factor. Some people go so far as to keep regular accounting records on their homestead projects, including the profit and loss statement. They keep track of what they produce, and estimate the value based on market prices. This can be a valuable exercise. Actually, it can also be a fun and interesting project if you're so inclined.

More commonly, the profit is not in cold cash and isn't easily accounted for by standard bookkeeping methods. You might be more interested in food security or health benefits than in saving money, but if your expenses are way out of line, you'll go broke, just like any other business. Therefore, a

homestead that is run like a business is going to be more successful than one operated from the hip pocket without regard for expenses and return on investment.

Getting Started: The Need for Seed Capital

Even the smallest business needs capital to start with. A lemonade stand isn't a business until it acquires some lemons, along with sugar and water, a pitcher, and probably a table and chair, and a sign. (Homesteaders can do without the advertising because, by definition, they are their only customers.)

Traditionally, lemonade stand operators float a loan from Banker Mom, who provides everything they need. Larger businesses might tap a variety of sources, including savings, loans from relatives, banks, credit unions, and credit card companies.

Homesteads have a wonderful advantage in that they can, and often do, start so slowly and blend in so well with everyday essential household expenditures that, except for really major projects, they can be financed out of existing cash flow.

This advantage is also a trap. Financing homestead activities from cash flow (current income) can make it more difficult to apply business principles. At the same time, it might wreak havoc with the essential everyday household budget. Walking this fine line requires planning, balance, self-control, and vigilance.

You might find it difficult to envision a lifestyle as a business enterprise. To complicate matters, people buy homestead tools even with no interest whatsoever in self-sufficiency. Any tool can be applied to self-sufficiency by definition.

Off the Beaten Path

Homesteading is a form of subsistence farming, which feeds the family that runs it. Farming is producing agricultural products to

sell.

The difference doesn't matter much in actual practice unless it becomes an issue for the IRS, zoning commission, or other political entity, but technically a homestead that produces a surplus and sells it is partly a farm.

Here's a further complication: there's a fine line between *homesteading* and *farming*, which is an honest-to-goodness business. While a farmer with a cash flow can get a business loan from a bank, a homesteader who wants to buy a small tractor might be advised to get a recreational vehicle loan! (This isn't necessarily a joke: we bought our first printing press with a furniture loan. But then, we kept it in the bedroom.)

An On-the-Ground Example

The easiest way to understand this is to consider the situation of a newlywed couple starting an honest-to-goodness rural homestead. Right now, their only possessions are their cell phones, laptops, and cars. (Unfortunately, they probably don't *own* even that much. As of late 2008, the typical American was \$16,000 in debt—a different problem we examine later.)

Assume they want to jump right in with both feet, or if they're in total agreement on this, all four feet. Their shopping list might look like this:

- Fives acres of good land with a nice house
- Pickup truck
- Garden equipment: tiller, hoe, rake, shovel, watering cans and hoses —heck, let's go all-out and install raised beds and a drip irrigation system—wheelbarrow, and, as country auctioneers like to say, other items too numerous to mention. (Let's not go crazy; the greenhouse can wait.)
- *Everything* for the kitchen! (They were previously microwave “cooks.”) This not only includes the usual pots, pans, utensils, and dishes but also the homestead requisites which include canning

equipment as well as a freezer, a food dehydrator, and maybe a yogurt maker, butter churn, cheese press, sausage grinder and stuffer, and more.

- Chickens and all their paraphernalia: brooder lights, feeders and waterers, materials to construct a chicken coop and outdoor run (and tools to build it with), feeders and waterers for adult chickens, feed and feed storage containers, and, oh yeah, chickens. And feed.
- Even if we skip the goats for now and the universal homestead dreams of the greenhouse and solar panels, there will still be fruit trees, grapevines, berry bushes, and a host of other “can’t wait” items.

The cost of these goods will vary widely, depending on quality, time, place, and the usual vagaries of shopping, but you can guess we’re talking major coin.

How could they possibly raise that much capital? They can’t. Then how will they ever own a real homestead? The same way you eat an elephant: one spoonful at a time.

The Pay-As-You-Go Plan

To demonstrate this idea, let’s take a look at another couple who were in similar circumstances some years ago but now appear to have the world on a string. They have their five acres, with a home they have kept up and even improved. Their fruit and nut trees and berries are in production; the asparagus bed is well established; and the garden soil is far more fertile than when they bought the place. They have a nice little barn, a shed, actually, with a couple of fine goats that produce far more than the pitiful first one they brought home. They have chickens, of course, and every few years they raise a pig or some ducks or turkeys, just for fun.

They had just as much money as the first couple, adjusted for inflation. But they invested it wisely, and over the years it paid dividends. They didn’t invest it in the stock market; they invested it in their homestead, in themselves.

The youngsters, of course, wonder how this is even possible. They earn barely enough to live on. How could they possibly free up any extra for these so-called “homestead capital goods”?

The theory is simple. They’re going to face choices, large and small, every day and sometimes more than once a day. The decision they make on each one of these thousands of choices, individually, will have a collective bearing on their future. They must make the right choices.

And it will take time—thousands of decisions and years of time. Here’s how it works.

Let’s call them Dick and Jane. Dick pulls into a gas station, fills the tank, and on a whim, puts out an extra buck for a can of soda.

Jane, doing the grocery shopping, religiously hews to the budget—until she reaches the checkout and selects a magazine and a candy bar.

These are small items, to be sure. Certainly, anyone who works hard all week is entitled to a small indulgence now and then. But how often is “now and then”? How small is small?

Fact: A mere \$2.75 a day is \$1,003.75 a year. Obviously, in 10 years that becomes \$10,037.50, without interest.

This is a more important observation than noting, let’s say, that a vacation at a nearby tourist area is cheaper than an ocean cruise or that camping at a state park might be even more economical. It’s easy to see where the money goes on large expenditures, but we often ignore how quickly it disappears down small rat holes.

Off the Beaten Path

Some people don’t spend any money on vacations because they don’t feel the need. I’ve always said, “Where could we go that would be any more fun than staying on the homestead?”

Not that most Americans worry much about the big expenses lately either, especially houses. Deferred gratification seems to be a quaint and

meaningless phrase for many people. Everybody thinks he deserves first class. Enjoy it now; pay later.

Life wasn't always like this. Few people today can even imagine mending clothes, reusing aluminum foil and plastic bags, or repairing a lamp. They can't imagine life without iPods, cell phones, BlackBerries, and Wi-Fi.

Fact: \$5 a day is \$1,825 a year and \$18,250 in 10 years, without interest.

The recent Age of Extravagance might have been an aberration, a blip on the upward progress of civilization that will smooth out with time. Or it might be a permanent part of the culture, only slightly bloodied by occasional economic setbacks.

In either case, the one and only way any average person is going to become the owner of a productive self-sufficient homestead is by watching his dimes become dollars. No one who spends beyond his means, no matter how paltry or how munificent, will ever become independent or self-sufficient. It's that simple.

Off the Beaten Path

A newspaper article about the teen texting mania spotlighted one girl who sent 6,473 texts a month, which I found incomprehensible. (Have I made that many phone calls in my entire life? When I was young, we weren't even allowed to use the candlestick phone on the party line.)

Even worse, for me, was when her mother said she was concerned, but cost wasn't a factor. It was only \$30 a month. *Only* \$30? For a telephone? Just think of what a homesteader could do with that!

Dick and Jane will scrimp and save until they can make a substantial down payment on an affordable house, and they will pay off the mortgage as quickly as possible. The money formerly paid on the mortgage will go into savings, where interest is collected rather than paid out.

Meanwhile, from *working capital* they will buy a shovel here, a cordless drill there, an electric saw from The Home Depot, and a hand one at a yard sale as the need arises and the budget allows. This isn't just spending; it's *capital investment*. In 5 years this will add up to a nice collection of tools; in 10, it can become a full workshop. Time equals money.

They will seldom choose to spend *discretionary income* on expensive tickets to sporting events or concerts, a weekly movie and/or dining out, or a newer car. Their acquaintances might not mind spending money on Manolo Blahnik and Jimmy Choo, but they will prefer to splurge on Muck Boots—a brand that's a little pricier than the average rubber barn boot.

Over time, one couple has some ticket stubs, receipts, and pleasant memories, while the other has a self-sufficient lifestyle. It's that simple.

Economists and business gurus don't consider ordinary people producers unless their production makes money. That's why housewives or stay-at-home-mothers—and homesteaders—are invisible to economists. And it's why backhoes and bulldozers are considered *capital goods*, but garden tillers are not. To economists, if a business owns a productive piece of equipment it's a capital good, but if an ordinary person owns the same thing it's a *consumer durable*. Go figure.

def·i·ni·tion

The cash available for day-to-day operations is working capital. But capital investment is money invested in a business venture with an expectation of producing income. That portion of income remaining after paying basic expenses (food, shelter, clothing) and prior commitments (loans, fees, and other contracts) is discretionary income. Capital goods are durable goods (those not used up or consumed) employed in the production of other goods. It's a business term seldom used in connection with the home, but a helpful concept for self-sufficiency. A homestead example might be a garden rake, which is used to produce food, hopefully for many years.

Consumer durables are heavy goods (freezers, lawn mowers) intended to last three or more years. Economists don't consider these capital goods because they're not owned by businesses. We say a freezer is a capital good because it's for a provident and productive purpose; a television set is not.

Homesteaders think this is foolish and ignore it. Let the economists run the Federal Reserve; we'll manage our homesteads. When simple old-fashioned nonmotorized garden cultivators are used to produce food, they're capital goods just like \$100,000 John Deere tractors, period amen.

You need money, but you don't necessarily need a *lot* of money. Old-fashioned garden cultivators are much cheaper than tractors. Even with great ambitions, you don't need it all at once. You can leverage time in two ways, often in conjunction: defer gratification (i.e., save up for it) or use your time in place of money (make a cheese press from a coffee can and some boards, instead of buying one).

The point is, don't let a lack of capital hold you back or even slow you down. It might be easier and more enjoyable if you have some, but it's not the end of the dream if you don't.

How to Get Some

In the past, most of the homesteaders I knew had ordinary jobs in town. Making a living on the homestead was a dream, but a deferred one. Some of the younger ones (usually) had different ideas. Making candles, soap, and macramé was a caricature of "homestead business" in the 1960s and '70s.

Now that has changed. There are probably more ways to make money without leaving home today than there were occupations a generation or two ago.

One factor is the Internet. Until recently, who could have imagined sitting at home and selling merchandise on eBay or telecommuting? A Google search for "Internet income opportunities" came up with 2,850,000 results—which, considering how Google works, must mean there are at least a

couple hundred Internet income opportunities, not all of which are scams. That leaves at least a dozen.



Watch Your Step

Don't even think about borrowing money unless you are *totally* into following a business model and have both eyes wide open. In that case you are borrowing for a provident and productive purpose, which means you know what you're doing. That includes a plan for repaying the loan, including interest, and contingency plans for when everything doesn't fall into place as expected.

There should be a constitutional law forbidding lending money to anyone who doesn't understand what compound interest is and how it works.

Another factor is the shift in attitudes regarding work, money, and personal fulfillment. Not everyone wants to work on Wall Street, in factories, or in offices of giant corporations. More and more people are enjoying autonomy and decent incomes, running bakeries and coffee shops, repairing bicycles and growing herbs, selling their handmade furniture and organic eggs and vegetables. In many areas, small, family farms are actually profitable again, thanks to specialty crops that don't have to compete with agribusiness: a few acres of blueberries instead of thousands of acres of wheat or corn, for instance. There are also more value-added products. Instead of milking a few cows and competing with a 4,000 head dairy, they milk sheep, make

that milk into cheese on the farmstead, sell the cheese at farmers' markets, and reap increased profits.

Keep More of What You Get

Everybody is interested in this, but not everybody likes the most obvious methods.

You might be living hand-to-mouth, payday-to-payday, or dragging down a six-figure income. (Amazingly to some of us, there isn't necessarily a lifestyle difference between any of these today.) For any financial situation imaginable, the adage attributed to Bill Earle speaks the truth: "If your outgo exceeds your income, your upkeep will be your downfall."

This is just an amusing way to state what should be obvious. But if it's so obvious, how did we as a nation accumulate \$16,000 or more apiece in personal debt, around \$10,000 of that just on credit cards? (Toss in the national debt and we're all responsible for another \$36 grand or so.) How come our personal outgo exceeds our income by 130 percent? And how come so many people were taken by surprise by our collective downfall?

Some thinking people are sick and tired of the insane consumerism and materialism that passes for normal. There seems to be no escape from it except for such "radical" ideas as self-sufficiency and voluntary simplicity or such crazy notions as deferred gratification and living within your means.

The fact that some people taking home more than \$100,000 a year are going broke can serve as an illustration. Most of us, certainly those who remember when 75¢ an hour was considered decent pay, can hardly imagine "earning" (does anybody really *deserve* that much?) a hundred grand or more in a single year. Not being able to live on that amount is unbelievable! It's certainly inexcusable. We won't even bother mentioning the bigwigs that pull down millions, even from bankrupt companies.

The details of how or why they went into debt despite such ample resources could be quite interesting and no doubt instructive. But what is more important for us to know is that even though they had access to several times as much money as the average American, it wasn't enough.

Off the Beaten Path

By the end of 2007 (latest data available) household debt averaged a record 133.7 percent of income; in other words, outgo exceeded income by more than a third. To make matters worse, those people paid a whopping 14.2 percent of their disposable income just to service that debt. If they got rid of the debt, they'd give themselves a 14 percent increase in salary.

“More” is never enough for the materialistic consumer. “Sufficient,” just enough to fill a need, is plenty for the self-sufficient.

It shouldn't be surprising to learn that two out of three Americans are considered economically illiterate (Harris Interactive study for the National Council on Economic Education). Among high school students, as many as 60 percent flunked a test on basic economics.

Economic illiteracy must surely be one of the reasons why people get in over their heads in debt. The availability of easy credit, the desire to keep up with the Joneses, an aversion to delayed gratification, and unexpected financial jolts such as job loss or illness are obvious culprits, but not understanding the effects of compound interest or how to use money wisely must take a lot of blame. When all is said and done, the heart of the matter is that most people simply don't know how to handle money, no matter how much or how little they have.



Lore of the Land

Dozens of free online courses in personal money management are available through a consortium of 250 universities and community colleges. According to the University of California-Irving, “Fundamentals of Financial Planning” is the most popular of its OpenCourseWare offerings. Enrollment in many of these increased almost 50 percent since September 2008, according to some of the schools. Go to www.ocwconsortium.org. To go directly to a course on family finances from Utah State University, try ocw.usu.edu/courselist.

Incidentally, if you’re looking for higher education on the cheap or just want to learn more about something, the consortium site has 3,278 courses to choose from.

Becoming a knowledgeable money manager is one of the most essential skills of self-sufficiency. Learning to do without or with less is fine and sometimes necessary, but learning to do more with less is the key to successful self-sufficiency. Remember, the only way to survive financially is to spend less than you take in.

“Oh, but that’s impossible!” I can hear someone protesting. And yet, no matter how little you have, you can be certain that someone else has even less. “I cried because I had no shoes until I met a man who had no feet.” He’s surviving. Put this revelation to practical use.

The average American has earned a dollar but spent \$1.30. When his next dollar comes in, he only has 70¢ of it to spend. If our consumer again spends \$1.30, the next dollar will only make 40¢ available. The downward spiral becomes a vortex, a black hole from which there is no escape, at least not without major trauma and readjustment. And that’s what’s happening to many, right now!

On the opposite side, we have a person who has also earned a dollar, but she’s spent only 70¢, which is what the first person ends up living on anyway. She has an extra 30¢ in her purse, cookie jar, or mattress. When the next dollar comes in, she does the same thing. Her dimes become dollars, and dollars become dreams fulfilled.

In the good old days (before 2008) this little lesson usually ended with advice to invest the surplus in the stock market and get really, really rich. So much for conventional wisdom. But the principle still holds. Collecting a small amount of interest, or even none at all, is vastly preferable to *paying* interest, which is seldom a small amount.

In a homestead context, the goal is not to accumulate money for its own sake but to save enough to invest in capital goods, which by definition should further increase wealth. And of course, the wealth of which we speak isn't in gold or yachts; more likely it's in well-being, happiness, and security.

The mechanics of spending less than you earn are the basis for the many sources of penny-pinching advice available today, online and elsewhere. Although they often make it sound like an entertaining challenge, which it can be, they seldom point out that even with your reduced spending, many people are living on less and doing just fine.

Some self-tests are easy. Pause and consider the money-you-spent-but-probably-shouldn't-have just in the past week. Maybe you smoke or drink (booze, soft drinks, high-priced coffee, even bottled water). What do you spend on junk food or snacks? Even these "insignificant" little expenses can total a couple of bucks a day and often much more.

Then move on to harder questions. Could you save money by driving less, maybe by combining errands or using public transportation? Maybe instead of grabbing a burger a couple of times a week, eating an apple would be better and cheaper. Some people don't seem to realize that not paying certain bills on time can result in late fees, which are a totally unnecessary waste of money.

Plug the little holes. Watch the pennies become dimes and dimes turn into dollars—dollars you can devote to your dreams.

Which brings up the oft-cited contention that a poor person today enjoys a more luxurious lifestyle than even the kings and emperors of yore. The comment we often hear from Depression-era kids is worth repeating: "We were poor, but we didn't know it because everyone else was poor, too." While this might hint at the keeping-up-with-the-Joneses mind-set of materialists and the effects of peer pressure, it also displays the value of the right attitude. Sometimes the difference between poverty and simplicity is nothing but attitude.

And also very often, attitude is an attribute of hope. If you perceive your deprived situation as being temporary and have the determination and a plan to end it, you'll be much happier than if you give up and wallow in your own pity.

The Least You Need to Know

- It takes money to make money.
- A productive homestead is a business.
- Poverty is relative; somebody always has less than you.
- Two out of three Americans are considered economically illiterate.

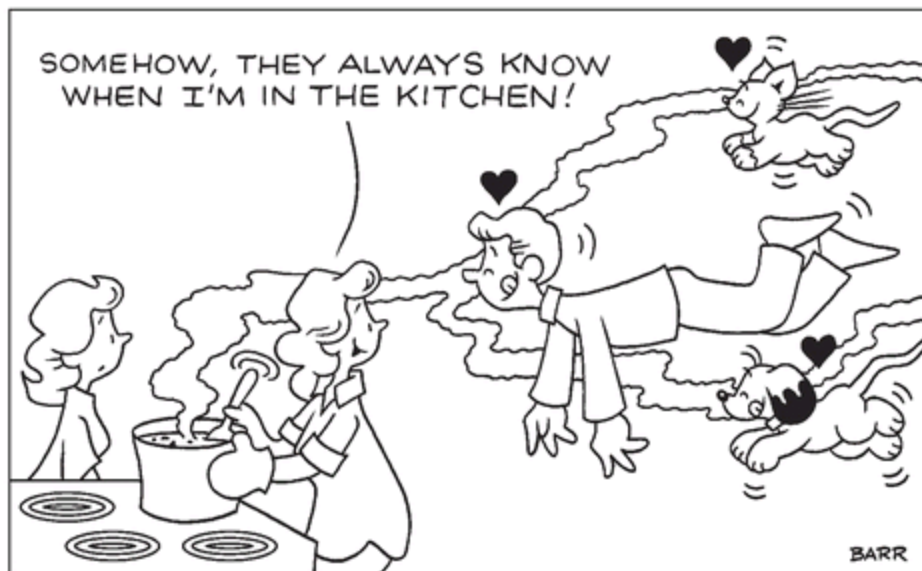
Part 2

The Kitchen: Heart of the Homestead

On a working, self-sufficient homestead, the kitchen is the first room to come alive in the morning and the last to quiet down at night. In between, it's the room where food is preserved, prepared, and presented. It's where the garden and barn meet the payroll, where the bounty of the land physically nurtures human life.

The kitchen is filled with aromas, laughter, and good company, and it's probably the location of the most productive business meetings and confabs.

Human survival requires food, and good food requires a kitchen, but a good kitchen provides so much more. Not least, it's the ideal place to start becoming more self-sufficient.



Chapter 6

Scratch the Itch to Cook from Scratch

In This Chapter

- Fast food changed the world
- The peasant gourmet and slow food
- Fusion cooking
- Eat better for less
- Enjoy pantry security

Food isn't just the commodity that we eat; it's a symbol that affects and reflects our thinking and how we live. This goes far beyond the considerations of sustainable production so important to self-sufficient living. When cooking from scratch is a lost art and fast food is considered normal, much more is at stake than obesity and poor nutrition.

The Food We Love to Hate

Self-sufficient types have loved to hate fast food almost from the beginning, which wasn't as long ago as most young people probably think it was. Plenty of us can still recall hearing about the first "drive-ins" (in California, of course) when we were already old enough to drive. In less than a lifetime, the concept of fast food has changed America and the world.

Off the Beaten Path

From its humble beginnings in the 1940s to 1970, fast-food sales went from zero to \$6 billion. Thirty years later, they were \$110

billion. On a typical day, 25 out of 100 adult Americans patronize a fast-food restaurant. The average person consumes three hamburgers and four orders of french fries every week.

The most common gripes about these places and their fare concern nutrition, with some justification. But in the world of self-sufficiency, this is only the very tip of the iceberg. How do I hate thee, Fast Food? Let me count the ways:

- Litter, of course—waste in general, but roadside litter especially.
- The industrialization of the hallowed rites of cooking and eating.
- Negative effects on society.
- Okay, nutrition.

I live on a lightly traveled gravel road, 20 miles from a small town (population 4,000) which has six fast-food places I can think of. With a total of 20 restaurants, that's 1 for every 200 people, which astounds me. And seldom does a day pass without someone tossing litter of some kind, most of it connected with food, from passing cars. I hate that.

There must be some serious and complex explanation for why so many people have so little regard for the environment and aesthetics. The social aspects of fast food go well beyond this outrage, and in the grand scheme of things it's pretty minor, but it still bugs me.

The Sociology of Fast Food

Some sociologists who have studied the phenomenon claim that the fast-food franchise system now stands atop the vast agro-industrial complex that small farmers and their sympathizers deplore—the complex that is the opposite of self-sufficient living.

If Cargill, Con-Agra, Monsanto, and IBP are guilty of sabotaging the family farm and all that entails, McDonald's, Burger King, and Hardee's are accomplices, at the very least.

Sociologists also note that the roughly 3.5 million workers in the fast-food industry represent the second-largest group of minimum wage earners in the

country, behind migrant farm workers. This is one of the results, indeed was one of the original goals, of the industrialization of restaurant kitchens.

How It All Started

The story of how the McDonald brothers—Richard and Maurice—revolutionized the restaurant business in 1948 is revealing. They had been operating a drive-in and reportedly tired of recruiting new carhops and short-order cooks who were in great demand in those post-war boom years in southern California. They were fed up with the teenage boys the cute carhops attracted and sick of replacing the tableware those young customers broke and stole, so they devised a plan that was to change the world.

They tore up the old menu and started over from scratch. Nothing on the new menu required a knife, fork, or spoon. Burgers were the only sandwiches. They replaced breakable dishes and glassware with paper and came up with the assembly-line kitchen. Grilling the hamburger, dressing and wrapping it, fixing the fries, making the milk-shake, and running the cash register were all separate jobs. They simplified the training, and because no skill was required, they slashed the payroll.

Their system was widely copied, even before it became a franchise. (Franchising and cookie-cutter businesses are another story, but the monotonous standardization all started with fast food.)

Today nearly half the money spent on food is spent in restaurants—most of that in fast-food restaurants. From that first restaurant in 1948, McDonald's leaped to 1,000 by 1968, and 40 years later, to more than 28,000. And they're still adding more today.

For a fascinating and penetrating glimpse into the world of fast food, check out *Fast Food Nation* by Eric Schlosser. It will give you plenty of reasons for questioning much of what went on, and goes on, in the business and its effects on the larger world. And if you have any taste at all, the descriptions of “food” coming from chemical factories, the rigid conformity, the transformation of food preparation and consumption into an industrial process will whet your appetite for—what else? *Slow* food.

Slow Food and the Peasant Gourmet

The Slow Food movement was founded, appropriately enough, to resist the opening of a McDonald's in Rome, Italy, in 1986. Its stated purpose was to preserve the cultural cuisine and the associated food plants and animals within an eco-region.

The movement promotes many of the ideas and causes commonly associated with and attributed to self-sufficiency: supporting organic gardening and family farms; preserving heirloom varieties of plants and livestock; and lobbying against pesticides, genetic engineering, and, of course, fast food.

Although those principles go beyond what was called peasant gourmet long before slow food had a name, they are certainly a part of homesteading and self-sufficiency in general. And for me, "slow food" brings to mind little more than the opposite of fast food, while "peasant gourmet" has all the pleasant earthy connotations of country living, complete with a cozy hearth and homegrown ingredients from the cottage garden.

Not that we need a special name for the way some of us have been eating since, who knows? I have no idea when my French-Canadian ancestors started enjoying pea soup, or those on the German side, *sülze*, *kartofel kloess*, and *kuchen*. *Sülze*, at least, goes back to the 1400s. Those ancestors were all farmers, homesteaders—peasants—so I'm sure they grew their own peas to make that soup and raised and butchered the hog whose head went into the making of *sülze*, a kind of head-cheese.

Peasants have to be adaptable. By the time I came along, we lived in a small town and didn't have a pig. Lacking a pig head, my mother made *sülze* from other cuts of pork, using the trotters to provide the gelatin that is the dish's signature.

We have continued that adaptability. Today the chic term is "fusion" cooking, which describes combining dishes of different cuisines in one meal. This could be an Asian restaurant featuring Indian, East Asian, and Southeast Asian cuisine, or it could refer to such a mishmash as taco pizza. The homesteader's "fusion" cooking is more closely related to immigrants who have trouble finding familiar old ingredients in their new homelands. Creative cooks use what's available.

What's available on the homestead is often what's ready in the garden, most abundant in the root cellar, or getting old in the freezer. So now we've added "eating locally and seasonally" to the definition of peasant gourmet or slow food.

Fast food and, indeed, nearly all the food consumed today is produced and processed by huge companies in industrial settings with strict adherence to conformity and production line efficiency, usually at a great distance from the consumer. On the other hand, peasant gourmet food is grown locally (can't get any more local than your backyard), is seasonal and fresh (stroll through the garden in the morning to decide what's for lunch), and prepared with care and personal attention in the home kitchen.

Cooking from Scratch

One of the Chinese cookbooks in my library notes that the Chinese don't use cookbooks. Chinese cooking is peasant gourmet cooking.

When you follow a recipe, you need some of this and some of that. That's okay if you buy your groceries in town and plan ahead. But when your kitchen is overflowing with fresh eggs or tomatoes or milk or anything else you produce on your homestead, data flows in the opposite direction. You inventory what's available and *then* see if you can find, or adapt, a recipe for it. This obviously works for leftovers, too.

The cook has to have enough experience or instinct to improvise. Industrial age technologists who must have exact amounts specified, who must be told the precise size of a dice or slice or cube, and who need a clock to time every dish to the precise minute will not excel at peasant gourmet cooking. My grandmother could tell the temperature of her wood cookstove oven with the wave of a hand. She knew exactly how many pieces of wood to add to get it just right. And her high loaves of golden bread came out perfect, every time.



Lore of the Land

Chopping, dicing, mincing—what’s the difference?

For the uptown gourmet, dicing is cutting food into uniform tiny cubes about an eighth of an inch square or the width of a book match. Chopped food is about twice that size and irregular. Mincing is the same as chopping but in much smaller pieces.

But does it matter? To the peasant gourmet, not a great deal. It’s fun to know such things, and that knowledge can be useful in a general way. But presentation usually doesn’t cost anything, and it helps put the “gourmet” in peasant gourmet dining.

The cook also needs enough experience or instinct to substitute. There are alternatives to baking powder if you happen to be out, but you are more likely to use yogurt instead of sour cream or puréed cottage cheese in place of cream cheese. Try rolled oats or crushed bran cereal as a substitute for dry bread crumbs.



Lore of the Land

Are you out of baking powder? For each teaspoon, substitute $\frac{1}{4}$ tsp. baking soda and $\frac{1}{2}$ tsp. cream of tartar *or* $\frac{1}{4}$ tsp. baking soda and $\frac{1}{2}$ cup buttermilk, and decrease the liquid in the recipe by $\frac{1}{2}$ cup.

A good supply of staples is essential, especially herbs and spices. Those who live far from the nearest store stock up on basic necessities as a matter of prudent habit. They can't just run out to buy a bottle of soy sauce when the vegetables are ready to stir-fry.

Cookbooks can be very interesting and instructive, and every kitchen needs at least a few. A homestead needs many more; even if you don't need a recipe for a salad or stir-fry or anything else from the garden, don't try to make cheese or sausage without a few tried-and-true recipes. You can always experiment later, but you have to know the rules before you can break them. For the peasant gourmet cook, cookbooks don't contain precise formulae and detailed instructions. Instead, they are idea-starters.

You Don't Always Get What You Pay For

The itch to cook from scratch often results from the itch to save money. The two are connected because the convenience of packaged food isn't free—and neither is the packaging, which bothers some Greens as much as the overabundance of salt and other complaints.

If you need proof, the next time you're in a supermarket, check the prices of a few items. Get the weights, too, so you can convert your data to cost per pound and compare apples to apples or potatoes to potatoes.

Determine the price per pound of raw potatoes, canned potatoes, dried potatoes, potato chips, and potato salad (from the deli), whatever you might be tempted to buy or prepare yourself. The following table shows what I found in North Central Wisconsin in March 2009.

Potatoes, cost per pound

Raw, Wisconsin russet	0.279	Frozen, hash brown	1.49
Raw, Idaho russet	0.475	Frozen, shoestring	1.52
Raw, red	0.499	Salad, deli	3.29
Organic, russet	0.998	Dried, instant	3.35
Organic, yellow, gold	1.198	Stax	4.43
Frozen, french fries	1.328	Chips	5.32
Salad, canned	1.42	Dried, au gratin	5.60

A list like this has obvious flaws. When you add water to the dehydrated potatoes to make them comparable to the others, the cost per pound will be much lower. And you'll have waste on the raw varieties. If you make good money and are pressed for time, maybe it's worth the extra cost to have a food factory process and season your potatoes for you. If you are really on a budget or underemployed with time on your hands, cooking from scratch is a good way to pick up some scratch.

The choices are also amazing, and believe me, the list could be much, much longer, especially if we included all the different brands and sizes. But they all started out as potatoes! Do you really need or want to pay for all this "service" provided by the industrial food system?

Note also the price differential between organic and regular and the specialty varieties. Those differences evaporate when you grow your own.

Off the Beaten Path

Only 19¢ of every dollar we spend on groceries goes for the food itself. The rest is for advertising and promotion, packaging, transportation, and such.

Many products are much worse. There is 6.7¢ worth of corn in a \$3.49 box of cornflakes. A loaf of white bread retailing for \$3.13 contains 14¢ worth of wheat.

When wheat is \$7 a bushel, a 5 lb. bag of whole-wheat flour selling for \$3.15 nets the wheat farmer 58¢. It might not pay to

grow your own wheat, but it wouldn't take long to pay for a grain mill for grinding your own.

Do the same with any of your favorite foods or meals. I found rice at \$1.08 a pound. Add a few seasonings, put it in a box labeled fried rice, rice pilaf, Mexican style, etc., and the price soars to \$5.84 a pound.

The money you spend on a unit of food is only part of the picture. How much packaging is involved, is it recyclable, or will it go to a landfill? What does the label say about nutrition and such things as sodium and preservatives or additives? And certainly not least, what does the stuff taste like?

I couldn't help but think of this as I typed the words on potatoes. I was wishing you could add your own homegrown spuds, which, for most practical matters, are almost free, to that list. Mine are, except for the labor. I save seed from one harvest for the next planting; I use no purchased fertilizers, no herbicides, and usually no other pesticides. As for labor, growing potatoes is to me what growing beans was to Thoreau: much better than a trip to Vegas. (He didn't say that; I did.) Comparing the taste of the homegrown with the store-bought should make a convert out of anyone whose taste buds have not been permanently damaged by fast foods. And what a kick it is when you dig them! You never know when you're going to unearth a real lunker.

If you don't grow potatoes and would like to try my challenge anyway, seek out a potato grower at a farmers' market. These might be expensive although you might be surprised. Either way, a gourmet, peasant or not, would gladly pay extra for those succulent thin-skinned beauties.

Their value is not only in the flavor. For certain people, the ambience of a good farmers' market far outshines that of an expensive high-class restaurant. The peasant will prefer the atmosphere and the people of the market to the white tablecloths and dim lighting of the restaurant.

Pantry Security

There are all kinds of reasons for storing food. We've already mentioned that people who live at a distance from a grocery stock up just because it's not worth the time, trouble, and gas to run to town for some minor, or not so minor, last-minute need. People often stock up before a blizzard or a hurricane or for other disasters of varying duration, natural or man-made. Some folks even make long-range plans, heeding the Biblical advice about seven lean years. Self-sufficient people are likely to have more, rather than less, than the average.

If you grow your own food in a temperate climate, you naturally have to store some for the winter. But then, when were those June peas on the supermarket shelf in May canned? If you don't store items like that, someone else has to. And it's often noted that supermarkets only have a three-day supply. If for some reason they can't replace their stock, their shelves will be empty in less than a week. People interested in food security don't like to depend on supermarkets.

However, there are other good reasons for self-sufficient people to avoid those stores. Some of them offer as many as 40,000 different products, which doesn't connect with simple living. An estimated 12,000 new products are rolled out every year, and—surprise—it's not to give you a choice. It's to get more of your money. It works like this.

We speak of “agribusiness” or “factory farming” as industrialized food production, which many in the self-sufficiency movement find distasteful or worse. However, the food this industry produces accounts for only 19 percent of what we pay at the checkout counter. The food industry itself is much more than farming or agriculture; it's a world of high technology, engineering, and chemistry.

What's alarming to many is that this high-tech industry is actually—we have to twist words and ideas here—post-industrial. Post-industrial is the stage of economic development that comes after industrialization, and its emphasis is not on producing goods, but services.

This explains why we have dozens of different kinds of breakfast cereal, for example. That's not to give you a choice, and it's not just competition between the handful of cereal makers. The goal is to break the market down into segments through product differentiation in order to get away with charging more per ounce. The same cereal made in different shapes or

colors or with dried fruits or flavors added commands a higher price than a run-of-the-mill corn or oat flake.

This product differentiation is found throughout the supermarket. To avoid paying for it is one more good reason to be self-sufficient.

The Many Joys (and Challenges) of Cooking

The world is full of cookbooks. The challenge is finding those that fit your self-sufficient lifestyle. A few years back, housewives struggled to convert Grandma's recipes into language they could understand. How much is a wineglass? ($\frac{1}{4}$ cup.) A peck? (Two gallons dry.) A pinch? (The amount you can pick up between thumb and first two fingers or less than $\frac{1}{8}$ teaspoon.) Then we had to deal with the metrics problem, which continues to bug us in the United States.

But for the self-sufficient, the challenge is often converting "cans" or "packages" commonly found in recipes today, to the piles of freshly harvested vegetables waiting on the kitchen counter!

The pleasures of preparing a meal are so abundant it's difficult to discern why so many consider it an onerous chore. Not everyone, of course; that's obvious from the popularity of cooking shows on television and food sections in newspapers and magazines, as well as the plethora of cookbooks.

Off the Beaten Path

The idea of "Eat to live; don't live to eat" originated with Socrates and has been passed down by Cicero, Molière, and Ben Franklin, among others. So it must be true, right? Not so fast! What else in life can compare with eating the year's first buttery, salted, corn-on-the-cob; a sun-ripened tomato, still warm, just picked from the vine; or a totally ripe juicy fresh-picked strawberry or raspberry? Is it some kind of Puritanical mortal sin

to pretend that a slice of freshly baked homemade bread (with homemade butter and jam) is not a heavenly treat?

Living to eat doesn't have to mean pigging out or overdoing the gourmet thing. It can simply mean appreciating the goodness nature has provided. It can embody a reverence and respect for the plants and animals that sustain us. It can include the joy involved in producing it. For one who nurtures that food from its beginning to the dining table, eating and cooking can be a sacred rite. Picking up a sack at a drive-up window is just the opposite: a sacrilege.

My theory is that the way most people approach cooking is about as exciting, and challenging, as changing the oil in their cars. It's not something the average person looks forward to and plans for with anticipation. It's not that far removed from the boring assembly line approach of the industrialized food system.

How different it is when you grow your own or come as close to that ideal as you can. When you have planted the tomato seed, tended the seedling on your windowsill, transplanted it into your carefully prepared garden plot, nursed it through dry spells, watched it ripen with expectation, harvested it at just the proper time and felt its sun-warmed smoothness in your hand, canned it in your own kitchen on a steamy summer afternoon, and now choose the glistening jar from a shelf in the root cellar and open it while the winter snow is swirling outside that windowsill where it all started ...

Well, how could that possibly compare with "Add one 12-oz. can of tomato sauce"? (Which also contains from 12 to 20 percent of your daily limit of salt.)

That's just one way we put the "joy" back in cooking. Another stems from the fact that the country cook uses recipes as guides or idea starters. That is, peasant gourmet cooking is a creative art, not an industrial process. Not only is there room for individuality, but most of the time it's also a necessary ingredient. As such, cooking is at least as satisfying as any other creative endeavor.

The Least You Need to Know

- Most food today is more industrial science than culinary art.
- Post-industrial food companies charge more for the inherent services than for the actual product.
- Use cookbooks as idea starters, not like chemical formulae.
- Cooking is even more joyful when you start with homegrown.

Chapter 7

Conservation in the Kitchen

In This Chapter

- The truth about wasted food
- Ways to avoid waste
- Cooking with recipe byproducts
- Recycling unavoidable waste

In the past, most of us paid little attention to food waste. Now it's being examined not only in the context of hungry people and financial losses but also for its impact on energy, climate, and water. That's a lot of guilt to heap on our daily garbage, but there are some simple solutions—for those who are aware of the problem.

Waste Not

A group called “Food Not Bombs” estimates that in the United States alone, 30 million people go hungry on a regular basis. It would take four billion pounds of food to feed these people. And food pantries, even in rural areas, are seeing more people and less food. Four billion pounds are needed. *But we waste 100 billion pounds.*

Until very recently, food waste was pretty much a nonconcern. Leftovers go down the garbage disposal and disappear. Or they go in the garbage, somebody hauls it away, and you can forget about it. Homesteaders and gardeners see it as future compost.

Off the Beaten Path

In the 1970s, archeologists at the University of Arizona measured modern-day garbage to see what people threw out. The press treated it as an amusing but harmless pastime. The study was updated from 1994 to 2004 with a grant from the USDA. The research became quite sophisticated, but the bottom line was still alarming: a shocking 40 to 50 percent of all food ready for harvest is never eaten.

On average, households waste 14 percent of their food purchases. Fifteen percent of that includes products still within their expiration date but never opened. The average family of four was discarding \$590 a year in perfectly good food.

The rising cost of food worldwide and landfill and sewage plant issues have caused this outlook to change. Now several countries have launched major campaigns to combat food waste. In Britain it's called "Love Food; Hate Waste."

The food wasted at home is only a small portion of the total. Edibles tossed by restaurants and supermarkets make a much bigger mountain, and that goes to landfills. Only recently has a very limited amount been composted. Yes, food waste is organic and decomposes in a compost bin. But landfills lack the air needed for aerobic decomposition. Thus, garbage creates methane gas, one of the leading causes of global warming. But that's not all.

Wouldn't you like to lower your grocery bill by a third? That should be a no-brainer. When you throw away one third of the food you buy, you're throwing away one third of the money you spent on it. According to some estimates, reducing food waste in such countries as the United States, Canada, Australia, and the United Kingdom could save the average household at least \$1,000 a year. Whether you use this number or the \$590 cited earlier, it's still a lot of money that could certainly be put to far better use.

We might also speculate on what our children learn when we treat our resources so casually. They probably don't learn the same values their great-grandparents did when food was often precious and scarce or at the very least limited in amount and appeal. (Lard sandwiches come to mind.

For a long time after butter rationing ended, we were careful to specify a *bread and butter* sandwich, just to make sure.) How can they learn to value food when it's treated as a disposable commodity?

In a nation where obesity is a major health problem, we should definitely be concerned about both waste and waist. Clean your plate, certainly, but don't put so much on it to start with. This is especially true with children. "Children's portions" should be just that. Their eyes are frequently bigger than their stomachs, which leads to waste. They can always take more, if need be and if it's not precious and scarce or limited in amount and appeal.

The Stockholm International Water Institute (SIWI) has reported that global food losses and wastage amount to 50 percent. One half of all the food grown never reaches the plate. That's a cost of \$48.3 billion in the United States alone, but it's not just food and money we're wasting. The SIWI estimates that the wasted food represents 40 trillion liters of water, enough for half a billion people. In addition, the energy used to produce that wasted food obviously contributes to carbon dioxide emissions. And of course, the nonrenewable energy itself was wasted on food that never fulfilled its purpose.

On rare occasions my wife and I eat at a fast-food restaurant, although slowly, of course, and never in the car. We have learned that one small order of fries is plenty for the two of us. Often even that is too much. Watching both how much some people eat and how much is thrown away is as educationally entertaining as going to the zoo, in a very alarming way.

Off the Beaten Path

For me, eating is a kind of daily celebration of life. I enjoy it, make a big deal out of it, and often write about it.

So it wasn't too surprising when a reader, meeting me in person for the first time, said, "Gee, the way you talk about food, I expected you to be a lot more, um, portly." Now I could stand to lose a few pounds, but I can enjoy food without eating a lot of it. So can you!

How Can We Avoid Waste?

We, as individuals, can't do much about losses in the field, processing plants, or even the supermarkets and restaurant kitchens. It's not at all uncommon for farmers to plow down certain crops because of low prices; they would lose more money by harvesting the crop than by letting it go to waste. The apple industry loses an average of 12 percent of the crop annually before it reaches the market. This is simply part of the industrialized agribusiness we consider so productive and efficient.

Off the Beaten Path

A fellow who works in a bakery (the kind I call a bread factory) told me that due to a mechanical glitch, several thousand loaves of bread were made just a tiny bit too big to fit into the bags. Due to various laws and regulations, the company wasn't allowed to donate the bread to a food pantry or similar agency. They couldn't even give it to a hog farmer. The entire batch went to the landfill.

The place for you to start is at home. The time to start is before you go shopping. The time-honored shopping list is a must and sticking to it is mandatory. But deciding what to put on that list is crucial.

Start by taking inventory. In the case of a large freezer, where heaven only knows what's on the bottom or how long it's been there, a running inventory is a good idea. Some people use a chalkboard or a magnetic white board; they record each item as they put it in the freezer and erase it when they take it out. I have no doubt that one day we will have little computers built into freezer and refrigerator doors to do this automatically. The next step would be to alert us to impending expiration dates and probably a link to our cell phone so we can check the inventory while we're shopping. Until then, it's a manual job.

Rotate the Stock

Refrigerators seem designed to hide food. Most of them are far larger than they need to be, and most people feel they should be kept full. A full freezer reduces energy consumption, but keeping a refrigerator full isn't as important. Check the temperature to be sure it's between 35 and 38 degrees Fahrenheit, and be sure the door seal is in good condition.

Off the Beaten Path

When I was a kid, we had an icebox—with real ice—not a mechanical refrigerator. It wasn't very large, and it certainly wasn't very cold. But I don't think we had nearly as much garbage as most families today, according to the containers I see lined up on the streets in town on garbage pick-up day. One reason there wasn't much waste was probably because there wasn't much in the box to start with. A large refrigerator filled with more than a household will eat in a timely manner is wasteful.

Examine the contents of this appliance weekly. Bring anything that should be used soon to the front—of the icebox and of your mind when planning menus. If it's a snack-type item, put it on a shelf where everyone in the house will see it, and call attention to it.

Go through your cupboards, pantry, root cellar, wherever you store food, the same way. This is especially important where long-term storage is concerned (see Chapter 8). Be sure to use the oldest stuff first, and be certain to use anything nearing its expiration date ASAP. This doesn't always necessarily mean the *Use by* or *Best before* date imprinted by the processor, and certainly not the *Sell by* date. These are all somewhat subjective; use them as guides, but use your own common sense as well.

def•i•ni•tion

Use by is the only date worth taking seriously; even then, use your own judgment.

Best before is the manufacturer's recommendation of when the product might be a bit past its prime, but that's a matter of taste.

Sell by is a stock control device for retailers.

In the process, properly store all foods. This includes refrigerating those that should be refrigerated and freezing those that should be frozen (such as meat you won't use within 48 hours). Don't leave a leftover half-can of tomato sauce in the can; transfer it to an airtight nonmetallic container. Put all refrigerated foods into covered containers.

Be aware of opened packets and cartons. Keep them closed, for one thing. But if just one helping of pudding is in the back of the bottom shelf or a swallow of milk or orange juice remains in the jug, it isn't likely to be used unless someone makes a concerted effort.

To be sure, some foods can be harmful, or even deadly, if they spoil. We all know the dangers of potato salad that's not kept cold enough at a picnic or seafood that's gone bad. Raw meat and fish will look and smell inedible before they actually are, as will most others; few people are attracted to wilted lettuce or shriveled carrots. But most potatoes and onions will last for months; cans and jars, for years; and hard cheese is indestructible.

Plan the Menu

With the inventory complete, it's time to plan the menus. Start with what's on hand, especially perishables. If you have too much milk left for the time remaining on the expiration date, how about making some pudding? If some of the vegetables are starting to go limp, you might develop a sudden hunger for soup or stew. Leftover rice has so many uses that we often cook

a double batch to have leftovers on purpose. In fact, we seldom have leftovers at our house; instead we have *recipe byproducts*.

It's been said that most people have no idea what they're having for dinner until after 4 P.M. The self-sufficient homesteader often knows months in advance. In a sense, ordering seeds or chicks is a homestead equivalent of grocery shopping. But any good cook would do well to have at least an inkling of what the main courses might be between one shopping trip and the next.

If you have food in your garden or storeroom, the process often reverses. Instead of deciding what you want to eat, you must decide to want to eat what you have on hand. When what you have is summer squash for the thirteenth day in a row, that's when a creative cook is really appreciated. It's also how some of the world's greatest recipes were created!

With the meals planned and the shopping list made, the next usual step is to check the ads for specials and coupons. Some people save a lot with coupons, but there is also a danger of buying things you don't need or won't use, which quickly wastes those savings and, very often, wastes food.

Getting you to buy more than you need is what supermarkets do, of course. That's why they put the milk in the back of the store and the candy and gum by the check-outs. You can't just pop in to pick up a half-gallon of milk without going past a thousand other temptations. In fact, the shortest distance between the front door and the dairy section is often past the candy, chips, and soda.

Even more insidious is the "Buy two, get one free" ploy or a variant of it. If you don't need two, to say nothing of three, it's no bargain. The British "Love Food; Hate Waste" campaign strongly discourages supermarkets from using the gimmick.

Examine two-for-one offers with a jaundiced eye. Some of the worst skeptics say the store merely doubled the price for a while, then halved the doubled price. Others refer to the "Halo Effect"—supermarkets like to give shoppers the feeling that they're in a land of endless bargains.

Be aware if the items are on sale because of a looming expiration date. This can be a good thing if it's something you can freeze or preserve in some way, but not if it will spoil before you can use it. Black bananas have many uses; mushy grapes or cherries do not, although if they're still edible and you have enough, you could make jam or jelly.

Off the Beaten Path

If we all quit discarding food that we could eat, the impact on atmospheric CO₂ would be the same as taking one of every five cars off the road.

You don't go into a supermarket when you're hungry, of course. That's pretty common knowledge now. And if you do stray from the shopping list, it better be for a very good reason, perhaps a special on a nonperishable staple like toilet paper or something else you use on a regular basis.

Naturally, you remembered to bring your own tote, so the answer to "paper or plastic?" is "neither." And you have just eliminated more waste.

The one-stop shop encourages you to buy more than you need, according to Joanna Blythman, author of *Shopped: The Shocking Power of British Supermarkets*. She's blunt about it: "Don't shop in supermarkets. They are a rip-off." And, of course, the green in all of us favors the local bakery and butcher shop and the farmers' market, for many reasons, including the support of small local businesses.

Many shoppers find that visiting the supermarket as seldom as possible saves money. This does require even more long-range planning but reduces impulse purchases. On the other hand, other experts advocate shopping daily for perishables. These must be people who live in cities, and cities with small shops.

Grocery shopping requires attaining a balance. You don't want to buy too much if it will result in waste as perishables often do. Yet you obviously don't want to run out of food, either, especially if you're 20 miles from town and a blizzard is blowing in. If you have a can of beans or Spam on the shelf, you can use them this week or wait until next week or next month. The list of potential emergency rations is long. The more perishable the item, the more consideration you must give to its purchase.



Lore of the Land

“When I buy a loaf of bread and don’t think I’ll eat it all before it goes stale, I put half in the freezer. You can make toast from frozen bread directly.” (From a web posting.) But then, stale bread is the kind to use for French toast and bread pudding—if you have any left over after making croutons and bread crumbs, that is.

Store It Properly

Back home, waste prevention turns to proper storage. If you get a deal on 10 pounds of hamburger or a family-size tray of chicken breasts and there are only two of you, naturally you’ll break it down into smaller packages and freeze what you won’t use immediately.

Apples will last longer in the refrigerator than they will on the counter or table, but be aware that they and many other fruits and vegetables emit ethylene, which will hasten the ripening of other fruits in the fridge.

You can trap and contain this gas by an EGG: an ethylene gas guardian. It’s about the size and shape of a chicken egg and comes in as many colors as Easter eggs. Just drop it into the produce drawer, and it should last for about three months.

Carrots will last longer if topped and tailed—cutting a bit off both ends, which is what we do when storing homegrown carrots for the winter to keep them from sprouting and thus shriveling. Incidentally, vegetables that still

have garden soil clinging to them keep longer than washed ones. Unfortunately, people are so accustomed to convenience and sterility that it's rare to find an unwashed carrot even at a farmers' market.

Convenience is also behind the very recent introduction and popularity of prepared bagged salads. Leaves of iceberg or romaine will last longer if attached to the core of the head than they will when removed (and often mixed with other high-priced but oh-so-convenient ingredients).

Tomatoes should not be refrigerated. Bananas can be, despite the old song, but they'll turn black.

A Recipe for Waste

A good many people are capable of following a recipe if it's not too complicated and doesn't have too many ingredients. But not very many have the ability to *cook*, a demonstrably different skill that enables you to know what to do with the baked salmon left over from last night. If you want to avoid wasting food, you can't avoid cooking.

People who follow recipes are likely to shop for the needed ingredients. If those purchases are more than the recipe calls for, the extra often goes to waste. A cook, on the other hand, has a pretty good idea of where the extra will show up on the weekly menu. Seen in this light, making a recipe is a one-time event; cooking is an ongoing process.

It's also much more personal and creative. A cook can size, season, and alter a recipe to meet the likes and dislikes of his or her frequent diners, as well as what might be available in the larder or garden. The recipe-follower is stuck with the recipe—and probably leftovers.

Off the Beaten Path

“French women know how to dress because they make a study of it. They are world renowned cooks because they make a study of that also. It takes more brains to prepare a good dinner than it does to learn French or German or to write a good essay.”

—Miss Helen Louise Johnson, *Cooking as an Art*, 1893

The good cook really shines toward the end of the week or menu period. That's when everything in the refrigerator is lined up to see what it looks like it wants to be for supper. As my grandmother used to say, anybody can make something out of something; it takes a good cook to make something out of nothing.

Alas, there are no rules or instructions for this that I'm aware of. But I'm quite sure that anyone who is interested in the process can learn, with a little practice. A good cookbook is the place to start, but don't limit yourself to the formulas. Obviously, the more you know about cooking the easier it will be. It will also help a great deal if both cook and diners have a sense of adventure.

If, or when, food becomes as precious as it has been in the past, it might pay to consult not only the old books from hard times but also the people who lived through those times. You probably have relatives who can tell you some stories.

"People just pick what they want off the shelf and end up throwing half of it away," complained one 80-year-old. "We never threw anything away because if you didn't use everything up, you had nothing to eat. People just seem to have lost that skill."

Eating Out

According to news reports, fewer people are eating out; those who still do, go out less often, and the historically risky restaurant business is on the skids. But if you do still patronize them, know how to handle the situation.

Eating establishments have traditionally overfed their patrons, for various business reasons. Escalating food prices have tempered that somewhat, in some places. But if you still encounter it, consider ordering off the appetizer menu or split an order.

And remember doggie bags are provided for a good reason, which has nothing to do with dogs. In the current economic environment, it's been

said that doggie bags are as chic as Gucci bags.

Waste Reduction Computerized

A company called LeanPath was formed in 2004 to help the food service industry—restaurants, hospitals, hotels, even cruise ships—enhance profits by operating in a more sustainable manner, including reducing waste. The heart of the system is software that tracks food that's being tossed. Employees put the garbage on a scale and record the type of food it is on the computer, which calculates the cost and tracks what is being dumped.

The timing was right. In November of 2008, founder Andrew Shackman told the Associated Press that the interest level in cutting food waste “has just skyrocketed in the last six to nine months.” There was plenty of incentive as wholesale food costs rose eight percent in 2008.

You can do something similar at home, as suggested by the British Love Food; Hate Waste program. They offer a seven-day Food Waste Diary (www.lovefoodhatewaste.com/about_food_waste) where you record everything you discard: egg shells, tea bags, banana skins, everything. You also record how much: a teaspoon of granola crumbs, a half-cup of leftover beans; and where: down the sink, into the compost, into the dog's dish; and finally, why: eggs shells are inedible; kids won't eat sandwiches with crusts; just a little bit was left in the pot.

The idea is that by keeping such close track of your waste, you'll find ways to reduce it. And again, by reducing food waste, we save money and help the environment.

Sometimes the solutions are amusingly simple. Dining halls at Virginia Tech simply eliminated cafeteria trays. Before, students would blithely load their trays with whatever looked good, then find they couldn't eat it all. The school says it has cut food waste by 38 percent.

Portland, Oregon's International Airport generates 165 tons of food waste a year. It was paying \$82 a ton to haul it to a landfill, but now it pays \$48 a ton to haul it to a municipal composting site.

Packaging Waste

Packaging isn't confined to food, obviously, and reducing the packaging waste stream applies to a wide variety of products. But according to a 2007 Nielson survey, environmental concerns about packaging are increasing faster than any other environmental issue including climate change, water shortages, pollution, and pesticide use.

Choose products with the least obnoxious packaging, then recycle it. Better yet, eliminate packaging by growing your own food.

The Least You Need to Know

- Half of all the food that's ready to harvest never gets eaten.
- Wise menu planning and shopping can save money and reduce waste.
- Reduce waste with proper storage.
- Keeping track of what you throw out increases awareness and suggests solutions.

Chapter 8

The Well-Stocked Pantry

In This Chapter

- Reasons for stocking up
- Items to store
- Ways to store it
- Food preservation methods

Unless you live in a year-round Garden of Eden, storing food from one growing season to the next is essential. The agro-industrial complex handles this for most people, but if you produce your own, you'll have to take care of it yourself.

Even if you haven't yet reached the self-sufficient ideal of living without the supermarket, long-term storage of some items is convenient, economical, and wise. With a well-stocked pantry and a little know-how, you could survive for months, if necessary, without setting foot in a food store of any kind.

Stocking Up Isn't Hoarding

There are many reasons for storing a few months' worth of groceries. One of the best in the context of self-sufficient living is that *somebody* has to do it, so it might as well be you.

Most people today are so disconnected from their food they have no idea where it comes from. Some might think it was manufactured in the back room of the supermarket. And the word "fresh" is so pervasive they probably think everything was canned within the last week.

In reality, that can of peas you buy in June was probably harvested and processed a year ago. The agribusiness complex has stored it for you since

then. The apples or potatoes you buy in the spring either came from the other side of the world or were harvested last fall and stored. When you purchase these items, you're stocking up for the week or longer, but the food industry has already stored them for months.

If you grow your own fruits and vegetables, the picture is even clearer. A gardener with baskets of gorgeous ripe tomatoes in August can't possibly use them all before they rot. But thinking ahead, wouldn't it be nice to have some of them throughout the winter and spring? So the tomatoes are canned and stored.

The Church of Jesus Christ of Latter-day Saints (LDS) considers it simply prudent to plan ahead for hard times and encourages its members to keep at least a year's supply of food on hand.

None of this is hoarding. Hoarders take a normal human activity to an irrational extreme. Stocking up is a normal and essential activity. Even squirrels do it.

Unless you live upstairs over a deli, you probably have a few days' worth of food on hand just because daily shopping would be a hassle. Stocking up for a week or more would be even more convenient. The prudent country dweller doesn't want to run out of a staple or basic ingredient at a crucial time when town is many miles away or the weather is threatening. The doomsayer asks what *you* will be eating when the truckers strike, the banks all close, or terrorists or rioters shut down the industrial food system. And if you grow anything yourself, you might have 6 to 12 months' worth of those homegrown items.

What to Store

Everybody who eats has a stockpile of something. Nobody buys two tablespoons of flour every time she makes gravy; she buys at least a pound or five pounds and stores the extra.

The average kitchen has many such items: sugar, coffee, vinegar, mayonnaise, crackers, and peanut butter. Take inventory and you might also find a few cans of soup, some pasta, and an unopened bag of marshmallows. Most people don't even think of this as stockpiling.

Stocking up requires more thought. What are we going to want to eat months from now? How perishable is it? Where are we going to keep it? How much will it cost? In some cases, will it even be available?

Once again, the first step is to inventory. What do you eat now? Some people who keep a diary of food eaten for a month or two are surprised. It's a good way to determine if you'd like to change your habits, as well as finding patterns that can be a guide to rational food storage.

Following the Mormon Model with a Twist

For some reason, serious stockpilers, such as survivalists, think first of the Mormon food storage model. The LDS food storage recommendations provide a good starting point. If it's survival you're interested in, with no concern for gourmet dining, this will do the job. It's certainly a good guide to what you'll need.

Basically, it covers six categories plus water: grains (300 lbs. per person per year), fats and oils (13 lbs.), sugars (60 lbs), dairy (75 lbs.), legumes (60 lbs.), and cooking essentials (baking powder and soda, yeast, vinegar, and 5 lbs. of salt.)

Grains include 150 lbs. of wheat and 50 lbs. of rice, along with flour, corn meal, oats, and pasta. Fats and oils are 4 lbs. of shortening, plus vegetable oil, mayonnaise, salad dressing, and peanut butter. Sugars start with 40 lbs. of white sugar and 3 lbs. each of brown sugar, honey, corn syrup, and jam, plus molasses, gelatin, and powdered fruit drinks. Dry milk is listed at 60 lbs., along with 12 cans of evaporated milk. And for the legumes, figure on 30 lbs. of dry beans, 10 lbs. of soy, and 5 lbs. of lima beans, split peas, lentils, and dry soup mix. You can check out the complete list at lds.about.com/library/bl/faq/blcalculator.htm.

I was one of those suggesting taking such precautions before Y2K, and I later heard from many irate readers complaining that because nothing happened, they had to throw out all that stuff!

Off the Beaten Path

Some storable food products were almost impossible to get in the days before Y2K, the year 2000 computer glitch that, had it occurred, would have had serious implications for commerce, including the food supply. The companies selling these in bulk reported shortages and delays again in the angst of 2008.

Pardon me? That was *food*. They were supposed to *eat* it, crisis or not. Maybe the end of the world as we have known it would have made it more palatable, maybe not. The point is, store what you like to eat, and like to eat what you store. Even a stockpile intended for an emergency should be rotated, meaning you must consume older items.

Highly processed, overpackaged foods are found neither in Green cupboards nor in food storage programs. Instead, pantries and root cellars harbor the raw ingredients of good eating. There might be a few cans and boxes, but the bulk of the cache is airtight buckets of wheat and rice, sacks of beans, and dried fruits and vegetables.

The homestead will also have bins of potatoes and onions, boxes of carrots, and a stone crock of sauerkraut. Add those Mason jars of tomatoes, pickles, applesauce, and more, and you have some fine dining. So what's to throw out just because Armageddon doesn't show up as scheduled?

In other words, I still endorse the Mormon recommendations but also urge you to learn to use and enjoy those stored products, crisis or not. Have wheat in storage, yes; but don't *leave* it in storage. Grind it to bake bread; crack it to make breakfast cereal; cook it to use in many ways. Use the gluten, make noodles, or sprout it and use the wheat grass. Yes, we're still using Y2K wheat in 2009, and yes, it's still alive; I even planted some of it last fall. Properly stored, wheat berries or the whole grain will easily last for 15 years or more; some say 30. I do a germination test at least once a year by keeping 10 seeds moist in a paper towel to see how many sprout. It's still at 100 percent.

Storing Your Dry Goods

For the best long-term storage, keep grains in oxygen-free containers. Many companies sell them packaged that way. To do it at home, you'll need oxygen-absorbing packets for canning jars or dry ice for 5-gallon buckets. Place five ounces, per five gallons, of dry ice (find it in the Yellow Pages, maybe under welding supplies) in the bottom of a clean, dry, food-grade plastic bucket with a sealable lid. Fill with grain to within an inch of the top. Put the lid on, but don't seal it until the dry ice has sublimated (the solid transforms into a gas). Then seal it tightly. If it begins to bulge, open it a bit to release the pressure and reseal. Sealing dry ice in an airtight container creates what is known as an "ice bomb." You can probably picture that, and you don't want one. Store containers in a cool, dry, dark, rodent-free place off the floor.



Watch Your Step

Dry ice, CO₂ or carbon dioxide, is 107 degrees below zero in its solid state. Handle with care and heavy gloves; just touching it can cause severe frostbite.

Have a Plan and a Budget

The complaint invariably arises, "Good grief, I can barely afford food now! How am I supposed to buy an extra month's worth, to say nothing of a year's supply?"

You don't do it in one shopping trip; pick up extra canned and dry packaged goods when they're on sale—*really* on sale, not gimmicked, which means you must be aware of prices, which is a good thing anyway. Occasionally you will find good deals on an entire case of something, which can be ideal for your food storage program. Other times you might buy in bulk or a larger quantity than normal. Store the extra.

It might take a long time to get where you want to be, but even a few weeks' worth of stored food can be comforting. If food prices keep increasing, it just might turn out to be a better investment than your 401(k) has been recently.

The key is, once you have that store, you'll rotate the stock; you'll use what you have stored and replace it, meaning you'll be back to your normal food budget, but you'll have enough for a year in case of emergency.

Homegrown Foods to Store

I am a great fan of potatoes. I love planting them, hoeing, digging, cooking, and eating them. Like the Irish before the potato famine, I could almost live on them. Because potatoes are nearly as versatile as wheat, I never get bored. With some of each, we're all set.

We do often run out of edible potatoes by spring. Then rice, beans, and pasta take over, in eating with the seasons. That also makes those first luscious, tiny, red, new parsley-buttered potatoes all the more appreciated.

Tomatoes are also versatile and an essential for us. We used to can 200 quarts a year and used all of them. Think juice, soup, chili, pizza, pasta, stew, casseroles, and you can see why. We've also dried tomatoes, with good results.

Onions are another staple at our house. Not a day goes by without our using at least one small one, if only in the trinity (onion, green pepper, and celery), but we also eat them almost like apples. Unfortunately, the sweetest ones usually don't keep very well, so we grow both sweet and storage varieties. In addition to keeping quality (which the seed catalog should disclose), be aware of the difference between short-day and long-day onions. Short-day varieties begin to bulb when the day length reaches 10 to

12 hours. Long-day varieties do best in northern areas with 14 to 16 hours of daylight.



Watch Your Step

Do not break off the stems when you harvest winter squash, because that's likely to increase spoilage. If you do break any stems, use those squash first.

Winter squash makes the list. This vegetable is easy to grow; it stores well with no fuss or bother; and it's both nutritious and delicious. Choose from the classic butternut, acorn, hubbard, or one of the many other varieties available today. After the first frost has killed the vines, we harvest the fruits and cure them in a dry place for a few days. On a shelf in the root cellar, they keep for months.

Root Cellaring

Not long ago every house that was a home had a root cellar. Some of the best were mysterious and wonderful, dark and spooky perhaps, a little damp probably, with a powerful earthy aroma.

Root cellaring doesn't actually preserve food; we might say it merely puts it in a state of suspended animation. The aim is to keep the temperature as close to a range of 32° to 40°F as possible to slow down the microorganisms that cause spoilage and the enzymes responsible for over-

ripening and rotting. For most vegetables, high humidity, 80 percent, is preferred.

Special rooms in basements came closest to meeting these requirements. Most modern basements are less satisfactory, but many can be salvaged. If you can block off a portion, preferably a corner on the north side, insulate it, and vent it to the outside, you can build a root cellar in your home.

Throwing up a stud wall and insulating it shouldn't be much of a challenge for any handy person. If it is, a quick trip to The Home Depot or Lowe's or any good lumberyard will take care of that. They'll fix you up with everything you need, including some advice on building a stud wall.

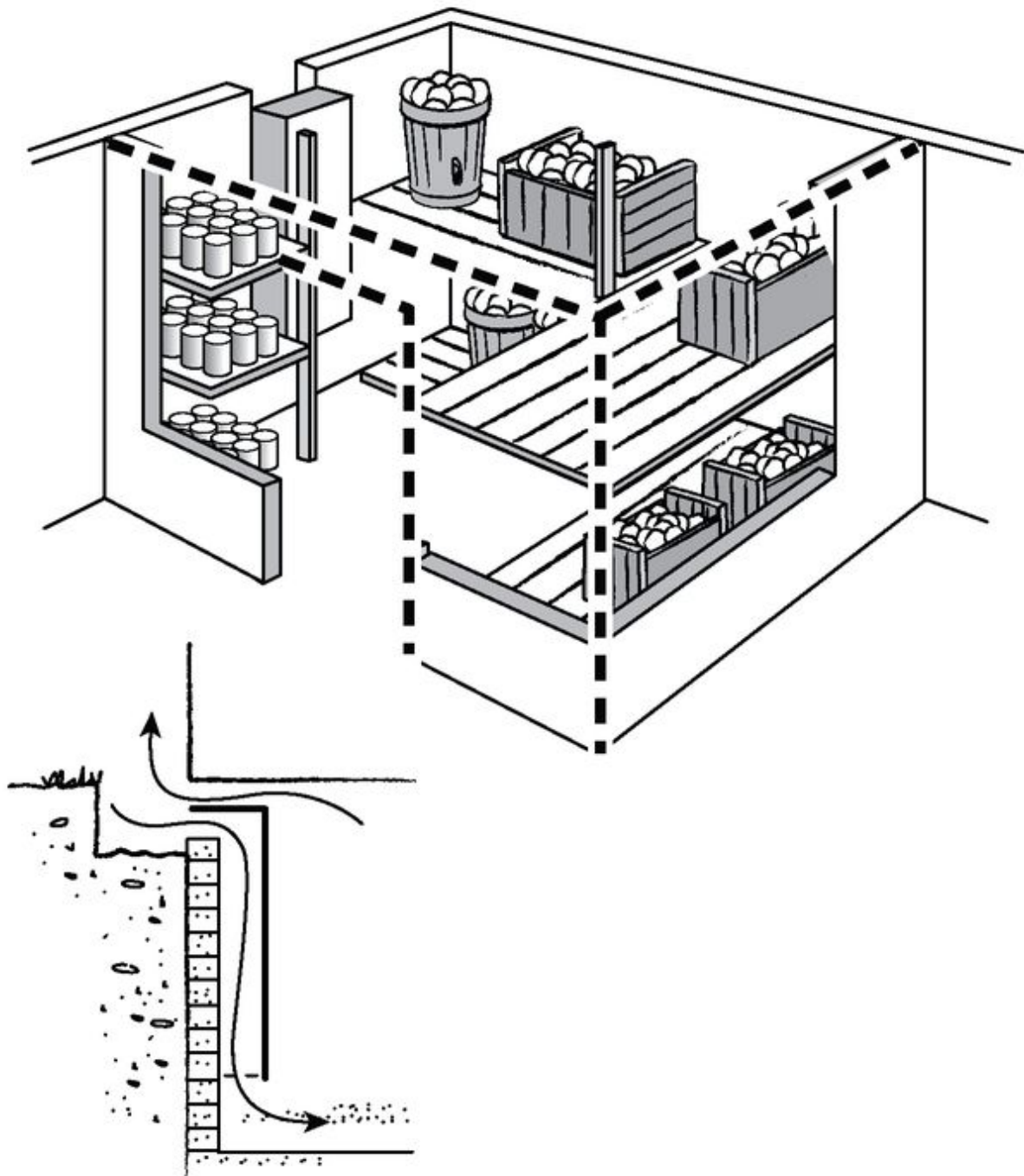
Insulate only the new wall, not the basement foundation. You should also consider insulating the ceiling.

Most people underestimate the importance of ventilation, in both greenhouses and root cellars. The standard method is an air duct. This is a box covering the bottom two thirds of a window, extending down to a foot or so from the floor. The air duct forces cold incoming air to the floor level and allows warm air out through the top of the window.

Our root cellar, which was here when we bought the house, utilizes a clothes dryer vent instead of a window and a small squirrel cage fan that we only run periodically.

We haven't had any problems with it, and it's a simple solution if you have no window in your chosen location.

Many modern homes have room for a root cellar in the basement. If the basement is heated, the storage room will have to be insulated, and good ventilation is essential.



Root Cellar Storage Guide

Produce	Ideal Temperature	Ideal % humidity	Storage life
Apples	32	80-90	4-6 months*
Pears	32	85-90	2-7 months*
Dry beans	32-50	70	1 year or more
Beets	32-40	90-95	4-5 months
Cabbage	32	85-90	2-3 months

Produce	Ideal Temperature	Ideal % humidity	Storage life
Carrots**	32-40	90-95	6 months
Kohlrabi	32-40	90-95	2-3 months
Onions	32	70	2-12 months*
Parsnips**	32	90-95	3-4 months
Potatoes	35-40	80-90	4-6 months
Squash	55	50-70	4-5 months*

**Some varieties last much longer than others. Sweet onions don't usually keep very well; use them first. Longevity claims for Jung's Mooregold squash induced us to test it. We kept some for a full year, and they were still good!*

***Carrots and parsnips keep better with high humidity, and are often stored in boxes of clean damp sand. They can also remain in the garden over winter if well-mulched to prevent freezing.*

A storage pit can be as simple as a clean, new metal garbage can, partially buried in the back yard and well-insulated. Cover it with enough straw or leaves to prevent freezing, forming a mound. Fill it with produce, and remove the food as needed, perhaps on a weekly basis to avoid opening it too often.

Home Canning

Canning is the overall best way to preserve most food. It is a process that destroys potentially harmful microorganisms by heating them to a scientifically determined temperature. Heat also forces air from the canning jar, so that when it cools, the two-piece cap forms a vacuum seal, keeping out oxygen as well as recontamination by new microorganisms.

Canning can be a satisfying and valuable activity. Not many jobs offer a sense of accomplishment like transforming a beautiful patch of garden vegetables into rows of gleaming jars in jewel-like colors in the pantry or root cellar!

Canning isn't difficult, although it does require specialized tools and equipment and attention to detail. Canned foods are perfectly safe if you follow the scientific directions. But always remember, you can't see, smell, or taste *Clostridium botulinum*, and heat does not destroy the deadly toxin that causes botulism.



Watch Your Step

Canning rules have changed considerably since François Appert first preserved peas in a wine bottle in the late 1790s. Even today some diehards recycle mayonnaise jars for canning or use what is known as the water-bath method.

But it's not worth the risk. Get the right equipment, read a decent book, such as the *Ball Blue Book of Preserving*, and follow the rules. Canning is a science, not an art.

Canning directions are different for every type of food, and too lengthy and complicated to go into here. With so many in-depth sources available, anything more than a brief overview would be a waste of paper and your time. I suggest you use the *Ball Blue Book of Preserving* because both Diane and I refer to it several times a year as we have for the past 50 years or so. It was first published in 1909, and yes, we do have the latest version!

Perhaps it's unfortunate that canning has taken a backseat to freezing, which is generally much faster and easier, because canning frequently results in a higher-quality product. Also, freezers tend to fill up as you empty the garden of its bounty. If you run out of space in the basement for canned goods, you can always stash them under the bed. And finally, when the power goes out or the freezer compressor dies when you're on vacation, canning looks like a pretty smart choice.

Drying Foods

The *Ball Blue Book* used to be the *Book of Canning*. That it is now the *Book of Preserving* is a nod of approval not only to freezing but also to the popularity of drying, which it also covers. Drying is an ancient technique that is being revived.

Once it gained acceptance, the tinkerers—and the marketers—took over, and with a little help from the writers who churned out books and articles praising it, drying snowballed. Jerky and fruit leathers are ancient foods; for a time they were forgotten, but now you can find them in any grocery store or gas station. And food dryers come in a wide range of choices, from many sources.

The *Ball Blue Book* refers to food drying as “dehydrating,” which is technically incorrect. The USDA defines dehydrated foods as containing 2.5 to 4 percent water, which requires sophisticated industrial machinery. At home we can get it down to 10 to 20 percent moisture level, which is what the USDA calls dried, not dehydrated. And getting that moisture level down to 10-20 percent is no big deal.

Food has been dried on boards in the sun for generations. When I was a kid, we peeled, cored, and sliced apples, threaded them on a string, and hung the string in the hot attic. We dried green beans the same way. We gathered herbs into large bouquets and tied the stems with string, put them into brown paper sacks, which we tied up around the stems, and hung these in the attic as well. My grandmother had a wood-burning cookstove, which was an ideal place for drying by festooning the strings of food above it. I have friends who still do this.

In the 1970s, people dried a lot of food in cars parked in the sun. They placed food on screens positioned over the seat backs and regulated temperature by opening or closing the windows.

Successful drying is weather-dependent, so they employed other means when the weather didn't cooperate. Most common was the gas oven, because an electric oven can't be set to a low enough temperature. In the olden days when gas ovens had pilot lights, just the pilot light was often enough for drying.

In the drying process, moisture is removed from a food product with the use of heat. The amount of heat is critical because too much will cook the product, making it hard on the outside but still too moist inside to prevent spoilage. A thermostat is an obvious advantage. So is a fan to circulate the air.

Now numerous appliances for drying food incorporate heat, a thermostat, and a fan, making it a much easier and more surefire project than ever. But naturally, the old ways still work, too.

Off the Beaten Path

Once something becomes popular enough to attract inventors and entrepreneurs, that technology can change overnight, and public perceptions change with it. This happened on a small scale with wood heat, composting, and wind power, as well as food drying. This, I believe, is the future of self-sufficient living and perhaps the future of the planet and the human race. When the marketplace makes sane, sustainable and appropriate technology as attractive as iPods, for example, we'll be making progress.

We have made—and used—a number of solar dryers of various designs as the basis of magazine articles. Some worked better than others, but temperature control was always a problem. Electric models are so much handier, more reliable, and so common today, it would be difficult to recommend anything else.

Freezing

Few modern homesteaders would be willing to give up their freezers. It's so simple to stash the morning's harvest of peas or green beans in the freezer, and what a pleasure it is to eat them in the dead of winter! This is especially true of broccoli. The first harvest is usually insignificant compared to the later pickings of small side shoots that develop. Freezing a handful at a time is a snap, but that handful is much appreciated a few months later.

Off the Beaten Path

When I mentioned to a neighbor that I was freezing green beans, he opined that frozen beans weren't worth eating. If they weren't canned, forget about them, he said. A few years earlier I would have agreed. Then we planted a different variety, one the seed catalog said was best for freezing, and the difference was amazing.

Many varieties of vegetables are better canned than frozen or the other way around, and some are only worth eating fresh. That's one reason gardeners are constantly experimenting and reading seed catalogs.

Peppers are merely washed, halved or quartered, seeded, and placed in freezer bags, but most other vegetables require blanching. If you put vegetables in the freezer without blanching, their enzymes keep on working, which damages their flavor, color, and tenderness. Blanching is simply heating the veggies for a few minutes and then rapidly cooling them; it's easy.

Always wash vegetables in cold water and lift them out of the water, leaving any sand or grit in the container. Then peel, trim, and cut as needed. If you have avoided poisonous sprays, insects might be lurking in such vegetables as broccoli and cauliflower, but that's no problem. Simply soak them for about half an hour in saltwater, using about a tablespoon to a quart,

and any bugs will come to the surface. Wash the produce again to get rid of the salt.

The traditional way of blanching vegetables is in boiling water. You'll need at least a four-quart kettle for a pound of vegetables. The ideal has a wire or perforated basket that fits inside neatly. Get the water boiling vigorously, lower the basket of vegetables into the water, and start the timer. Shake the basket a bit now and then to ensure even heating. When the time is up, remove the basket and immediately plunge it into a container of ice water. Cooling will take about as long as the blanching.

Don't blanch more than a pound at a time, so the water keeps boiling when you introduce the cold produce. For smaller amounts of certain vegetables, a steamer works better. Steam blanching takes less water and less time and energy to heat it. Use a steamer basket and a covered pan. The process is the same as with boiling water.

You can also blanch some foods in the microwave with basically the same process.

Times are variable and depend on the product and its size. Thin stalks of asparagus might take two minutes in boiling water; medium stalks, three minutes; and thick ones, four. Green beans and broccoli stalks require three minutes, but less if they're cut up or chopped. Books on canning and freezing will give exact times, but with a little experience, it's easy to tell by the change in color. Broccoli and beans will turn a nice bright green.

If we're baking a large squash, we usually have half or more left over. Sometimes we put an extra one in the oven, if there's room, to take advantage of the heat. When it's soft, scrape the pulp from the shell, and freeze it in bags or containers. This you can use in late winter and spring when the root-cellared squash is gone or beginning to spoil.

Corn is cooked as usual or leftovers are frozen, but opinions differ as to how to freeze it. The common thread is to cook or blanch the ears, chill them, and then cut the kernels from the cob. Most people wouldn't waste valuable freezer space on corn-on-the-cob; others find it delicious and well worth the space.

We can say the same of tomatoes. You can freeze a tomato, but it will come out as mush. If you have that much extra room in your freezer, you need to do more hunting or fishing or butcher a pig. Not everyone agrees. Take your choice.

You must blanch greens such as spinach, chard, kale, collards, and beet and turnip tops in water; don't steam them. They mat in the steamer and aren't sufficiently heated.

Unfortunately, you can't preserve other greens, such as the lettuces, at all. Some vegetables are hardly worth preserving because of the quality of the end product. Celery, cabbage, and Brussels sprouts are in this category.

What's left of the vegetable family doesn't need to be frozen or even preserved.

You can leave carrots, rutabagas, turnips, parsnips, and Jerusalem artichokes in the ground over winter; just cover them with a thick blanket of leaves or straw, and you can dig them anytime until spring.

Off the Beaten Path

It used to give me a weird kind of pleasure to dig carrots from the garden in December or January with a foot or two of snow on the ground. Neighbors looked at me as if I were crazy, but when I held up a bunch of freshly-dug red-orange carrots, they were amazed.

Alas, one year there was so much snow I couldn't find the carrots. They did show up by spring, and were edible, but the winter was carrot-less. Since then, I have taken greater care in marking our stash before it snows.

A humming freezer, constantly keeping the electric meter spinning, filled with rock-hard packages in an inhospitable climate, doesn't sit well with a diehard Green. It has none of the ambience of a well-provisioned root cellar or pantry. But few of us would enjoy homesteading, or dining, quite as much without one. It's one of the concessions we make.

Toys and Tools: the Essential, the Handy, and the Useless

Yes, food preservation can entail a hefty investment in capital equipment. Whether or not it will be worth it depends on what you do with it. A tool used once or twice and then set aside or discarded greatly increases the cost of whatever you made with it. But we have a number of things we've used for decades, which by now have paid for themselves several times over.

Acquire enough tools; live long enough; and you, too, will have both winners and losers. You can get by with very little, but there are some reasonable minimums. Here's what you might expect:

Canning requires a canning kettle, jars, and lids. All but the lids will last for many years. Any large pot that's at least 11 inches tall will work as a water bath canner, but the traditional black or blue enamel with white speckles will also have a proper cover—and an exceedingly handy rack to raise and lower the jars into and out of the water.



Watch Your Step

If you use a pressure canner, remember to check the pressure gauge annually. Your county agent can either do the testing or direct you to someone who can. Also read and heed the manual!

A better and naturally more expensive choice is a pressure canner, which is essential for most nonacid foods. A small amount of water is turned to steam, and steam under pressure can get much hotter than boiling water. Water boils at 212°F, but at 10 lbs. of pressure, the temperature in the canner rises to 240°F. At 15 lbs., it's 250°F.

Any of these canners are available in various sizes, from various manufacturers, at various prices, with presumably varying quality.



Lore of the Land

You can remove the metal rings after the jars have sealed and cooled. Store them, washed and dried, for the next use with little danger of rust.

Jars come in quarts, pints, and half-pints, as well as wide-mouth and narrow mouth. Do *not* use recycled jars such as a mayo jar! If you buy used jars, be sure there are no nicks or cracks on the edges that will hinder a vacuum seal and check each jar for defects every time you use it. You'll need new lids with rubber seals whenever you do canning, but you can reuse the metal rims indefinitely.

A colander or sieve will have many applications in canning, as well as in other food preparation. A jar lifter is a simple and inexpensive gadget, but a very handy one.

So is a plastic funnel a great aid for ladling boiling liquids into hot jars. Don't use a spoon; a large ladle works much better.

I wouldn't think of canning tomato juice, sauce, or paste without a food processor, such as the Victorio Strainer. It saves the mess and bother of blanching and peeling and removes both skins and seeds in jig time, creating a superior product with less time and effort. Several brands are widely available.

You most likely have everything you need for drying food. As explained above, you don't even need a dehydrator although that will certainly make the job easier and more goof-proof.

Otherwise, ordinary kitchen knives, by which I mean *good* kitchen knives, measuring cups and spoons, assorted pots and pans, towels and hot pads you use in everyday meal preparation will work fine for processing food, whether canning, drying, or freezing.

The useless category is a matter of personal preference and opinion. I'm sure *somebody* must really like pea shellers, bean frenchers, and apple peelers because they still sell them. Maybe I should sell mine, too, since I never use them. On the other hand, it's awfully hard for me not to try a new food prep gizmo or gadget just on the off-chance it might be the greatest thing since sliced bread. Yeah, we have a couple of useless aids for that, too.

The Least You Need to Know

- Food storage is a necessary human activity in temperate climates.
- Store what you eat, and eat what you store.
- You can probably build a root cellar in your basement.
- Freezing, canning, and drying all have their places in a food storage program.

Chapter 9

Look What I Made!

In This Chapter

- Nut and seed butters
- Pasta
- Basic bread
- Yogurt and cheese

Many products that are homemade in the old style of self-sufficiency are little more than curiosities in the new-style self-sufficiency we're talking about here. Some people do take great pride and pleasure in crafting soap or candles, spinning and weaving, or tanning leather, but these skills are hardly essential for life in the twenty-first century.

But food is different. Everybody has to eat, and everyone should know where his food comes from and how it's processed into familiar forms. Factory-made food might not be the ideal, but how will you know you can do it better yourself until you try? Here are a few basic recipes to get you started.

Peanut Butter

Peanut butter is a staple in most American homes, and that's one reason a peanut product recall is a traumatic event for so many people. But it's easy to make your own peanut butter; it's simply seasoned, ground-up roasted peanuts.

Homemade nut butters won't keep as long as the factory-made kind, but if you're into self-sufficiency, you probably aren't particularly fond of eating preservatives anyway. The homemade products also separate; the oil rises to the top. Actually, all peanut butter separated when I was a kid, and I have to

admit, the new stuff that didn't separate was quite a sensation when it first came out. But mixing the oil back in is no big deal, and storing the jar upside down is an even easier solution.

You can make other nuts and seeds into butter the same way. Try using unsalted roasted cashews, almonds or hazel nuts, or sunflower or sesame seeds.

Homemade Peanut Butter

1 pound shelled, skinned

roasted peanuts

1 tsp. coarse salt

1½ tsp. honey

1½ TB. peanut oil

1. In a food processor or blender, combine peanuts, salt, and honey. Or grind peanuts in your steel burr grain mill; a stone burr mill will gum up. Add salt and honey, and mix well.
2. Continue to process and drizzle in peanut oil. If you don't have a food processor or blender, mix oil in a little at a time until it's well-blended. Either way, grind nuts as smooth or as coarse as you want them.

Off the Beaten Path

A grain mill is one of the basic tools of self-sufficient living because it's essential for converting whole grains into flour and meal. They come with stone or steel burrs, in hand-cranked and electric models, in all price ranges, and are available by mail order.



If you grow your own peanuts or buy raw ones, here's how to roast them.

Roasted Peanuts

**1 pound fresh in-the-shell
peanuts**

1 TB. peanut oil

**1 TB. kosher salt (or less,
according to taste)**

1. Rinse soil off nuts with cool water, shake off excess water, and pat dry with a clean towel.
2. Place peanuts in a bowl, and add peanut oil and salt. Toss and stir until peanuts are well-coated.
3. Place peanuts on cookie sheets in a single layer. Roast in a preheated 350°F oven for 30 to 35 minutes, stirring a few times.



Sesame Butter (Tahini)

2 cups sesame seeds ½ cup olive oil

1. Roast sesame seeds in a heavy sauté pan over medium heat on a stovetop for a minute or two. Toss or stir seeds constantly because they can burn quickly.
2. Process roasted seeds with olive oil.



Pasta

Pasta is interesting from several standpoints in the context of self-sufficient living. It is, of course, almost legendary as a frugal food (macaroni and cheese, Ramen noodles), as well as a comfort food (chicken noodle soup) and a peasant gourmet item (*Agnolotti di Aragosta e Scampi*).

Although pasta has been around for a couple of thousand years, it didn't become a staple until the Industrial Revolution. The *durum* wheat it's usually made from wasn't widely available until then, and the *semolina* often called for is factory-milled with grooved steel rollers the ancient Chinese didn't have. Most recipes for homemade pasta don't even specify semolina; they just call for *bread flour* or even *all-purpose flour*. If you really get into pasta making, you might want to experiment with different flours, but for your first experience it isn't all that critical.

def•i•ni•tion

Durum is a very hard, light-colored wheat used mostly for pasta. Crushed durum wheat, separated from the chaff comprises semolina; purified middlings of hard wheat. Commonly made from hard, red spring wheat, bread flour is high in protein and gluten, which is what makes bread rise. All-purpose flour is often made from hard, red winter wheat, but it's not as high in protein and gluten as hard, red spring wheat. Pastry flour is usually made from low-protein, soft, white winter wheat.

Pasta contains only three ingredients: flour, eggs, and salt. If you have these and a fork, knife, and rolling pin, you're good to go. If you don't have a rolling pin, use a wine or beer bottle.

Basic Pasta

2 cups flour

3 eggs

½ tsp. salt

1. Pile flour on your work surface, and make a nest or well in the center. Break eggs into nest, and add salt.
2. Mix eggs and salt with the fork and then, little by little, start incorporating flour. If you mix in too much flour at once, you'll have trouble with lumps.
3. When ingredients are mixed as well as you can get them with the fork, use your fingers, and when it becomes dough, make it into a ball. If the ball is somewhat wet and gooey and sticks to your fingers, rub your hands with flour. If mixture seems dry and crumbly, add a drop—just a drop—of water. It's better to have to add a smidgeon of flour than a drop of liquid, and egg would be better than water, but egg doesn't come in drops.
4. Knead dough. Make a ball, and push it down and away from you with the palm of your hand. Fold it in half, rotate it about 90 degrees, and repeat. With a little practice, it becomes easy and rhythmic. Depending on how fast and brutal you are, this will take from 7 to 15 minutes to make a smooth, elastic dough.
5. Divide dough into thirds, form them into balls, cover them with a towel, and let them rest for about 15 minutes.
6. If you have a pasta machine, use it now, following the instructions that came with it. If you don't have a machine, use a rolling pin. Flatten one of the dough balls with your hand on a lightly floured surface, and begin rolling it out. The size doesn't matter, but if you want to mimic the machine, make it about four inches wide and as long as the dough will take you. Roll it out as thin as you possibly can; the thickness of a dime would be ideal.
7. With the dough as thin as you can get it (it will expand when cooked), cut it into strips, whatever width you want. You can use a knife or a pizza cutter, but the easiest way to do this is to lightly flour the dough, roll it up like a jellyroll, cut the roll, and immediately unroll the pieces and shake off the excess flour.

8. Dedicated pasta makers have dowel drying racks, which you can buy or make should you, too, become dedicated. For now, drape a towel over the back of a kitchen chair and hang your pasta on that, or even just leave the strips to dry on a flat towel. Unless you're storing it, it doesn't have to actually dry; use it whenever you're ready or when the water is boiling.



Watch Your Step

Fresh homemade pasta will cook much faster than an old, dry, store-bought product, so don't overcook it.



Some people enjoy green pasta, usually made with spinach although you can use wild greens, including nettle. A combination of green and yellow is called *pasta paglia e fieno*, or straw and hay.

Spinach Pasta

8 oz. raw spinach

3½ cups flour

3 eggs

Pinch of salt

1. Wash spinach, shred it, and put wet leaves in a pot without adding water. Heat until wilted, about five minutes, and let it cool.
2. Squeeze out as much liquid as you can. Blend spinach in with flour, eggs, and salt, and make dough as described in the basic recipe above.



Basic Bread

Bread is the staff of life; most cultures have some form of it, and some cultures have many forms. The chemicalized, industrialized mushy white stuff has become such an American standard that many people, especially children, have never even tasted real, honest-to-goodness bread.

You've probably made bread, yourself. Don't you remember? When was the last time you made pancakes or waffles? Technically, those are breads. So are biscuits, corn muffins, and tortillas.

Bread is made of flour, water, yeast, a little sugar to feed the yeast, and a little salt and oil. That's all you need. Of course, that doesn't mean it's all bread bakers use. Besides the different types of grains (wheat, rye, oats, triticale, etc.), the liquid ingredients can range from water to all the various forms of milk, potato water, vegetable liquids, and beer. Somebody always wants to know where to buy potato water. You don't buy it; you simply save it after boiling potatoes for dinner.

Not All Flour Is the Same

The flour is obviously of the utmost importance. If we had time, we could get into the differences between red wheat and white wheat, *winter* and *spring wheat*, hard wheat and soft. Then there is bread flour and all-purpose

flour, bleached and unbleached, and bromated and enriched. Let's touch on a few of the most important ones.

Flour is bleached to make it whiter and more appealing to those who prefer white bread and to artificially age the flour, which enhances its baking properties. The two most common chemical bleaches are chlorine gas, which is deadly to humans, and benzoyl peroxide, an ingredient in acne medicine. We need say no more about our preference for unbleached flour.

def•i•ni•tion

Winter wheat is planted in the fall and harvested the following summer; spring wheat is planted in the spring and harvested the same year. Winter wheat needs to undergo a certain amount of chilling in order to produce grain.

Potassium bromate is an additive used to strengthen bread dough. It accelerates the growth of yeast and chemically fortifies the gluten to make the bread rise more. A carcinogenic, it has been banned in most of the world, including Canada, but is still legal in the United States although California requires a warning label when it's used. Do not use bromated flour.

Commercially available flour is "enriched" by law. In the 1940s, the Food and Drug Administration decided that one way to alleviate nutritional diseases such as pellagra, beri-beri, and rickets, was to mandate the addition of certain ingredients to flour. That's why we add iron, niacin, thiamin, and riboflavin. Obviously, these will be lacking if you grind your own flour from whole wheat. You'll have to provide them yourself, maybe by eating real food containing the actual natural vitamins. But then, you're getting nutritional benefits from whole wheat that are missing in enriched flour, most notably the all-important bran.

There's an Art to It

The first rule of bread baking is that there are no rules. Find and follow recipes at first, but don't get overly concerned about kneading or rising times or even oven temperatures. Ovens are notoriously persnickety anyway, and you can never be sure what they're up to. I've followed recipes calling for starting bread in a 500°F oven, and I've baked bread in a solar oven that never went above 250°F. Both turned out fine; one just took longer.

Exact measurements are also nothing to worry about. That's partly because different kinds of flour, in different locations or on different days, have different qualities due to temperature and humidity. Sifted flour weighs much less per cup than flour that's been compacted in the package and shipped for hundreds of miles. What counts is the smooth elasticity of the dough. A little experience will teach you what good dough is like. Then it's a matter of matching the flour to the liquid to achieve that ideal.

We measure the water and add as much flour as we need. That's because I know four cups of water will make two loaves of the size I want, and Diane knows one cup of water is just right for her pizza pan. If you're making a free-form or round loaf on a flat baking sheet, even those considerations don't apply although, of course, they're helpful approximations.

For most breads you'll use *about* three parts flour to one liquid, by volume. Some bakers use a packet of yeast or a scant tablespoon for one loaf. But yeast is a plant and grows if nurtured. I feed it and use one tablespoon for as many as three loaves. (We also buy it in bulk from a local Mennonite store where it's much cheaper than by the packet or jar. You can freeze yeast.)

This recipe makes two small loaves of basic, traditional, hearth bread.

Traditional Hearth Bread

2 cups water

1 TB. sugar

**1 TB. active dry yeast (1
pkg.)**

**5-6 cups unbleached flour
(bread or all-purpose)**

½ TB. salt

1-2 TB. oil

1. Pour water at close to body temperature into a large mixing bowl. Yes, body temperature. Unless you want to get a thermometer to be sure water is between 95°F and 115°F, sprinkle a few drops on your wrist like you test a baby's bottle. Yeast won't grow at much below 95°F and will start to die off at more than 120°F, but within that range it doesn't really give a care and neither should you.
2. Add sugar and stir until it dissolves. Sprinkle yeast on top. Let it sit for 5 or 10 minutes, until tiny bubbles form and mixture starts to look foamy. If this doesn't happen, your yeast is dead or at least tired, and you need new yeast. (We call this proofing.)
3. Stir first cup or two of flour into liquid before adding salt. Otherwise salt will slow the reaction of yeast.
4. Stir in rest of flour, little by little. When you can no longer stir it with a spoon, use your hands. You'll know it's dough when it holds together and no longer looks or acts like pancake batter. Then it's time to start kneading.
5. Plop lump of dough on floured work surface at a convenient height. You want to be able to use your whole body, not just your arms. If you're not very tall, a table might work better than a kitchen counter if it's the conventional height.
6. Dust your hands with flour. Push down and out on the dough with the heels of your hands. Then grasp the far end, fold it back on itself,



Lore of the Land

One reason measuring flour doesn't mean a whole lot is that packaged flour is compacted. A cup of compacted flour might weigh five ounces, while a cup of the same flour, sifted, would only be four ounces. If you want to come close to using six cups in this recipe, either use a flour sifter or fluff it up with a spoon. Then scoop a measuring cup full and scrape off the excess with the back of a knife to get a level cupful.

and rotate it 90 degrees. Push, fold, and turn again. And do it again. When you get the hang of it, it'll be quite rhythmic. And of course, if you find a different method that delivers the same results and works better for you, that's fine, too.

I like the dough to get a little sticky, so I know I didn't add too much flour. This is also why you don't have to measure very carefully; you go by what the dough tells you, not by any strict measurement. If it's sticky, add a little more flour and continue kneading.

7. After maybe four to five minutes of this, let the dough rest while you clean and grease the bowl. Scrape it out with a silicone spatula. Wash and dry it, then swirl a tablespoon or so oil on the bottom and a ways up the sides. Use any oil or shortening you prefer.

After that brief rest the dough will feel different, maybe more satiny. Knead it some more. When it's smooth and elastic, you're finished. Form it into a ball, coat it with oil or grease by turning it in the bowl, cover the bowl with a damp towel, and stash it in a preferably warm place away from drafts.



Let It Rise

Leavening, or making the dough “rise,” is the process of adding gas to the dough to produce a lighter, more chewable bread. There are unleavened breads, but our western culture favors the risen variety. Rising can be accomplished with baking soda, sourdough starter, and other leavening agents, but to keep this simple we refer only to yeast.

Some recipes say to let the dough rise at room temperature. Room temperature in January in Minnesota or Wisconsin can be a long way from the ideal 75°F. You can use a heating pad, set the bowl in warm water, or just be patient. Rising will only take longer at cooler temperatures; instead of an hour, it might be two or three. Faster rising is not better! Anything close to 70°F should work fine.

The dough is considered risen when it has doubled in bulk. The standard test for that is to poke your finger into the puffy mass. If the dough doesn’t spring back, it’s ready to punch down. Punching down is the process of getting the gas bubbles out. You can literally punch it, but it will take a little extra kneading to finish the job.

Divide the dough in half, and shape into loaves. Place them on a baking sheet sprinkled with corn meal. Cover them with the towel and let the dough rise, again to double in bulk. Avoid over-rising; the bread will collapse and become denser, not lighter. And this time do *not* poke it with your finger.

Preheat your oven to 400°F. For real old-fashioned crusty country bread, place a roasting pan on the bottom oven rack when you preheat. When the oven is hot, *carefully* pour a cup or so of water or a half tray of ice cubes into the pan. Immediately put the bread on a rack right over the pan. Steam, for the first several minutes of baking, gives bread that fabulous crustiness some people enjoy so much. If you’re not some people, just skip this step.

Bake at 400°F for 35 to 45 minutes. A finished loaf should sound hollow when tapped on the bottom. If you’re not sure and it’s not too dark, pop it back in for another 5 to 10 minutes.

Times and temperatures can be very variable. In my everyday baking, I start the bread at 450°F for about 10 minutes, then turn it down to 375°F and bake it for another 30 to 35 minutes. I use freshly ground whole-wheat flour, not aged all-purpose flour. I also replace the sugar with half honey and half brown sugar. But these are the things that make bread baking more art than science and fun to experiment with until you come up with the perfect loaf.

There are, literally, hundreds of different breads. Because most people eat bread daily, there are plenty of opportunities to try new varieties. Besides basic white breads and whole grain breads, there are embellished yeast breads, baking powder and soda breads, muffins and biscuits, steamed and poached breads, flat breads, holiday breads, sweet breakfast and tea breads and rolls, and even more. If we're talking about self-sufficient living, we certainly can't forget sourdough! There are many good books on bread, but my favorite is *The King Arthur Flour 200th Anniversary Cookbook*, Country-man Press.

Even if you don't bake your daily bread on a regular basis, you'll probably want to make special breads on certain occasions. It's a handy skill to have and one that will surely impress your family and friends.

Dairy Products

I was prepared to tell you that if you don't have a dairy animal or know someone who does and has extra *raw* milk, making your own dairy products is not an economical enterprise. And while homemade bread and pasta might be worthwhile because of superior flavor and quality, it would be hard to say the same for dairy products made with *homogenized*, *pasteurized*, and *standardized* milk.

def•i•ni•tion

Raw milk is the milk as it comes from the animal, untreated in any way, while pasteurized milk has been heated to 165°F for 15 seconds or to 145°F for 30 minutes to kill harmful organisms, then rapidly cooled.

Homogenized milk has been mechanically treated so the cream layer does not separate out of the milk; goat milk is said to be naturally homogenized because the cream doesn't separate.

Butterfat is removed in standardized milk to bring it to a three, two, or one percent level (low fat); raw milk can range from less than two percent to more than four percent fat.

I was prepared to tell you that until I encountered some people who *love* to make cheese and who *rave* about their homemade products, all crafted from store-bought milk in plastic jugs.

If you do have a dairy animal, I certainly hope you have a book or two about it that contains a few hints on using the milk, along with at least one on making cheese. A very good web source is Biology.clc.uc.edu/Fankhauser/Cheese/Cheese.html, written by a homesteading goat-raising college professor of biology and chemistry. Other sites also offer supplies and equipment, such as New England Cheesemaking at www.cheesemaking.com.

This is the lab section of Self-Sufficient Living 101. If you're dreaming of some day milking your own cow or goat, I suggest you splurge on a gallon of milk. Try these recipes now, even in your apartment kitchen, if that's what you have, just to see what's involved. And who knows, you might become one of those avid cheesemakers who doesn't even know how to milk!

Yogurt

Making yogurt is a good introduction to cheesemaking. There are similarities between the two, but yogurt is simpler. If you're not familiar with its many uses, discover them when you make your own.

To begin, you need milk. Low-fat milk will produce low-fat yogurt, and whole milk will produce a richer flavor. Use either one. You also need a yogurt starter or culture. Dried cultures are available, but to keep it simple, we'll use some plain store-bought yogurt as a starter. Any brand will do, but what you really want is the live *Lactobacillus acidophilus* culture, so be certain it's fresh. In most markets this means a common and popular brand such as Dannon Plain, rather than something that might have been on the shelf for weeks.

Yogurt

1 quart milk

3 TB. plain yogurt

1. Warm milk to 100 to 110°F. You need a thermometer for this, but it doesn't have to be a floating dairy thermometer, at first. A digital probe used in ovens and barbeques or a candy thermometer are acceptable substitutes.
2. Mix in the store-bought yogurt. Pour mixture into the cups of a yogurt maker if you have one or into a preheated wide-mouth thermos or small plastic containers with lids. Fill the thermos with hot water and let it sit a few minutes to preheat it.



If you use the thermos, wrap it in towels and set it where it won't be disturbed for five to six hours. Set the covered plastic containers on a heating pad on medium heat, cover them with towels for insulation, and leave them for five to six hours. Some people just set them in the sun on warm days.



Lore of the Land

Yogurt makers, which were popular a few years back and are available for around \$30, will automatically keep the yogurt mixture at 100°F for five to six hours.

If you prefer a firmer product, add about $\frac{1}{2}$ cup powdered milk to the quart of fluid milk when you add the culture.

If you intend to make more yogurt in the near future, retain a cup of the finished product, tightly covered and refrigerated, to use as the starter for the next batch. If your yogurt didn't turn out at all, it was probably because the culture you used was dead or you didn't maintain the proper temperature.

As for its uses, try yogurt as a substitute for sour cream or light cream, use it in cooking and baking, or check out some cookbooks from the Middle East, where they use yogurt in everything from soups and stews to hot-weather beverages.

Cheese

Cheese is simply curdled milk with the whey drained off. You can eat it then, perhaps as cottage cheese. Or you can further treat it in numerous ways to create hundreds of different varieties. For our instructional purposes, just remember that all cheeses—cheddar, Swiss, blue, mozzarella, feta, colby, whatever—started out as basic curdled milk. The type of milk

and coagulant you use makes a difference, of course, but the subsequent treatment during pressing and aging creates most of the unique varieties. You can make a basic cheese with nothing more than a stockpot or large kettle, slotted spoon, colander, cheesecloth, and a thermometer. A floating dairy thermometer is the ideal, but any submersible thermometer that measures 185°F will work.



Watch Your Step

Do *not* use aluminum utensils when making cheese! The acids will react with aluminum.

Basic Cheese

2 quarts milk

¼ cup vinegar, lemon juice,

or lime juice

1. Heat milk to 185°F.
2. Slowly add vinegar or juice, stirring constantly. Milk should coagulate, separating into curds and whey.
3. Skim off curds, placing them into a colander lined with several thicknesses of cheesecloth or muslin. (The cheesecloth found in supermarkets isn't the kind cheesemakers use, but until you place an order at a supply house that sells the genuine item, this will work if you use several thicknesses.)

4. Tie the four corners of the cloth together with twine, and hang it where it can drain for several hours. One option is tying it to a cupboard door handle, with a pan on the counter underneath to catch drained whey.
5. When it stops dripping, you can slice or cube it and eat it. It won't have much flavor, but it's cheese, and you made it!

Variations

When you taste and pass around your first cheese, try to save enough for this.

Queso Blanco

Marinate cheese in olive oil, wine, or soy sauce. Or mix in salt, green chiles, jalapeños, olives, or anything else you enjoy with cheese.

If you have enough left after that, you can press it for 8 to 10 hours for a firmer cheese. Here's a simple way. Wrap it in cheesecloth, and place it in a colander. Put the colander over anything that will catch the drained liquid, and place any saucer or cover that will fit into the colander on top of the cheese. Weight that down with anything handy: a No. 10 can of tomatoes or a Ziploc bag of water will work.



Cottage Cheese

1 gallon milk

¼ tablet rennet

½ cup cold water

1. Warm milk to 86°F.
2. Crush rennet tablet with a spoon, and dissolve it in cold water.
3. Add rennet solution to warm milk, and stir it in. Let milk stand in a warm place, undisturbed, until curd forms. This

should take about an hour.

4. Test for a “clean break.” Put your finger into curd at an angle and lift. If curd breaks clean over your finger, it’s ready to cut.
5. Cut curd into small cubes. A long, thin-bladed knife, such as a serrated bread knife, works well. Holding the knife vertically, cut curd, all the way to the bottom of the pot, into ½ to 1 inch squares. Turn the pot 45 degrees and cut vertically again. Then repeat those cuts, but holding the knife at a 45 degree angle. Now cut it a fourth time, angling the knife to the opposite side. The goal is to cut curd into cubes, as much as possible.
6. Stir curds, very gently, and cut any remaining large pieces.
7. Very slowly and gently, warm curds to 110°F. This will take at least 30 to 45 minutes or even an hour. Watch the thermometer! Some people are more comfortable doing this with a double boiler arrangement. Set your cheese pot inside a larger kettle filled with water (this one can be aluminum), and heat water.
8. When curds become firmer and have a tendency to stick together, pour curds and whey into a colander lined with cheesecloth, and let drain.
9. Rinse off any remaining whey by running cold water over curds. This gives the cheese a milder flavor and a longer shelf life.



Some perfectionists might want to differentiate between large and small curd cottage cheese, farmers’ cheese, queso fresco, dry curd cottage cheese or paneer, but we’re trying to keep this simple. In the same vein, don’t look at too many recipes for cottage cheese before you try making some; you’re liable to go mad and give up on the whole idea.

The problem—and the beauty of cheesemaking—is that when a recipe calls for letting the milk set for 1 hour or 18 or 24 hours, when it calls for a temperature of 86°F or 72°F or something else, when it says to use rennet or buttermilk or nothing at all, it all turns out to be cheese. That's why there are so many different kinds.

Before you get confused by all those options, try a typical simple recipe for one kind of cottage cheese, such as the previous one. It's only slightly more complicated than the vinegar cheese. One big difference is the rennet, which replaces the acid. You might be able to find Junket rennet tablets in a supermarket, but *be absolutely certain it's not the kind for pudding*, which is far more common but useless for cheesemaking. Real rennet is available online in both liquid and tablet form. Tablets are preferred for home cheesemaking if only because the liquid form has a limited shelf life.

You can eat this cheese as is, pressed, brined, marinated, or processed into more complicated cheeses. If you have come this far, you have made cheese.

The Least You Need to Know

- Homemade isn't always cheaper, but it's almost always better.
- Most foods made in factories are ridiculously easy to make at home.
- The only rule in bread baking is that there are no rules.
- Learn the basics of cheesemaking, and you're ready to make dozens of different varieties.
- Your homemade products won't have all the preservatives and other chemicals of factory-made.

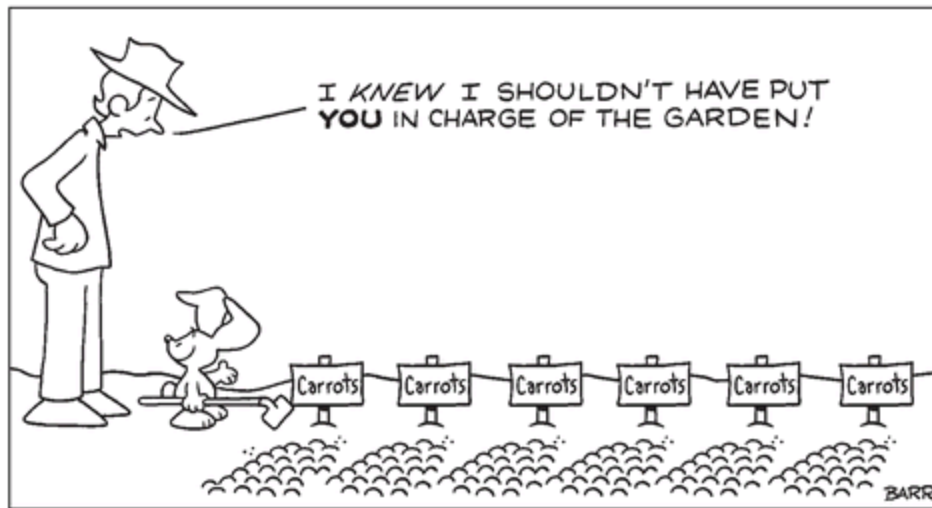
Part 3

The Self-Sufficient Gardener

Gardening entails nothing more than planting a seed in the dirt, and when it grows, keeping it weeded and watered. Then you pick it and eat it. What's so difficult about that?

The simplicity is misleading. So many intertwining factors affect plant growth that some people spend a lifetime studying them and still learn something new every day.

The fact that you can actually survive with only the food you grow yourself is tremendously exciting and motivating to anyone even remotely interested in self-sufficient living. Let's examine a few of the things you'll want to learn as you work toward that goal.



Chapter 10

Gardening Fundamentals

In This Chapter

- The four needs of a plant
- Soil isn't just dirt
- The need for water
- Weeds and other nuisances

Most people are aware that gardening helps us relax, offers a great way to get light exercise, connects us with nature, gives us an opportunity to be creative, and enhances our living spaces.

The specific benefits of vegetable gardening are also well known. The puzzle is why more people don't take advantage of them. Freshness is a given, flavor is legendary, and pride and satisfaction can be taken for granted.

Low cost is often assumed. However, this is true only if you do almost everything right. This chapter will get you started in the right direction.

What a Plant Needs to Grow

Green plants need four things to live and grow: soil nutrients, water, light, and a certain degree of warmth. Each species has its own range of tolerance within these needs. If those tolerances aren't met, the plant won't thrive; if they aren't even close, it will die.

In a natural setting, nature takes care of this ruthlessly. If a given plant isn't suited to a certain location—the soil, climate, or amount of rainfall—the plant perishes or won't even get started. It's that simple.

In our gardens, we humans like to grow subtropical plants like tomatoes and peppers even if we live in temperate climates. Especially for self-sufficient

living, we want to grow plants that need a regular water supply even when it doesn't rain. Nature won't take care of these. They depend on our efforts—and knowledge. Thus, gardening is a collaboration between God and man.

Soil Feeds the Plants

Entire books have been written about soil. I wrote one myself, *Soil Fertility*, in which I explain what soil is, where it comes from, how it's destroyed by improper farming or gardening methods, and how to restore and preserve its fertility. We obviously can't get into all that in this chapter, but we will take a closer look in the next chapter because nature's lessons in soil building are critical to self-sufficiency. The more you know about soil, the better your garden will be.

It's said that modern agribusiness treats soil like dirt; it's just something to hold the plant's roots in place while the farmer feeds them synthetic chemicals. Factory farming destroys the living soil, thus requiring still more chemical inputs for plants to grow well. Add to that the massive use of fossil fuels, and it's just not *sustainable*.

def•i•ni•tion

The term sustainable farming is sometimes used in place of organic farming. Some of today's conventional farms use so much fossil fuel—for fertilizer, insecticides, and herbicides as well as diesel, gas, and oil—that they put in more energy than they take out in the form of food. In addition, their methods often kill living soil organisms and thus fertility, requiring further inputs of chemical fertilizers. Because this can't go on forever, it's not sustainable.

Not all self-sufficient people garden organically. Some are PMO, or Pretty Much Organic, and some probably use as many chemicals as anyone.

But for most people, eating organic food is a large and important part of green living and self-sufficiency. A way of farming that isn't sustainable isn't leading to self-sufficiency, by definition. With the growing acceptance and popularity of organically grown food, everyone should know the concepts behind it, if only to be an informed consumer. Organically grown doesn't just mean the food hasn't been sprayed. There is an entire philosophy behind it.

Let There Be Light

Green plants need sunlight. If you paid attention in school and remember hearing about photosynthesis, you know how plants use that light and the chlorophyll contained in their leaves (mostly) to manufacture *carbohydrates* from carbon dioxide and water.

Some plants need more light than others. Hostas, ferns, and impatiens are well known for tolerating low-light levels. But vegetables need more light. In practical terms, this means locating your garden where it will get at least six hours of sun a day. Most vegetable plants will appreciate more, and full sun is best.

If you must make a choice on your location, morning sun is usually preferable to afternoon sun. Some plants do not do well in the more intense afternoon heat and, in any event, will require more water.

One interesting detail about light is that some plants are attuned to the amount they're exposed to. There are short-day, long-day, and intermediate onions, for example. The amount of light determines when the plants start making fat bulbs.

def•i•ni•tion

Carbohydrates are organic compounds, including starches, sugars, and fiber, that comprise the major source of energy for

animals, including people. That's why following the food chain inevitably leads to plants, photosynthesis, and eventually sunshine.



Watch Your Step

Shaded areas change not only during the day but also during the season as the sun rises and sets further to the north (in the Northern Hemisphere) and is higher in the sky during the day. Take this into account when deciding where to locate your garden.

Warmth

Every plant has its own temperature requirements, which means several things for gardeners. An obvious one is that not all plants will grow in your garden. We need not point out that bananas don't do well on the shores of Lake Superior, but some new gardeners might not know that some plants, such as apples and rhubarb, need certain *low* temperatures in order to produce. So do spring bulbs such as tulips, but those aren't edible.

Then we have differences within the range of adaptable plants with cool-weather and warm-weather crops. This means that you'll plant cool-weather ones, such as peas, lettuce, and radishes, very early in the growing season as soon as you can work the ground. In southern Florida, folks plant cool weather crops in January. In northern Wisconsin, we're often forced to wait

until April or May. Later plantings won't do nearly as well. Most lettuce will bolt or go to seed in hot weather.



Lore of the Land

A few crops that like cool weather take it to the extreme. A University of Saskatchewan study showed that you can double your garlic harvest by planting it in the fall rather than spring, even in Canada.

However, you can plant these vegetables again after the worst of the hot weather passes, and you'll get fall crops up until frost and, in some cases, beyond. The fall garden is too often neglected, but self-sufficient gardeners can't afford to ignore its bounty. Other cool-season or early crops include broccoli and cauliflower, cabbages, spinach, beets, and chard.

Warm-weather plants, in contrast, will not survive early spring planting and will not thrive until the weather becomes actually hot. Don't waste your time planting corn or beans in cold soil because the seeds will just rot. Melons and cucumbers are in the same class.

Others, most notably tomatoes, peppers, and eggplant, require such a long growing season and so much heat from the beginning that they are usually started indoors about two months before it's warm enough for them to grow outside. These we call *bedding plants*.

Even a Cactus Needs Water

All plants need water. Some, like cacti, don't need very much; others, like cattails, grow *in* water. Most vegetables fall somewhere in between, but some need more than others.

In nature, rain and dew provide the water plants need to survive. While this would be the most self-sufficient way to produce garden vegetables, it's not always reliable or even possible. For optimum results, we often have to give nature a helping hand, and we'll look at several ways to do this later. But you can lessen the need to provide water by mulching plants to conserve moisture.

Weather and Climate

Today's weather might help determine whether you plant the garden, water the garden, or weed the garden. But the climate you live in determines what kind of garden you'll have or even if you have one at all!

One simple definition of "climate" is "average weather." Almost everyone has a pretty good mental image of the average weather in such diverse places as Minnesota and the Florida Keys. Knowing this, you can understand that plant life differs in the two locations.

All of this is neatly organized and coded for your gardening pleasure and convenience in what we call "USDA (United States Department of Agriculture) Plant Hardiness Zones." Here's how it works.

Find your location on the zone map, which is widely available in gardening books, seed catalogs, and, of course, on the web. Note the zone number. Numbers range from 1 to 11; 1 is the coldest part of Canada, and 11 is the southernmost Florida Keys, neither of which are great locations for gardening.

Each zone boundary is an isotherm; that is, a line connecting places with the same temperature. In this case it's the lowest minimum temperature you can expect in any location on the line. The upper and lower boundaries of the isotherms are 10 degrees apart. Thus, any garden within zone 3 (the coldest in the continental United States) can expect an average annual minimum temperature of between -30° to -40°F. Zone 9, which is much of California, Florida, and southern Texas, doesn't get below 20° or 30°F.

Off the Beaten Path

During a January phone conversation with a reader in California, I mentioned that the temperature outside my Wisconsin office was 35 below.

There was a pause. Then she asked in a querulous voice, “Below what?”

Some plants can survive much lower temperatures than others. Horticulturists determine these limits by trial and error. The practical use of zones is that most perennial plants, those that live more than one year, are sold with a hardiness zone rating. If you live in zone 4 and plant something rated for zone 5, you’re probably wasting your time and money. But don’t worry; all gardeners do that on occasion, just in case they get a plant that can’t read zone maps.

This doesn’t matter as much for vegetable gardens as it does for ornamentals. Most vegetables aren’t in the ground over winter anyway. Even if the plant is actually a *perennial* in a tropical climate, we treat it like an *annual*. *Biennials* are a special case, if you want to save seeds. (See Chapter 15.)

def•i•ni•tion

An annual plant is one that sprouts from a seed, produces flowers and fruit, and dies, all in one growing season. A biennial grows without flowering the first year but survives for the next growing season when it flowers and produces fruit and seeds. Then it dies. A perennial plant lives for several years. Trees are perennials that can live for hundreds or even thousands of years.

However, knowing your zone is important when buying fruit or nut trees and perennials such as grapes and berries. Most peaches, for example, are zone 5 to 8, but some new varieties are said to survive in even the cooler parts of zone 4.

Most gardeners agree that the official USDA hardiness zone map is outdated—thanks to global warming or whatever the doubters think is melting those polar ice caps. Several updated versions are already circulating, and a new official map is in the works.

Even this one won't be the final word, however, because of *microclimates*. Microclimates can be as helpful—or as harmful—as the zonal climate. Microclimates are small areas where temperatures are significantly different from the surrounding region and the official climate.

def•i•ni•tion

Microclimates are small areas of a climate within a climate. They can be warmer than you might expect because of their southern exposure or because of the moderating effects of a nearby lake. They might be colder because they're in a low spot where cold air sinks or on a north-facing slope. A microclimate can be as small as a protected area near the foundation of your home. Plants growing in such locations can get a significant jump on or be more retarded than those in open areas nearby.

Watch for microclimates on your homestead, and make use of them. Especially if you live on the border between two zones, you might be able to shift up to the warmer one, or if heat is your problem, find a cooler zone without even moving.

Another weather-related item of great importance is the date of the first and last frosts. Warm-weather plants set out before the last frost of spring will obviously freeze. Any crops that are not frost-tolerant will be lost if you don't harvest them before the first fall frost.

Irrigation Irritation

Usually, we depend on rain to provide water, but that doesn't always work, so be prepared to irrigate your garden should the need arise. This can be one of the most irritating aspects of the home garden.

Most vegetables need about an inch of water a week. This means that among other things, you'll need a rain gauge or some way to measure what nature provides. Then you'll have to decide how much to supplement that with and how. This is often as much art as science because soil type, wind, temperature, humidity, and mulch, as well as needs of individual plants, are all factors that affect water usage.



Lore of the Land

You don't need anything fancy to measure rain. Just set a plastic or metal container with a straight bottom and sides where you want to measure either natural rainfall or water from a garden hose and sprinkler.

The old-fashioned sprinkler systems of garden irrigation are now out of favor basically because of the waste of water. It's not as bad as watering lawns—and in the process sidewalks and driveways—which can make Green people see red. But it's much more efficient to put the water where you need it, in the amount you need.





Lore of the Land

How much water is an inch a week?

An inch of water on one square foot would be 144 cubic inches ($12 \times 12 \times 1$). A gallon contains 231 cubic inches. So a plant growing in about one square foot of soil needs a bit more than half a gallon a week (0.62), and a 4 foot \times 8 foot bed, about 20 gallons a week.

For a few plants a watering can will do (preferably filled from the rain barrel, where natural precipitation falling on roofs is saved). But for any garden approaching the size needed for self-sufficient living, a soaker hose or drip irrigation system is much preferred. Components for these systems, along with directions for installing and using the various kinds, are widely available today. Check out local garden or home improvement centers.

Plants sometimes suffer from *too much* water when water replaces the air in the soil, which plants require. In times or areas of heavy rainfall you can't avoid this, but where you have a persistent problem, planting on raised beds of any kind can be helpful.

A World of Weeds

Books and articles on gardening treat weeds as villains and something to be done away with as effortlessly as possible. But weeds do have a good side, too.

All plants we cultivate today, both for food and pure enjoyment, were once nothing but weeds. In the long-ago past people who ate these plants noticed

they grew better and were easier to gather if they gave them a little care, and gardening was born. Repeated selection of the biggest, the sweetest, the hardiest plants resulted in improved varieties.

Some people still eat weeds, and we'll look at that later. But weeds have other uses, too. Many of my gardening friends who are otherwise sticklers for weed eradication always leave a few milkweeds for the monarch butterflies and even thistle for the finches. Milkweed, *Asclepias syriaca*, is the sole food of monarchs.

It's also possible to use weeds as indicators of soil fertility. Dandelions are often a symptom of calcium deficiency. Chickweed indicates high humus levels; plantain lies prostrate in poor soil, erect in rich. You'll probably notice weed concentrations on your own place and be able to deduce why if you look for them.

Some weeds have been used as fertilizers. Liquid fertilizers called "teas" because they are brewed like tea, made from stinging nettle or comfrey, are said to be very effective. And of course, any weeds you remove from your garden can go on the compost pile and become fertilizer, with the exception of quackgrass, which has more lives than a cat. Also avoid weeds that have set seed, unless you are absolutely certain your compost will heat up sufficiently, above 196°F.

In spite of the benefits of weeds, they certainly can limit your gardening self-sufficiency. When weeds crowd your crop plants, they divert the fertilizer and water intended for your future food supply. If you let them get too big, they'll even stifle photosynthesis. In other words, a weed among your vegetables truly is a plant out of place—but we have ways of coping with them.



Lore of the Land

To make garden tea, fill a five-gallon plastic bucket halfway with nettle or comfrey. (Is it necessary to warn you to wear good gloves? It's not called *stinging* nettle for nothing!) Fill the bucket with water, and put some crumpled chicken wire on top to hold the plant material under the water. Stir it at least once a day; it will ferment and smell awful. After a week or two, depending on temperature, it will stop bubbling. This stuff is so strong you must dilute it, about 1:10 (one quart tea to 10 quarts water.) Apply it with a sprayer or sprinkling can. Some gardeners swear this is ambrosia for plants.

First and foremost, get 'em while they're young and vulnerable. Scraping little seedlings off the soil surface with a scuffle hoe is a lot easier than pulling big ones with well-developed root systems. (A scuffle hoe has both edges sharpened and can be pushed or pulled.)

There is a huge difference between annual and perennial weeds. Annuals are easier to control. Some of the more notorious perennials, such as Russian thistle and burdock in my area, can take years to eliminate once they get a foothold. The only sure cure, aside from a killer herbicide such as glyphosate (Roundup), is to cover them with plastic or tar (roofing) paper for a growing season.

Quackgrass is a problem because it spreads by rhizomes. Rhizomes are stems but can be confused with roots because they are generally underground and horizontal. They send out roots and shoots from nodes. If you leave even the tiniest piece of rhizome with a node behind, it will develop into a new plant, seemingly with the speed of light.

Some gardeners avoid weeding almost entirely by using thick mulch or plastic. A few years ago red plastic was said to make tomatoes ripen faster, but I never met anyone who claimed that worked in actual practice. I gave it up after two years of trials. More common is black plastic, which helps increase soil temperature, which in turn aids tomatoes, eggplant, and peppers. But plastic isn't cheap, can be a pain to work with, and isn't

biodegradable. Organic mulches such as leaves and dry grass clippings are preferable.



Watch Your Step

Beware of black walnut leaves and wood chips and sawdust in mulch and compost. Black walnut trees (*Juglans nigra*) contain a substance (juglone) that is so toxic to most plants that they won't even grow near the trees. Gardeners who get free wood chips from tree trimming crews sometimes regret their bargains if black walnut is involved.

I plant a few carrots as early as possible, but the main crop doesn't go in until later—sometimes not until just before the Fourth of July. Why? Because carrots are a bear to weed, and if I let the weeds sprout and then eliminate them before planting, the job is much less of a chore. In addition, we don't eat many carrots during the summer when there is so much in the garden. We plant them late so they mature in fall and become sweeter after a good frost. Then we mulch them heavily—and can dig fresh carrots from under a couple of feet of snow and leaf mulch all winter long.

You can treat potatoes the same way with the added benefit (at least usually, in my area) of avoiding the Colorado potato beetle infestations that come with early crops.

One herbicide, corn gluten meal, deserves mention because it is acceptable even to organic gardeners. However, this is a pre-emergent herbicide, meaning it keeps seeds from germinating, so you can't use it where you are planting seeds. When you're transplanting started tomatoes, peppers, and

the like, corn gluten might be worth knowing about. Follow the directions, because timing is everything.

Aside from these few suggestions, I know of only one way to keep unwanted weeds from taking over your garden, which I learned many years ago from my grandfather. He admonished, “Never plant more garden than your wife can keep weeded.” I have seldom followed that advice, and even with the two of us working together, weeds get the upper hand from time to time. And guess what? The world hasn’t ended.

Pest Patrol

That same *laissez faire* applies to garden pests. Some people seem to have a great deal of trouble in this regard, while others report nearly none. Most of us in the second category probably either aren’t paying that much attention, or we shrug it off as a minor concern. The Lilliputian losses aren’t worth any gargantuan preventive measures, with two exceptions, in my case.

Without great effort, we would never have homegrown sweet corn, thanks to deer and raccoons. The coons are by far the worst, but in recent years I have foiled them with electric fencing. High tensile woven wire fencing, often referred to as New Zealand fencing, would no doubt be ideal for this, but like many ideals, it wouldn’t be cost-effective. To keep the fence from costing more than the corn is worth, I recycle fiberglass fence posts (just rods, really) and ordinary electric wire, attached to an old solar powered electric fencer. It does the job.

I am not proud of the corn, the weeds, or the poor fence in this photo. Actually, the photo was made accidentally, with a motion-activated game camera. I wanted to see a raccoon or deer testing the fence, but it didn’t happen. But the fence was cheap; it worked; and you probably get a better idea from this than from the word description.



To make this simple fence even more effective, attach sheets of aluminum foil to the wire at intervals, and smear the universal bait, peanut butter, on the foil. This will get the attention of the critters and teach them a lesson, even before the corn is ripe.

The only other garden pests to get my regular attention are potato bugs or Colorado potato beetles. I mentioned that late-planted spuds generally escape the scourge in my garden. Those planted early, at the normal time, never do. I start out picking them off by hand, but we grow a lot of potatoes, and eventually the bugs overwhelm me. A few early in the season or after blossoming won't destroy the crop, but when every leaf on every plant in every row is chewed down to the vein and stem, I can forget about eating potatoes for that year.

In years past I have fallen off the organic wagon and reached for the insecticide pyrethrum. Yes, some people regard this as organic because it's made from chrysanthemum flowers, but here's an example where organic is

not synonymous with nontoxic. Pyrethrum is highly toxic, which shows both how seriously I take my potatoes and how devastating the beetles are. A better solution is a type of bacteria called Bt, which stands for *Bacillus thuringiensis*. I apply it as a spray when the beetle eggs start to hatch, and it must be eaten by the larvae. It's slower acting than conventional insecticides and works better in warm temperatures, which we don't always enjoy during that period, but it will not harm other life, including natural enemies of the potato beetle. About half a dozen varieties are now on the market.

The only other pest that has ever entirely destroyed a crop important to our self-sufficiency was an invasion of onion thrips. In a matter of hours, it seemed, every onion in the garden was silvery and dead or dying. In several decades of growing onions, I had never seen one, and I have not seen any since. This might be explained by the fact that such pests can arrive on transplants from the South although they are a problem even into Canada. The only lesson I can share from this weird experience is that in your quest for self-sufficiency, expect the unexpected.

Reportedly, some people do have a lot of trouble with insects and other pests such as slugs. Healthy, organically grown plants are said to be less susceptible. In most cases, insects might cause some cosmetic damage, but that's nothing to get too upset about.

The Least You Need to Know

- Provide plants with enough food, water, light, and heat, and stand back to reap the bounty.
- Soil is a living thing and should be treated with knowledge and respect.
- Nature invented soil fertility; follow that example.
- Weeds and other pests will always be with us; you don't have to eliminate every last one to get a crop, but do your best anyway.

Chapter 11

The Dirt on Garden Soil

In This Chapter

- Recognizing elements of soil
- Reasons you need compost
- All about fertilizers
- Decoding the NPK

Our economy, our health, our very existence, all depend on a fragile umbilical cord that stretches between Mother Nature and her children: soil. Few people in a world fed by industrial agriculture give soil any thought or even know very much about it. So it follows that they have little respect for it and little reverence for the processes involved in growing food. However, in the context of self-sufficient living on Spaceship Earth, it's mandatory for us to understand soil.

Soil: What's Your Type?

If you read most any book about gardening, you'll learn about sandy soils, loam soils, clay soils, among others. And if you find that exciting, you'll love books on soil taxonomy and classifications. Soil has 12 "orders" and over 20,000 classifications, according to the United States Department of Agriculture's (USDA) Natural Resources Conservation Service. Soil obviously isn't just "dirt." Good soil is some combination of sand, silt, clay, and organic matter.

All soils began with the various kinds of rocks that comprise the earth's surface. The types of rocks and what has happened to them in the past couple of million years determine what kind of soil it is. The properties of soil are important to people who build roads, dams, large buildings, and

gardens. Fortunately, the gardener's requirements are relatively simple. A good garden soil is simply one that is easy to work and contains nutrients plants need. This is often called texture or friability and fertility.

The term friable has nothing to do with frying but comes from a Latin word meaning crumble. So you can easily crumble friable soil in your hand. A clay soil that balls up when you squeeze it and stays that way is not friable. Neither is sand that runs through your fingers.

Friable texture is important for several reasons as it holds water and yet drains well, so the plants' roots neither dry out nor drown. That crumbly texture also admits air, which is essential to the roots. These requirements cannot be met in a soil that leans too far toward either sand or clay. A perfect soil contains sand, silt, clay, and humus in varying amounts.



Lore of the Land

Few people realize the soil they walk on is teeming with life—life important to plants. We all know the importance of earthworms, but healthy, fertile soil contains many, many other living creatures. A single teaspoonful of fertile soil can contain as many as 4 billion bacteria, 40 to 100 meters of the mold filament of fungi, 144 million actinomycetes, plus assorted other living things that grow, consume, excrete waste, reproduce, and die. Some farming and gardening methods kill these valuable life-forms while others encourage and nurture them.

Few spots on Earth are blessed with perfect soil. Recently constructed suburbs are notorious for having had the topsoil scraped off, maybe a little “black dirt” hauled in, and the whole mess compacted by trucks and bulldozers. No wonder so many gardeners think they need power tillers. But rural areas can be just as bad as many farm soils have lost their natural fertility. In the old days, they called it “worn out,” and when that happened the farmer just moved further west. Now there is nowhere else to go. Chemical fertilizers such as ammonia (for nitrogen) also “burn up” the humus, or organic matter, that makes natural soils fertile. With soil life destroyed, no new humus forms. Soil is basically ground up particles of sterile stone, so when the humus and living organisms are gone, the soil is essentially sterile.

Off the Beaten Path

Ammonium sulfate, an early commercial source of nitrogen fertilizer, was originally a by product of the manufacture of coal gas made for gas lamps. Ammonium nitrate is a principle ingredient in the manufacture of explosives. When the United States government found itself with huge surpluses after World War II, someone decided it would make good fertilizer. Yes, the boom in chemical farming started with surplus explosives.

In both city and country, on both sand and clay, humus is the secret ingredient. Humus is a dark black or brown material resulting from partial decomposition of plant or animal matter and forms the organic portion of soil. One easy way to increase humus is by adding compost.

How to Make Compost

While scientists declare some eye-crossing technical differences, most gardeners gladly use “humus” and “compost” quite interchangeably, both in

speaking and in amending their soil. The compost bin is one of the most important amenities on a self-sufficient homestead, and making compost is one of the most important tasks and skills, so take notice.

Any organic material will decompose, eventually. A pile of wet grass clippings or weeds in your garden will not make compost, but it will make a stinking mess of rotten plant material. Composting is not the same as rotting.

Incidentally, the word compost has no connection with decomposition. It derives from an old French word meaning mixture. Mixing materials is extremely important.

Good compost is made from a mixture of moist plant and animal (organic) materials and air to promote controlled *aerobic* decomposition. Those weeds we piled up and left to rot weren't a proper mixture, and because there was no air in that mixture, their decomposition was *anaerobic*.

def•i•ni•tion

Aerobic decomposition occurs when microorganisms break down organic material in the presence of oxygen. Anaerobic decomposition takes place with different microorganisms, in the absence of oxygen. Among the byproducts is methane gas, a cause of global warming. Anaerobic decomposition is more likely to produce pathogens.

Compost also needs a mix of carbon and nitrogen. For a quick, simple lesson in composting, we call it brown and green materials. Dry brown leaves, dry grass or hay, and materials of that nature are high in carbon. Green grass and weeds, the stuff that just rots by itself, is high in nitrogen. Manure might not be green, but that's nitrogenous, too. So are other animal products, but we don't recommend adding meat or bones, etc. to a compost pile or bin if only because it will attract rodents and other pests. Also avoid pet manures, which might contain pathogens.

However, anything else that's organic—that was once alive—is fair game. This includes coffee grounds and tea bags, orange peels and banana skins, egg shells, and, of course, all the vegetable waste and trimmings from cooking, canning, and freezing. After the harvest, the spent plants are turned into compost, too, along with all the weeds.

Don't let those weeds go to seed, or you'll be planting them when you use your compost! A proper compost pile will get hot enough to kill most weed seeds, 160° to 180°F, depending on other factors such as moisture, but most homestead compost doesn't attain these temperatures without special efforts such as shredding the materials.

What we want is a carbon to nitrogen ratio (C:N) of about 25 or 30 to one. If there's too much carbon, decomposition will be slowed. Too much nitrogen, well, there's the green weed pile, rotting again.

Books on composting and organic gardening give charts estimating C:N ratios. Manures are commonly listed at 15:1, while leaves are 60:1. Coffee grounds, food waste, and grass clippings are 20:1. But shredded newspaper is 175:1, and sawdust, 315:1. These are general estimates and can vary, but you can see why you have to blend most materials with others to get anywhere near the correct C:N ratio.

Then don't forget the mixing, both to incorporate air for that aerobic digestion and to blend the materials. Keep the pile moist but not wet, and in anywhere from a few weeks to a year, you'll have compost.



Lore of the Land

The time it takes compost to “finish” depends on several factors. Shredding the materials increases the surface area and speeds the

process. Mixing the materials together and evening out the hot and cool areas will help, and maintaining the proper moisture level is important. It's a good idea to have two or even three bins to make mixing easier. Compost won't work in cold weather.

Anyone who is picky enough to measure all his composting materials and do all the math should loosen his top button. That kind of detail isn't necessary. It's enough to realize that when people complain that their compost stinks or that the pile never heats up or the eggshells never disintegrate, it's because they didn't follow one or more of the rules. If the pile is too dry or has too much carbon, it won't decompose. If the pile stinks, it might be too wet or too high in nitrogen. But basically, if you come close, that'll do the job. If you need to do some fine-tuning, just add sawdust or shredded newspaper to a pile too high in nitrogen or fresh grass clippings to one high in carbon. Turning or mixing the pile helps. Some people don't mind a bit of compost odor and go a little heavy on the nitrogen just to make sure the pile keeps cooking.

The self-sufficient gardener never has enough compost. Spread it on thick, work it in, or use it for mulch, and you'll soon see an improvement in even the worst of soils.

Fertilizers Demystified

Soil is created by water polishing rock, by wind sandblasting rock, by the acids in primitive lichens dissolving rock, and by roots and freezing water opening fissures in rock. The ice age glaciers created a lot of soil from materials they scraped off Canada and deposited in the United States corn belt.

Then tiny creatures appeared: bacteria, actinomycetes, and many more. Larger insects and worms followed, then birds and small mammals. All contributed their wastes, and when they died, their bodies, to the developing soil. To paraphrase what they say about money, keep this up for a few thousand years and pretty soon you're talking real soil!

Then came farmers with their plows, tractors, chemical pesticides, and bigger tractors. And soon we had soil erosion and depletion. Soil that had taken many thousands of years to develop was “worn out” after just a few years of moldboard plowing and growing nothing but cotton. Plowing up the prairie grasses led to the devastating Dust Bowl of the 1930s.

Moldboard plows turn the soil over, destroying the environments of the life forms within it. Growing a single crop year after year, called monoculture, is more destructive than growing a variety of plants as nature does. Any crop removed from the land obviously takes something away from that land. In most cases, and certainly eventually, that something must be replaced. What replaces it in conventional agriculture is fertilizer.

Records of fertilizing crops with natural ingredients go back 7,000 years in China. The ancient Egyptians, Greeks, and Romans all knew the benefits of certain soil amendments, which were invariably natural, such as the fabled fish Native Americans used to fertilize corn.



Lore of the Land

Legend tells us that fertilizing plants began after some prehistoric farmer noticed that plants grew better in places where a fire or garbage pit had once been. Today we know that wood ashes affect soil pH and furnish potassium, and a garbage pit is pretty much an easygoing compost heap. Homesteaders still utilize both, along with the accumulated knowledge of people who have studied soil nutrients and plant growth over the years.

We can credit German chemist Justus von Liebig (1803-1873) with starting the whole business of fertilizers in a bag. And start something he did: in recent years the United States alone has used around 13 million tons of nitrogen fertilizer a year, more than 4 million tons of phosphorus, and in excess of 5 million tons of potassium.

If you choose to use commercial fertilizers, you need to know two important things about them:

- What the numbers on the bag mean
- How to use them properly.

You will always find three numbers on a container of fertilizer, written as 10-10-10 or 5-2-0. This is the *guaranteed analysis* and means the 10-10-10 product is guaranteed to contain at least 10 percent each of nitrogen, phosphorus, and potassium, commonly written as NPK. The 5-2-0 product contains five percent nitrogen (N), two percent phosphorus (P), and no potassium (K). And yes, this only adds up to seven percent. Yes, again, the other 93 percent is filler. What the filler is comprised of is seldom advertised; it can be sand or sawdust or maybe kitty litter, but you pay for it and haul it home whether you want it or not.



Lore of the Land

It took an estimated 1,000 years for one inch of topsoil to form in southern Indiana; 2,000 years for one inch in northern Michigan, and more than 10,000 years to form one inch of soil in central Canada. The difference is due to climate. However, tropical

locations do not have more fertile soils than temperate regions, for several reasons, including the leaching effects of heavy rains.

N, P, and K are called macronutrients because plants use more of them. Magnesium and sulfur are also macronutrients but are available in most soils. Scientists have also identified more than a dozen micronutrients, which are essential but in lesser amounts. These are also more likely to be present in the soil, so they get less attention despite their importance. Breaking it down even further, based on personal experience and observation (most based on animals fed organic or nonorganic crops), some people believe there are unknown elements, as yet undiscovered in healthy, organic soils, which are essential for health-giving foods.

Feeding Plants by the Numbers

Why would you use 10-10-10 instead of 5-2-0 or 4-8-16? Because of what these nutrients do. The need for them, of course, depends on what your soil lacks, based on a soil test.

N, or nitrogen, is a part of all living cells and a part of the chlorophyll that makes plants green (photosynthesis). It promotes rapid growth, especially in leafy crops. Too much can result in beautiful green leaves, but no fruit, on plants such as tomatoes and green peppers.

P, phosphorus, is likewise essential for photosynthesis and encourages blooming, but it's most valued for promoting root growth. However, it's also a major water pollutant. It has been banned in some areas, including the entire state of Minnesota, for use on lawns. Phosphates in laundry detergents are similarly restricted for the same reason.

Potassium, or K, helps build protein and enhances photosynthesis, fruit quality, stress resistance, and overall plant health.

The quick way to remember the basics is by associating them with the phrase, "Up, down, and all around." Up is N, which promotes green, leafy growth. Down is P, with its effects on roots. K is the all around.

How do you know what kind of fertilizer to use and how much? That's easy. Have your soil tested. You can find soil test kits at garden supply

centers, or get a more accurate report from your county agent, who will explain how to do it (in the Yellow Pages look under “Government Offices-U.S.”). Some private companies will provide a more detailed analysis of special interest to organic gardeners.

An accurate soil test is the only way to know which plant nutrients your soil is lacking and how much. In some cases you might have *too much* of an element, such as phosphorus in the Midwest. Without that information or by just dumping any old plant food on your soil, you’re probably wasting money and in some cases could be doing real damage by adding too much of an element.

Soil pH

A soil test will also indicate the pH, or acidity, of your soil, info at least as important as the NPK reading. The pH scale runs from 0 to 14, with 7 being neutral. Water is neutral—except for acid rain, of course. The pH level has a direct bearing on nutrient take-up and other factors affecting plant growth. It also affects whether chemicals, such as herbicides and fungicides, are absorbed by the soil or not. If the soil is too acidic, the chemicals will simply end up in water and become pollutants.



Lore of the Land

Test for soil pH with a strip of litmus paper. Mix a small soil sample with distilled water, and insert the strip. If the paper turns red, the soil is acidic; if it turns blue, it’s alkaline. The cure for

acid soil is agricultural lime. And use sulfur to acidify alkaline soil.

Off the Beaten Path

The acidity of a soil can have some strange effects. Witness the hydrangea (*Hydrangea macrophylla*), which produces pink flowers when grown in soil with a pH of 6.8 or more and blue flowers when the pH is 6.0 or less.

Most food crops prefer a neutral or slightly acidic soil. A neutral pH level of 6.3 to 6.8 is also most beneficial to soil life. But some plants, including potatoes and strawberries, will do better if the soil is slightly acidic, and a few, such as azaleas and blueberries, thrive in acid soils with a pH of 5.0 to 5.5. Others, like members of the cabbage family, do well in more alkaline soils.

Soil pH is largely determined by the parent rock the soil was formed from, but there are other factors as well, primarily annual precipitation. The northeastern United States and western Washington and Oregon have acid soils; dry areas such as southern California, Arizona, and New Mexico tend to have high-alkaline soils.

You can learn much, much more about soils and fertilizers, but you don't have to become an expert just to grow your own food. Pay attention to the basics, *think* about your land and what you're putting on it. Learn from experience. And most of all, respect the living land.



Lore of the Land

You can use wood ashes to increase soil pH. Although considered a soil amendment more than a fertilizer, they do contain small amounts of potassium, phosphate, boron, and other plant nutrients. Ashes are best applied in a thin layer during the winter as they will damage germinating seedlings or plant roots they come in contact with.

The Least You Need to Know

- Good soil is a combination of sand, silt, clay, and organic matter.
- A mixture of raw organic matter needs a carbon-to-nitrogen ratio of about 25:1 in order to become compost.
- The main active ingredients in commercial fertilizers are N (nitrogen), P (phosphorus), and K (potassium).
- It takes more than 1,000 years for nature to create an inch of topsoil, but conscientious and knowledgeable gardeners can speed up the process.

Chapter 12

What's Your (Garden) Type?

In This Chapter

- Traditional gardens are history
- Raised beds are riding high
- Gardening by the square foot
- The supporting cast
- Extending the season

Many people picture a vegetable garden as a little spaded plot in the backyard, with nice, straight rows of leaf lettuce, onions, and radishes marked with seed packets skewered on sticks and maybe a tomato plant or two.

And that traditional garden is still planted by people who don't know it's as outdated as black and white television. However, there are many exciting types of gardens, some even older than that traditional one, that can make vegetable growing more efficient, easier, more interesting, and much more productive.

The Evolution of Gardening

When our hunter-gatherer forebears learned how to make life easier by planting seeds, rather than relying on nature, gardening was invented. And one thing led to another. Eventually, gardening evolved into agriculture, using tillage tools pulled by draft animals, which required planting seeds in long, straight rows.

Off the Beaten Path

Historical records from early missionaries indicate that Native American gardeners were familiar with raised bed gardening before the first white settlers arrived.

As agribusiness expanded and processed foods became more available, gardens got smaller and were often spaded by hand. Yet the old method of planting straight rows, far enough apart for a horse to cultivate, persisted. It still does today in many gardens. Many seed packets still recommend planting rows 30 inches apart—room enough for a rototiller, if not a horse. Why plant rows several feet apart, when plants grow quite well spaced only three inches apart in the row? Why not plant them three inches apart in all directions, the way seeds were planted before the industrialization of gardening? That's how plants grow in nature!

Wide-Row Planting

In its simplest form, a wide-row garden is a bed about the width of a rake and can be any length. Smooth the soil, and scatter the seeds over the bed. For bush beans, you might want them 2 to 4 inches apart. Radishes might only be 1 to 2 inches apart. In general, follow the package instructions for spacing between seeds in the row, but in all directions. Cover the seeds to the depth suggested on the package. In most cases, just poke them in with a finger and fill in the depression.

Several seed companies don't even mention rows on their packets anymore. Instead, they suggest how many seeds to plant per square foot. This is clearly the gardening method of the future.

If you plant as far as you can reach from either side of a bed, you will have a strip 36 to 48 inches wide. Plant several rows in this area, the number depending on the size of the mature plant, and you'll save a considerable

amount of space compared to planting the rows with a path between each one.

Don't line everything up like soldiers in a parade. Stagger the planting so the seeds in the second row are in-between those in the first row, in a triangular rather than a square pattern. That way you can get the rows closer together and save even more space.

Note: close spacing does *not* mean crowding. Plants face similar problems whether they're crowded by weeds or by their siblings. Crowded plants compete for light, moisture, and nutrients; air circulation is impaired; and general stress makes them more vulnerable to disease and insects. And of course, they'll be smaller.

Raised Beds

From wide-row planting, it's a short step to raised beds. As the name suggests, this is planting in beds raised above the general terrain. The advantages can be better drainage, faster soil warming in spring, and easier accessibility. As an extreme example, some growing beds are raised high enough to be tended by people in wheelchairs.

These raised beds are 4×8 feet, made with 2×12-inch treated lumber. There's room for more, as time and budget allow. Each bed contains a variety of vegetables. (J.D. Belanger)



Some are built with *soilless soil*, which is an excellent way to garden if you have stony, sandy, or very heavy clay soil. By building your own, you can have a very fertile, friable, weed-free, and moisture-retentive home for your vegetables, no matter how bad your native soil is.

Raised beds can be as simple as elongated mounds made by shoveling soil from the paths onto the growing area. But more commonly, raised beds have sides, often of wood, although stones, cement blocks, brick, and other materials are also used. The very best choices might be woods that naturally resist rotting, namely redwood, cedar, and cypress, but they're not cheap.

def•i•ni•tion

Soilless soil refers to any mixture of materials for growing plants that contains little or no actual garden soil; potting soil is one example. It's lighter than natural soil and is less likely to contain

weed seeds, insects, or plant diseases. (See Container Gardening in this chapter.)

Old railroad ties are not a good choice because they have been preserved with toxic creosote. Any treated wood was once frowned upon, but some people have no qualms about using wood preserved with newer techniques. Green pressure-treated lumber using chromated copper arsenate (CCA) or ammoniacal copper arsenate (ACA) are said to have a very low tendency to leach into the soil, but even so, they're hardly the first choice for a vegetable garden. A more environmentally friendly preservative is ACQ (alkaline copper quat), which contains neither arsenic nor chromium. It does, however, contain more copper, which is corrosive to fasteners. Use double galvanized or stainless-steel nails or screws if you go this route.

Most homesteads have plenty of old lumber lying around, so there's no need to use wood impregnated with preservatives. Sure, it will rot out in a few years, but the price is right. It might as well rot in the garden as in a pile behind the barn. Use the uptown stuff if appearance or longevity is important.

You can buy prefab raised beds, including models made of recycled plastics and other materials. For frugal self-sufficiency, scrounged materials work just fine.



Lore of the Land

Don't plant in rows or squares. Stagger your plantings in triangles. You'll grow at least 10 percent more in the same space.

Regardless of how you construct the bed, always remember Rule Number One: *Stepping on a raised bed is a mortal sin!* Never compact the soil. But that's an easy rule to follow if you make it narrow enough to be able to reach at least half way across and short enough so it doesn't discourage walking around. For us, 4×8 feet is the ideal size.

Square-Foot Gardening

The next step up the ladder of garden evolution is square-foot gardening. This was the brainchild of Mel Bartholomew, a civil engineer and hobby gardener who became frustrated by the waste inherent in row planting. He claims his engineered method produces 100 percent of the crop with 50 percent of the cost, 20 percent of the space, 10 percent of the water, 5 percent of the seeds, and 2 percent of the work. He could be right.

It is essentially a raised-bed, wide-row planting as tweaked by an engineer. The basic unit is a 4×4 foot box, filled with a perfect soilless soil, which Bartholomew says is $\frac{1}{3}$ compost, $\frac{1}{3}$ peat moss, and $\frac{1}{3}$ coarse vermiculite. The box is divided into 16 one-square-foot sections with strips of wood. Each section is devoted to one kind of vegetable with 1, 4, 9, or 16 plants per square.



Lore of the Land

Peat moss is a touchy subject. Some Greens and organic gardeners are very much opposed to its use for several reasons, including sustainability. Moss is very slow growing, and moss bogs are ecologically delicate. Coir, a fiber found between the husk and outer shell of coconuts, is a renewable and sustainable substitute.

Succession and Relay Planting

Succession planting was in vogue before square-foot gardening and can be used with other methods, but the two go together very well.

Succession planting means that when you harvest one crop, you plant another in its place. In short season areas like the north, this is normally confined to replacing very early crops, such as radishes, lettuce, and peas, with later or warm-weather crops, like beans, corn, transplanted tomatoes, or peppers. Warmer regions have many more choices.

As a self-sufficient gardener, you should not neglect the end of the growing season, which also lends itself to succession planting. From midsummer on, plant cool-weather vegetables, including peas, carrots, beets, and a late planting of a variety of greens, in areas vacated by earlier crops. Most likely you planted broccoli, cabbage, and Brussels sprouts earlier, which you'll harvest in the fall, but you might consider late plantings of these as well.

Transplants started in flats—you won't need a greenhouse for starting them in summer—will produce long before direct-seeded vegetables and can make a wonderfully productive fall garden when all your neighbors consider the gardening season over and done with. Faster-maturing varieties will also speed up turnover.

Somewhat related to succession planting is relay planting. This refers to planting the same crop, but at intervals of time, for a prolonged harvest. You can plant patches of sweet corn, for example, at two-week intervals to extend the season—which will still be too short for corn lovers. Or plant snap beans at three-week intervals.

You can achieve the same effect by planting different varieties at the same time, such as planting corn with 63 day, 80 day, and 92 day maturities.



Watch Your Step

Don't have two varieties of corn pollinating at the same time because they can cross-pollinate, affecting the quality of the kernels. Read the seed catalogs carefully and understand the differences between all varieties you plant.

Interplanting and Companion Planting

Interplanting refers to growing two or more vegetables in the same space at the same time, pretty much the way nature does it. It might sound and look like a haphazard method, but in reality, it requires a lot of knowledge and planning.



Lore of the Land

One of the classic resources in this field is *Carrots Love Tomatoes: Secrets of Companion Planting for Successful Gardening, 2nd Edition*, by Louise Riotte, Storey Communications, Pownal, VT, 1998. Charts listing good and bad companions are available on the Internet (www.attra.ncat.org/attra-pub/PDF/complant.pdf).

You must be sure the plants growing together are compatible. Consider their light, moisture, and nutrient needs. Days to maturity and height are also important. Some plants make good companions, but others do not.

While most vegetables need more sun, lettuce and spinach will actually grow better in the shade of taller plants during the hotter days of summer. You can interplant fast-growing radishes with slow-growing carrots and eliminate some of the need for thinning. Or interplant heavy feeders, such as crops in the cabbage family (cole crops), with less demanding vegetables.

A classic example of interplanting is the well-known Three Sisters of the Native Americans: corn, squash, and beans. The corn provides support for the beans to climb on; the beans, being legumes, add nitrogen fertilizer to the soil; and the squash shades the ground, conserving moisture.

Many gardeners plant marigolds with their vegetables to deter nematodes. Just about anything you can plant has good companions and bad companions due to odor or root secretions. Knowing how to match up plants can help control diseases and insect pests, which are generally host-specific. It can boost yields and make your vegetable garden more attractive and interesting.

Vertical Gardening

Now that we are planting as close together as we can while making sure each individual has enough room to stretch out and collect sunlight, water,

and soil nutrients, next comes the wasted space *above* the plants.

Limited real estate isn't the only concern here. Many vegetables actually do better when given vertical support and are easier to harvest. And saving space means you can either get by with a smaller garden or grow more in the same area. You also save fertilizer, mulch, and water.

Some vegetables, such as pole beans, demand something to climb on: a fence, trellis, corn stalk, or even a pole. Tomatoes are commonly tied to stakes or grown in tomato cages to keep them upright, which keeps the fruits off the ground, cleaner, and away from slugs, among other benefits.

Many gardeners stake all their tomatoes, but *indeterminate* varieties almost demand it. Cucumbers take less room, grow straighter and longer, and are much easier to harvest when grown on a fence. Short-vine peas can do without climbing, but the longer-vine varieties require a fence or trellis of some sort. Squash and melons do well on sturdy supports, such as field fencing or welded-wire stock panels, which are more commonly used to confine animals and can be found at farm supply centers.

def•i•ni•tion

Tomatoes are determinate or indeterminate. Determinate varieties grow only so much, then quit. They take up less space and produce a heavy crop pretty much all at once, and they're done. Indeterminate varieties are more like vines and require stakes or cages. They'll produce right up to the first frost. Seed catalogs tell you what each variety is, and it's normally on the seed packet.

Extending the Growing Season

Most of us gardeners in the United States and Canada can always use a few more frost-free days, both in spring and fall. There are several ways to make this happen, and some work very well with boxed raised beds.

Floating Row Covers

Floating row covers, a very lightweight gauzelike material, are commonly used to keep destructive insects off plants. However, they also offer some protection from light frosts and are easy to spread over a garden bed in a hurry. They are permeable to rain and air circulation.

However, be sure to remove them before the plants they're protecting need pollinating. One of their purposes is to keep pests off the plants, but that same trait will prevent pollinizers from reaching the flowers.

Grow Tunnels

A grow tunnel requires a little more work but offers a great deal more protection. In fact, I've grown lettuce, spinach, mache, and other greens well into winter in one of these. As a bonus, some of the plants survived the entire Zone 3 winter and provided extra-early salads in the spring.

All you need is enough plastic sheeting to cover the area, something to hold it up and off the plants, and something to anchor the edges so it doesn't blow off. You can make a hoop frame of heavy-gauge wire, plunged into the ground on both ends. This makes it easy to get at the plants when you roll the plastic back.

Not incidentally, when these tunnels are left in place over the winter, the soil warms up much faster in the spring and thus allows for earlier planting. Speaking of warming up the soil, laying down strips or sheets of plastic in early spring can be a big help in cold, heavy soils. Most people prefer black plastic for this although some experiments have indicated that clear is even better. This is good for cold-sensitive crops, like corn, tomatoes, melons, and peppers. You don't plant these until later anyway when the ground warms, so you might as well use that waiting period to hasten the warming.

Insulate with Water

For individual plants, you might try Wall O Water or similar products. These are plastic tubes, connected to make a donut with about an 18-inch center. You fill the tubes with water, which stiffens them and enables them to stand up with a tomato or pepper plant (usually) in the center. The water heats up during the day and releases heat at night. Even freezing will provide extra calories of heat.

There's a snug and happy tomato plant cocooned inside this Wall O Water.



Some people love them; some people hate them. We got samples to field test when they were first introduced, years ago. I reported that the tomatoes did get off to a fine and early start and looked great, but that fruiting was delayed.

You can buy a few and see for yourself. If you do, set them up around a bottomless or upside-down 5-gallon bucket, to support the floppy tubes while you fill them with water. When filled, they'll stand on their own.

Or get a bunch of empty two-liter plastic bottles. Tape them together to form the same kind of donut, with about an 18-inch center. Fill the bottles with water, and put the caps on. These aren't as tall as the commercial product, but it's the small, early transplants that need the most protection. The price is right, and you're recycling.

The idea of protecting individual plants is merely an update of the *cloche*, or bell jar, which generations of French market gardeners used. Cloches are still available, but cost much more than a Wall O Water, and they're smaller. A much cheaper modern version would be a gallon plastic milk jug with the bottom removed. We use these a lot, the only problem being they have to be pretty well anchored by soil to keep them from blowing away in spring winds. But you can't beat the price.

Container Gardening

Container gardening is self-explanatory. The fun starts when you ask, "What kind of container?"

Everybody has plants in containers if only to start tomatoes in the house or when bringing them home from the garden center. Container gardening refers to keeping plants in containers throughout the growing season or even for years. While containers are overwhelmingly devoted to flowers and other decorative plants, you can also use them for vegetable production. Even some vegetables varieties, if not specifically developed for containers, are touted as ideal for "patio" growing, including tomatoes, peppers, cucumbers, and squash. Lettuce, radishes, carrots, beans and the like are no problem, either.

There are turn-key systems for patio growing, such as the Earth Box, which makes it easy for even an apartment-dwelling novice gardener to experience the delights of growing her own vegetables (www.earthbox.com). You can also find instructions for making your own by Googling earth box.

But you don't have to live in an apartment, be cramped for space, or even need a patio to grow patio plants. Even with our large garden and a kitchen garden closer to the house, we still grow herbs, a cherry tomato, a jalapeño pepper, and such in containers.

As a bonus, all these can come into the house in the fall and continue to produce food for months afterward. One good pot of parsley lasts until the next summer's crop is up and running. In addition, the peppers, both sweet and hot, being perennials, can be set out again the following year, and they'll have a terrific head start on the new plants.

Almost anything that holds soil will work as a container as long as it holds enough for what you plant in it. For most vegetables, that will be anywhere from one to five gallons. You can spend a lot of money on truly gorgeous planters; you can make your own, from redwood or cedar, in any shape or size you want; or you can buy old whiskey barrels cut in half. You can make tuffa troughs—a concrete mix that substitutes light-weight moss and perlite for the heavy sand and gravel of regular concrete. You can even use any old metal or plastic container with holes in the bottom, including pots from the nursery that held trees or shrubs.

The soil, of course, must be top-grade, considering the demands you will put on it. No matter how you feel about “manufactured” soil, a container is not a good place for dirt right out of the garden. It's too heavy; it won't hold enough water; it won't be fertile enough to sustain a plant in a constrained space; and it will have bugs.

If you have some very good compost, wonderful. If not, you can purchase potting soil, but that's just a mix of peat moss and vermiculite or perlite, with some additives. There are numerous recipes, many formulated for specific uses, such as starting seeds or growing orchids. Most are based on a mix developed at Cornell University for commercial growers. If you want to mix your own, try this formula, scaled down for gardeners.

Where do you get bonemeal and bloodmeal? Any garden center, or even hardware stores that sell fertilizer. Actually, coir and perlite are a lot harder to find!

- 4 quarts peat moss or coir
- 4 quarts vermiculite or perlite
- 2 TB. bonemeal

1 TB. ground limestone
1 TB. bloodmeal
2-4 TB. 5-10-15 fertilizer

Thoroughly mix and moisten the moss before you put it into a container. It won't absorb water without being mixed, and the other ingredients will be easier to incorporate, too.

Containers need regular watering—porous ones, sometimes more than once a day in hot, dry, breezy weather. They also require fertilizing every two weeks or so. A soluble fertilizer in the water is usually recommended.

Good drainage is essential. Don't plug the bottom holes, not even with stones or pot shards, as is so often done. A bit of soil will leak out, but don't worry about it.

Cold Frames and Hot Beds

Cold frames can be very handy and have a number of uses in most of the cooler growing zones. Think of a cold frame as a mini-greenhouse. A typical one is little more than a frame, covered with a recycled window. One of the most successful designs I've used had walls made of straw bales, which was even easier and quicker to put together than a wooden frame. It cost nothing and provided plenty of insulation to boot.

Cold frames are often used for starting or hardening off (getting plants acclimated to wind and bright sun) when outdoor temperatures are still too cold or variable. If you have no greenhouse, they take some of the pressure off the windowsills. Normally, they're too small to be used to grow crops to harvest, and not being heated, a severe frost can damage or kill plants inside them. However, some vegetables, such as lettuces and other greens, can do very well in a cold frame even in subfreezing weather. The biggest problem is keeping the plants from roasting on sunny days. Opening or removing the top is essential.



Lore of the Land

Old windows, being replaced by more efficient ones, are easy to acquire. If you don't just happen to run across a bunch waiting to be carted off to the landfill, ask a local contractor or carpenter. It's so easy to make a recycled window and a few salvaged boards into a free cold frame, you might as well make several.

Add heat to a cold frame and you have a hot bed, which offers plants more protection early or late in the growing season. The traditional hot bed used composting horse manure to provide the heat. The modern equivalent is the electric heat cable, made specifically for the purpose. This is not the same as the heat cables designed to keep pipes from freezing. A 60-foot cable (available from garden supply centers) will heat a 6×6-foot bed. Arrange the wire on the ground according to the package instructions, making certain the wire doesn't cross itself, which could cause overheating damage. Cover it with about four inches of soil. Obviously, a nearby source of electricity is a requirement.

Intensive Gardening

Taken together, these methods make pretty intensive use of your garden space. Some people call this intensive gardening. Others use specific practices to define a particular school of gardening. You might hear of biodynamic, French intensive, or biodynamic French intensive gardening.

Intensive gardening is nothing new. It goes back thousands of years in China and was used in ancient Rome. But French market gardeners greatly improved it in the 1800s when they perfected the cloche, or glass bell jar, and also used covers much like our recycled windows. But the most interesting technique involved double digging: moving soil from trenches, laying down a mix of aged and fresh manure with straw litter, and replacing the soil. Plants grown on these beds were warmed by the decomposing manure, greatly extending the growing season and the gardeners' profits. Gardens like this covered over a thousand acres around Paris by the mid-nineteenth century.

Unfortunately, as the automobile replaced the horse on Paris avenues, the supply of manure was lost and with it, the gardens.

However, a similar method is used in today's French intensive gardens. The key is the double digging, where the soil is loosened to twice the depth of the spade and compost is added. This obviously entails a lot of hard work, but it's only for the first year. By not compacting the soil with foot traffic or machines, it retains its *tilth* so that in the future it is easily loosened with a fork. Do not turn it over, like the plow does, though. Keep the topsoil on the top and the bottom soil on the bottom.

def•i•ni•tion

Tilth is the physical condition of a soil as related to its suitability for plant growth.

The Least You Need to Know

- Unless you really, really like the looks of long straight rows of vegetables, or you think running the tiller up and down those rows is the most fun you can have with your clothes on, forget about the old-fashioned, traditional row garden.
- Save on weeding and watering and greatly increase the yield per square foot of your garden by setting plants close enough together so that their mature tops just touch each other.

- Raised beds warm up faster in spring and drain well.
- For maximum self-sufficiency, increase your vegetable production by extending the growing season beyond what's "normal" for your area.

Chapter 13

How Does Your Garden Grow?

In This Chapter

- Gardens start with seed catalogs
- The means and time of beginning
- The care and feeding of vegetables
- Keep good records

The average backyard garden probably has some lettuce, a few onions, and a couple of tomatoes most likely planted without much forethought. But that won't suffice for a self-sufficient garden.

Planning a garden that will feed your family for an entire year is like making a shopping list—for the next 52 weeks. And after that comes deciding how you're going to actually *grow* all those grow-ceries.

Let me give you some options to choose from.

The Supermarket in a Seed Catalog

You're probably accustomed to buying groceries every week, more or less. Ideally, you have a shopping list, based on what you plan to eat in the next week or so. The self-sufficient gardener does the same thing but buys seeds instead of groceries, from a catalog instead of a supermarket, and not for a week but for a year.

This means you do not flip through all the catalogs that arrive, or will arrive once you land on a few mailing lists, picking out seeds willy-nilly or based on the pretty pictures. Plant what you like to eat, combined with common sense and experience.





Lore of the Land

What junk mail? Gardeners eager for ideas and information *want* to get on seed company mailing lists. Many seed catalogs are filled with helpful data and advice. (Some are not. You'll soon learn the difference.) To get started, simply find a few companies that sound interesting in the appendix to this book or any garden magazine, and ask them to send their catalogs.

Now this is easier said than done. A beginner who has assumed that a bean is a bean and a tomato is a tomato will be overwhelmed to discover the dozens of different varieties of every kind of vegetable in the catalogs. If you're only accustomed to iceberg lettuce from California, the lettuces available in any good seed catalog will astound you—and no two catalogs are alike!

The only substitute for experience is beginner's luck, so don't plan on eating exclusively from your garden the first year or two, at least. In reality, few of us ever achieve that Nirvana, but we keep reaching. It will help—a lot—if you like to eat vegetables that are easy to grow. Fortunately, easy things include some of the most popular homestead staples, such as tomatoes and lettuce, peppers and snap beans, and potatoes and onions.

Items such as lettuce are easy to grow, but not in hot weather. It can be frustrating to wait for the first ripe tomato in anticipation of a BLT, only to find that by the time the tomatoes are ripe, there's no lettuce. As you become a more experienced gardener, you'll figure out how to have lettuce and tomatoes at the same time, even in difficult climates. One piece of advice: watch the catalogs for such descriptions as “slow to bolt”; remember, bolting means going to seed.

Most of us in northern regions can garden only a few months of the year, which means we have to squirrel away half or more of what we produce. We'll store some in the root cellar, at least for a while. We'll can, freeze, dry, or pickle some more. Not all varieties of any given vegetable will be good for all these uses. Good seed catalogs offer advice and opinions on which varieties they sell are best for specific purposes.

Needless to say, the smaller, friendlier companies are a lot heavier on helpful, neighborly opinion than the giant conglomerates.

Oh, and don't forget or be afraid to experiment. You might find you enjoy something you never even heard of. Maybe salsify (oyster vegetable), Jerusalem artichokes, ground cherries, or garden huckleberries will become a new family favorite. You can have plenty of gourmet eating in a well-planned garden, and the planning usually starts with the catalogs.

Planning the Planting

The casual gardener can wait for a warm, sunny day, hopefully after the soil is sufficiently warm and dry, and plop the seeds into the ground and be done, but the self-sufficient gardener must do more than that.

As seen in Chapter 10, you must start some seeds early in all but the warmest climates. The usual recommendation for tomatoes is to sow them indoors six to eight weeks before the last frost date for your area. This, of course, is highly variable, and even after that date, some heavy soils might not be ready for planting. On the other hand, planting seeds indoors early can result in "leggy" plants—tall and skinny, due mostly to inadequate light in most homes. Planting too late is better because these will often catch up to the others once they're settled in the garden.

You can start eggplant 8 to 10 weeks before the last frost. For artichokes, figure two months. The cole crops (cabbage, broccoli, cauliflower, Brussels sprouts) are examples of a few vegetables that can be planted directly into the garden even in very cool weather, but for a head start, plant them inside a few weeks before you can work the ground.





Lore of the Land

You'll often be advised to plant "as soon as the ground can be worked." This does not mean "as soon as the snow has melted." Pick up a handful of garden soil and squeeze it. If it crumbles, it's workable. If it forms a ball, don't walk on it, and don't even *think* of plowing, tilling, or digging. You can ruin some soils by working them when they're too wet. Sandy soils can usually be worked long before clay soils.

Anyone who loves to garden can be expected to tempt fate by planting too early, and this probably goes double for somebody who's been living off stored vegetables most of the winter. But this is not all bad if you realize it's a gamble. Go ahead and plant a few things early. If they survive, you win. If they don't, replant them. Seeds are relatively cheap. But remember, this is experimental; don't risk the whole packet of seeds on such folly.

About Tilling

It's an old and common saying that farmers just love to plow. Gardeners with rotary tillers love to till, too. And both can be dangerous to soil health. The problems include but are not limited to compaction, loss of tilth, and hardpan, which is a water-impervious layer resulting from continually plowing or tilling at the same depth.

The ideal, as you know, is soil that doesn't have to be tilled at all, as found in raised beds. I like to loosen it by plunging my garden fork into it and

twisting a bit, which is easy to do in ground that hasn't been trampled by either boot or tractor tire. Rake it smooth, and you have a perfect seedbed. For larger areas, the broadfork does the same job, but much faster. One source for this often-neglected and hard-to-find tool is Johnny's Selected Seeds (www.johnnyseeds.com).

def•i•ni•tion

Green manure is a crop grown for its fertilizing and soil conditioning value. Rather than harvesting it when grown, it is incorporated into the soil. Common crops include clovers and grains such as rye, oats, and buckwheat.

But if you *must* till or plow or spade because the ground is too hard or you have too many weeds or you're turning under a *green manure* crop, wait until the ground is dry and warm enough.

Organic gardeners usually frown upon fall tillage—in theory, the ground should never be bare, even over winter—but it can make spring easier if you have heavy clay soil. Frost breaks up the clods, and the loose soil dries out faster in spring.

Hardening Off

You couldn't wait to get some seeds started, so you planted them indoors while the snow was still flying outside. The plants are now ready to go to the greenhouse, cold frame, or outdoors. But wait!

Do not take plants directly from the windowsill to their new spot without acclimatizing them to the cold, hard, outside world. Even a day that seems bright, warm, and sunny to you can be deadly to a plant that has been coddled indoors. The hot sun can be a killer, but wind is even more dangerous.

The process called hardening off consists of exposing tender young plants to the outdoor environment gradually, over several days. Here's where a cold frame is worth having; simply raise or remove the cover for a few minutes on nice days or even several times a day. This sure beats hauling flats or trays of pots in and out of the house. In any case, if seedlings start to wither or look stressed, rush them back to their protected area or close the cover of the cold frame. Gradually increase the exposure until they can face the elements on their own.

Even then, take precautions. The best time for transplanting is on a cloudy day without much wind because both bright sun and wind can harm even hardened-off plants.

After transplanting, give each seedling a good drink. It won't hurt at all to protect them for a while with bottomless gallon plastic jugs or, in windy locations, even boards or shingles pounded into the ground on the windward side.

Mulch is good, but not in all times and places. It helps keep the soil cool, which is fine in the heat of summer but not so desirable when heat-loving plants are stuck into still-chilly ground. Put off mulching tomatoes, peppers, and eggplant until the soil is consistently warm.



Lore of the Land

When transplanting tomatoes, dig a hole deep enough to accommodate all but the top few leaves. For large transplants, you can even lay the plant in a trench, with only the tip above ground. The entire buried stem will develop roots, making a

stronger, healthier, more productive plant. This tip is especially handy with leggy tomatoes.

Starting from Seed

Most of the garden will be direct-seeded; that is, you'll plant the seeds directly into the garden soil, not in containers inside. This means that outdoor environmental conditions must meet the seeds' requirements for germination.

Seeds are amazing things when you consider that those tiny things have the potential to become beautiful and productive plants. Just as amazing is the variety of what they require in order to germinate or sprout.

For example, some, such as lettuce and peas, can thrive even when planted in cold soil. They'll sprout and won't even mind a little snow on their new leaves. If you try that with corn, the seed will just rot. All seeds have a range of temperatures at which they'll germinate. Planted outside that range, they're wasted. You can buy a soil thermometer to determine the exact temperature. But if the daytime air temperature has been relatively steady for several days, you can make a fair guess without getting too technical or scientific.



Lore of the Land

If you live in corn-growing country, don't base your corn planting on what your farm neighbors do. The sweet corn you're

planting is more sensitive to cool weather than the field corn farmers plant. Large commercial growers also have different criteria than gardeners do, such as “windows of opportunity” between expected rainfall. Planting too early will reduce the yield, but not by as much as planting too late, if field work is delayed by rain. But they spend days doing what you can do in minutes. For good corn germination the soil should be at least 50°F two inches below the surface.

Some seeds require light to germinate, so just sprinkle these on top of the soil. Others need darkness and must be buried. The general rule of thumb is to plant a seed about three to four times as deep as its own size.

Some are so particular they won't germinate until after a forest or grass fire! Fortunately, these are generally trees such as certain pines, so we vegetable gardeners don't have to worry about torching our gardens. But we do have to be aware of the needs of the seeds we plant, and you can find this information on each seed packet.

Watch and Weed

Once you've planted your garden, your main duty consists of keeping an eye on things. Watch for weeds, bugs, and any signs of stress, such as wilting. Check the soil moisture several inches down; the surface can appear damp while the roots are bone dry.

Weeds are likely to present the first challenge as weed seeds are present in vast numbers in any soil. If you get rid of them by vigorous digging, you'll just uncover more. Most weed seeds can remain viable in the soil for many years, some even for decades.

Weeds are eliminated so they don't compete with the cultivated plants for water, light, and soil nutrients, and so they don't go to seed and cause even more trouble next year.

Small weeds, even tiny ones, are much easier to eradicate than larger ones, and many tools are designed for weeding, so you make your choice. You'll

probably try several before finding one that really works to your satisfaction. Even then, it seems avid gardeners never stop looking for something better.

Off the Beaten Path

Learning about weeds can be an interesting adjunct to gardening. Some are edible and quite tasty. You might find the lambsquarters and purslane you're throwing on the compost pile to be as valuable as the plants you're cultivating.

In other cases, knowing something about the plant can help you control it. Annuals are easier to control than perennials; those that reproduce from seed are easier than those that spread underground. It's good to know if the weed is a native plant or an introduced one and if it was introduced accidentally or on purpose. Dandelions were first brought to America as a food plant.

If nothing else, being able to identify weeds will give you a sense of satisfaction beyond just getting them out of your garden. Your county agent will have information on weeds prevalent in your area.

If the first rule of weeds is hit 'em while they're small, the second is *never* let them go to seed. Some unimpressive small weeds can scatter thousands of seeds; lambsquarters can have 75,000 seeds, which can sprout, grow, and take over in almost any soil.

Off the Beaten Path

Lambsquarters belong to the family *Chenopodiaceae*, which includes beets, spinach, and chard, as well as quinoa (used as grain) and epazote (an herb used with beans). You can eat young

lambsquarters raw or steamed like spinach. It contains more vitamin B2 and vitamin C than either spinach or cabbage. You can also eat the seeds, raw or dried. *Chenopodium* is Greek for “goose foot,” and several members of the family, including lambsquarters, have leaves shaped like a goose’s foot.

The name has nothing to do with sheep or lambs. We’re told that in ninth-century England, the year was divided into quarters. One quarter, known as the Lammas Quarter, started on August 1, which was when the wheat harvest began. The harvest started with a festival featuring a leafy green, which came to be called lambsquarters.

Most weed seeds remain viable, i.e., they will germinate and grow, for one to five years, but some live far longer. Common lambsquarter and velvet leaf have been found to be viable after 17 years in the soil. Some scientists have speculated that under ideal conditions, certain seeds could still sprout after 1,000 years!

That’s why whenever you till soil, you “plant” more weeds by unburying them. So merely scratch the top few inches, eradicate the weeds that do grow, and you’ll soon have a weed-free garden. Or that’s the theory, anyway.

Stubborn weeds such as perennials can be cooked to death by the sun, with a little help from you and some clear plastic. If you have a patch of such troublesome plants, rake it as smooth as you can, water it well, and then cover it with 1- to 4-mil clear plastic (UV-resistant is best). Bury the edges with soil, or weight them down with boards or whatever. It will take four to eight weeks or even longer to kill the really tough ones, so unless you live in the South, you’ll lose a growing season. But if you have a really stubborn patch, don’t want to use herbicides, and can spare the lost space for a season, it’ll be worth it.

Off the Beaten Path

Weed seeds are an important food source for a number of creatures important to the biosphere, including field crickets, ground beetles, various mice, and, of course, birds.

Some weed problems are of our own making, which also proves that a weed is simply a plant growing in the wrong place. I once tilled an area where horseradish had been planted. The roots had been harvested except for a few stray pieces. Once these were chopped up by the tiller tines and spread over a wide area, I had the finest horseradish patch anybody could want, but where I didn't want it! (A piece of horseradish root the size of a pencil eraser will grow into a fine plant, and I had dozens of fine plants.) Likewise, never, ever attempt to eradicate comfrey by tilling it. It's even worse than horseradish.

Weeds are important components of most compost bins as they provide nitrogen for those who aren't fortunate enough to have livestock manure. But do *not* compost weeds that have gone to seed! While most seeds will be killed in a proper composting operation (140°-160°F) many home compost bins never attain these temperatures. Even if they do, seeds at the outside of the pile might escape the heat. The best solution is to get rid of the weeds before they go to seed.

Water

Most people recognize that plants need water, but that's about as far as it goes. They turn on the sprinkling system (or worse yet, on lawns, it turns on automatically) whether the plants need it or not. At best, they've heard that a garden needs an inch of water a week, so they try to supply that amount, more or less.

Water is much more complicated—and fascinating—than that. For example, we often think of irrigation as something that makes the desert bloom, supplying water where rainfall isn't sufficient for crop growth. Most of Wisconsin gets around 30 inches of precipitation a year, which should be enough. But the central vegetable-growing region is heavily irrigated.

Florida is even further from being a desert. It's classified as humid subtropical, and most of the state gets between 50 and 60 inches of rain a year, much more than most plants need or can use. So why is irrigation such a big thing even in a place like Florida? The answer lies in soil-plant-water relations.

Water in the soil contains dissolved minerals, which are delivered to the plant's roots. These minerals are absorbed by the plant and feed it. Water in the plant is the chief medium for the chemical and biochemical processes that support plant metabolism. It's a solvent for dissolved sugars and minerals transported throughout the plant, and evaporation inside the plant cells cools the plant so it maintains the temperature necessary for metabolic processes.

Off the Beaten Path

The Pacific Northwest has a reputation for having damp and rainy weather, but on average, only 20 percent of that rain comes between the peak growing months of May to September. So farmers often use irrigation even in that moist climate.

And because of its pressure within plant cells, water provides physical support; it makes plants stand up. When that pressure is too low, we say the droopy plant is wilted. In other words, wilting is a sign that the plant doesn't have enough water to stand up or to perform all of these other functions, which is not a good thing.

Water is being circulated throughout the plant almost constantly, much like blood. Unlike blood, it is taken up by the roots, delivered to all parts of the plant, and then released to the air as water vapor through the small openings on the leaf surface called stomata. This, as you probably recall from high school biology, is called transpiration. Add in evaporation from the soil and wet plant surfaces, and the total water loss to the atmosphere is called evapotranspiration.



Off the Beaten Path

Sometimes plants voluntarily close down operations to conserve water. You are likely to observe this on large-leaved plants on dry, hot afternoons. When the air cools in the evening, the plant will bounce back.

And that's why we water plants: to replace water lost by evapotranspiration. How much water is this? It depends. One factor is the soil.

Technically, plants don't even need soil. They can grow in a liquid culture in a method called *hydroponics*. Today, many supermarket tomatoes and cucumbers are grown hydroponically. This is basically growing plants in water containing nutrients. Some of us old traditionalists aren't convinced that scientists know everything there is to know or that food grown hydroponically isn't missing some essential ingredient found only in fertile soil. But also for many other reasons, most plants are grown in soil.

According to soil scientists, good fertile soil has three major components:

- Mineral and organic matter
- Water and various dissolved chemicals
- Air

The proportion of these components varies considerably among soils and is dependent upon soil texture and structure, which, in turn, is related to the amount of sand, silt, and clay. The size, shape, and arrangement of these soil particles, as well as the empty spaces that result, determine how much water a soil can hold. Large pores in the soil can conduct more water more rapidly than small pores.

The bottom line: sandy soil can store a lot less water than clay soil. And the bottom, bottom line for the gardener is: plants growing in sandy soil (like central Wisconsin or most of Florida) need more water than rain provides.

So how much do you water? As much as the plant needs, based on the foregoing information. Aim for the recommended one inch per week, but don't fixate on that. Watch your plants carefully. They'll tell you what they need. Remember that air space in the soil; plants can drown if that air is displaced with water.

How Not to Water a Garden

The method you use to apply water can be as important as the amount. In addition to ecological considerations, such as wasted water, and practical ones, such as time-consuming labor, there are others that directly affect how the plant uses the H₂O you supply.

No green person can condone the all-too-frequent practice of watering a lawn with a sprinkler and letting half the water fall on the driveway or sidewalk, especially if said green person is jogging on said sidewalk. But sprinkler systems are inherently wasteful. In the vegetable garden, they water the vegetables, paths, odd corners, and unplanted areas indiscriminately, especially on windy days. Plus they waste a great deal of water through evaporation.

Hauling hoses and setting up sprinklers is work, but not as much work as hauling buckets or sprinkling cans. If you're doing that for exercise, you might want to know that water weighs about eight pounds per gallon.

Besides the time and labor factor, sprinkling cans (or standing there holding the hose) are not ideal because they deliver the water too fast; it doesn't have a chance to soak into the ground, so it doesn't reach the roots, which deliver it to the plant. That's why a soft, gentle spring rain is more beneficial than a sudden summer downpour and also why one inch of water a week isn't always equal to another inch of water a week.

That gentle rain is the ideal. It soaks into the ground and encourages deeper root growth, which shallow watering does not. One inch of water once a week is much better than one-quarter inch four times a week, but it must soak in.

Drip Irrigation

We can imitate a gentle rain with drip irrigation. This system delivers water exactly where it's needed: to the plant roots and to the roots only. Paths and other unplanted areas are not affected. The leaves don't get wet, thus avoiding certain plant health problems such as mildew.

Drip irrigation has only recently become popular on a broad scale, but—thanks once again to the tinkerers—you can easily find a selection of different systems at garden centers and home improvement stores. Each specific system comes with instructions, so all I need to tell you here is that drip irrigation consists of a network of small tubes or hoses with special outlets or emitters you install yourself at the base of each plant.

The ultimate ideal is to use drip irrigation in connection with a rainwater collection system although this raises other issues. Drip irrigation does require a certain amount of water pressure, and the water must be super-clean to avoid clogging the emitters, so rainwater isn't usually an option. This is something for a tinkerer to work on. See Chapter 14 for more on the mechanics of irrigation.

Another form of drip irrigation comes in the form of soaker hoses which just ooze water throughout their length. These can work well where crops are closely inter-planted or in rows. They do tend to plug up and water unevenly, so watch the plants carefully.

Remembering What You Learn

No matter how many books, articles, and websites about gardening you read, your own experience will give you the most valuable knowledge. Nobody else has exactly the same soil, microclimate, tastes, opinions, tools, time, or goals and ambitions as you do. What works for me might not work for you, and vice versa.

You need a garden journal. Really! If you think you're going to remember a year from now whether that heirloom tomato that did really well for you was Black Krim or Cherokee Purple, you're kidding yourself. You certainly are if you take it out four or five years and add a few dozen other vegetables and cultivars.

Planting dates, temperatures and other weather conditions, amendments you made to the soil, and unusual circumstances, all can be very helpful and especially interesting, even years from now.

And, of course, you want to record the harvest. When did you pick the first peas or beans; what was the yield (per square foot or other unit); which

variety of the three you planted had the best flavor and appearance or other traits you deem important? Which was the overall winner? And even more important, which one will you never bother with again?

More than once I've had trouble finding a special seed. Referring to my records reminded me which company it came from. This can also be handy if you want to check the catalog's professional photograph and ad copywriting with what's actually growing in your garden!

Some people really get into this record-keeping and add all sorts of observations, including their first sighting of the monarch butterfly or the dates of budburst on various plants. This is called *phenology*, and while it has recently become quite popular, it's nothing new. Such observations are what gave rise to such old-time sayings as the time to plant corn is when the oak leaves are as big as a squirrel's ear. In other words, don't go by the calendar on the wall but by what's happening in the real world. Incidentally, some people who have been recording such events for years say their observations prove, to them at least, that global warming is real.

def•i•ni•tion

Phenology is the study of the times of recurring natural events, such as the arrival of the first robins or hummingbirds of spring, the blooming of the lilacs or crabapples, or the first appearance or flight of an insect. This information has many uses in agriculture and related fields, such as insect control. There is now a nationwide program to collect such data (see www.usanpn.org)

But don't confuse phenology with *phrenology*, which studies the bumps on people's heads!

In your journal, you can also keep a diagram of your garden, showing what you planted where. You can use this for years to come, when planning crop rotations and when deciding how much to plant. And today, I'd be lost without my time-dated digital photos!

The Least You Need to Know

- Plan your garden as if you were going grow-cery shopping.
- You must gradually introduce seedlings started indoors to the outdoors.
- Weeds compete with vegetables for space, sunlight, water, and nutrients.
- Most plants require an inch of water per week.
- The most valuable gardening book on your shelf will be the journal or notebook in which you record what happens in your garden.

Chapter 14

Tools of the Trade

In This Chapter

- Tilling the soil
- Irrigation
- The supporting cast: stakes, trellises, and more
- The best of the rest

It's possible to spend hundreds, even thousands, of dollars to grow a few dollars' worth of vegetables. It's possible—but certainly not necessary. Our goal is to grow hundreds of dollars' worth of vegetables with a few dollars' worth of tools. But in order to make intelligent decisions, the home gardener must know what his options are.

Preparing the Ground for Planting

The first job in planting a garden is tilling, or preparing the soil for planting, which might involve several steps. If your chosen garden spot has been a lawn or weedy wasteland, the chore will be a bit harder than if it has been a garden in the past.

How Not to Till Your Land

Traditional primary tillage involves plowing. A moldboard plow, drawn by draft animals or a tractor, slices into the earth vertically in the direction of travel and laterally beneath the soil surface. The moldboard lifts this slice and turns it over in long strips.

Then usually some form of a disc, which is a series of metal plates on edge and at an angle that slices the earth into bits, pulverizes the long strips and clods. In most cases this requires several passes. A drag or similar toothed tool, which works much like a garden rake, further pulverizes and smoothes the soil.

Finally, the plot is ready for planting. But a lot of time and fuel has already been used and greatly affected the soil in a not altogether benign fashion.

The topsoil is on the bottom, and the bottom soil is on the top. This disrupts the living creatures in the soil, their food supply, and their environment. Continued plowing or rototilling at the same depth creates hardpan, a layer that's impervious to water and hinders root development. Organic farmers were the first to ditch the moldboard plow, and organic gardeners feel the same about tillers.

Off the Beaten Path

When Edward Faulkner wrote *Plowman's Folly* in 1943, he attracted a lot of attention. Most farmers were outraged to hear someone question the value of the moldboard plow. Faulkner later toned down some of his arguments in his book, *A Second Look*. Nevertheless, today moldboard plows are gathering rust all across the country. Reduced tillage, several forms of conservation tillage, and even no-till systems had replaced the plow on 38 percent of American farms by 2004, according to the United States Department of Agriculture (USDA).

Until relatively recently, most gardens were prepared the same way, often with a horse or mule. Smaller plots—and some sizeable ones as well—were spaded by hand. A spade or fork simulates the action of the plow, turning over the soil.

Cultivators, long-toothed rakelike devices pulled by draft animals or tractors, or hand tools, such as hoes and hand cultivators, controlled weeds in both farm fields and garden plots. Farmers today are more likely to rely

on chemical herbicides, while organic gardeners reduce hand cultivation with deep mulches.

The rotary tiller, so common today, was invented in Switzerland in 1910. Imported from Germany and Denmark, that tool didn't reach the United States until 1930.

The importer, The Rototiller Company, gave the tool its American name, which has become generic. The Rototiller Company later became Troy-Bilt and manufactured its own machines.

The tiller was a great improvement over the plow for garden-size plots and much less work than hand-spading. It could prepare the soil in one pass, usually, and be used for both primary and secondary tillage (plowing and cultivating or ground-breaking and weeding). It's still the machine most people automatically think of when they think of vegetable gardening.

However, not only can you garden without one, but also with up-to-date systems like raised beds, a tiller is useless. A growing number of gardeners who truly understand soil consider them worse than useless. They say tillers are detrimental to the soil's health and well-being. Grinding the soil into a powder, as many enthusiastic tiller owners do, can literally kill a soil.

Essential Tools

Preparing a garden bed, raised or not, even a first-class double-dug one, requires nothing more than a shovel, garden fork, and rake. Most homeowners have these even if they never gave self-sufficiency a moment's thought.

Any good shovel will work, and you'll find many uses for the common pointed-end variety. But for double-digging and some other garden tasks, I prefer a short D-handled garden spade. Instead of a pointed curved blade like the shovel, the spade has a flat and straight blade, so it digs to a uniform depth, which is especially handy for edging beds.

A preferred garden rake, not a lawn or leaf rake, has a flat head, not a bowed one, so you can use either side. Although it will break up clumps, the main purpose of the rake is to remove debris (sticks and stones) and to level the bed for easier planting and more efficient watering.

As for weeding, that old standby, the garden hoe, is still ubiquitous, although there are plenty of choices to befuddle the first-time buyer. In addition to the traditional and familiar paddle hoe, you'll encounter tools with triangular blades, heart-shaped blades, half-moons, and some no wider than a butter knife, as well as handles of different lengths. It all boils down to personal choice.

Don't consider a hoe a chopping tool. Chopping might be unavoidable with large weeds, but if the soil has tilth and the weeds are reasonably small, a scuffling action is sufficient. This is also easier on the tool, the soil, and your body. A light and shallow scuffling of the soil also creates a dust mulch, which conserves moisture by breaking up the capillary action that brings ground moisture to the surface. The dust mulch will discourage weed seed germination, and soil thus loosened will absorb rain better than a hardened surface.

Scuffle hoes made for this type of use have two sharpened edges on a blade that lies flat on the soil, so it cuts on both the push and the pull.

You might have to try several before you find the ideal. But remember that a hand tool is an extension of your hand. Just hefting it in the store will tell you if it feels right for you.

Beyond that, look for quality, in materials and construction. Big-box stores generally have two or three levels of garden tools, priced accordingly. The cheapest might suffice for occasional use. The higher quality is a better choice for someone who will be using the tool on a regular basis, hopefully for many years. In fact, the ideal for a homesteader might well be a top-of-the-line tool not found in the mass market. A good tool is a pleasure to use, especially after you have worn out a couple of cheaper ones.

An inexpensive garden trowel is handy for most transplants. For planting straight rows in raised beds, making a furrow with the edge of an old board is the easiest and best method I've found. In square foot gardening, you can just lay the seeds on the surface and poke them down to the proper depth with your finger.

A raised bed with a good soil mix should have few weeds, and those are most easily pulled by hand although a very narrow hoe or weeding tool might be handy. Close planting doesn't leave much room for weeds or tools. And that's it. Basically, you don't need any tools not found in almost any homeowner's garage or shed.

Keep all your garden tools clean and sharp. Wipe metal parts with oil to prevent rust, or plunge them into a bucket of sand. Don't leave them out in the weather. Apply boiled linseed oil to wooden handles. Take care of them, and they'll serve you for a long time.

Watering the Garden

Getting water to your vegetables is a different matter. Here, the homeowner's standby, the hose and lawn sprinkler, don't cut it. Because we've already discussed some of the reasons why and looked at the alternatives, let's go right to the ideal.

In a perfect world, the ideal homestead would have a totally automated waterworks that, as far as the garden is concerned, would utilize rainwater, drip irrigation, and maybe greywater for ornamentals. Because the average rural or suburban home uses none of these, at least as of now, they'll require some capital investment. But not all that much.

The Rain Barrel

Around here we can get food grade plastic 50-gallon barrels for three bucks apiece. If nothing else, plop one under every available downspout, and dip rainwater out of them with a bucket, the way Great-Grandma did. (She also used soft rainwater to wash her hair.) But you can make them into proper rain barrels with very little extra time or cash, and they'll still cost only a fraction of the store-bought kind.

Off the Beaten Path

Rain barrels and cisterns were quite common back when water was pumped by hand or even drawn from the well with buckets. But this being America, when water became available by turning on a faucet, gathering rain went the way of the buggy whip.

Good ideas come and go, and collecting rain is one that came again. In cities, barrels are often used in connection with rain gardens to keep rainwater from causing flooding or polluting nearby waterways. And this being America, you can buy the things, not only as basic barrels, but also in many shapes and sizes. And of course, this being America, they come in 30 colors.

There are really only two simple improvements to the old-time basic barrel, which of course was made of wood, not plastic. One is some kind of top to keep out mosquitoes and animals and small children. The other is a spigot at the bottom so you can drain the water through a hose, rather than heaving a loaded bucket over the edge.

A clever solution that kills two birds with one stone is to use a one-piece barrel (no separate cover) with a spigot-size threaded hole as well as the more common larger one, also with a cover. Cut a hole in the original bottom—it will be the top when you're finished—to accommodate the downspout. Simply screw the faucet (use an outdoor one, called a sill cock) into the existing threaded hole. Level the site beneath the downspout and make a platform of brick, cement block, or sturdy wood, allowing room for attaching a hose to the faucet that will be on the bottom.

You can find many plans on the web, some from universities and municipalities that are promoting use of the barrels. Just Google rain barrel plans, or go to www.ehow.com/how_2070724_best-rain-barrel.html, which explains it pretty well.

Spreading the Water

You can connect two or more rain barrels together, but larger containers are also available. I have two 250-gallon tanks. I use a hose to siphon water from them into a small tank on a trailer, which I haul to the evergreen plantation and other things needing water far from the house with an ATV.

Aside from the siphon and trailer, my own situation requires a fairly long run of hose, and I've found that emptying the barrels with a sump or utility pump is a slick solution. I purchased my inexpensive pump for other uses,

so this is a bonus. The ideal might be a solar pump, although not all rain barrels are in the sun. I transfer water from the barrels to holding tanks in the garden. Water drains from these to a drip system using ¼-inch ball valves instead of emitters, which would probably plug up with rainwater. Rainwater isn't as clean as drinking water, and even that you must filter for the tiny holes in emitters.

An extensive system of drip irrigation or soaker hoses can require time and money to set up, but it's a long-term investment. A potentially greater deterrent is the bewildering array of options, many of which are incompatible. Fifteen or 20 years ago drip irrigation was a Third World kind of appropriate technology. It involved a five-gallon bucket and some plastic tubing. Now it can be overwhelming because you'll encounter such items as pressure regulators, backflow preventers, barbed connectors, barbed tees, inline hose filters, pressure compensating button drippers, and, my favorite, goof plugs, among many others.

One solution would be to purchase the kits some companies are offering. Another might be trying two or three different systems, to see which works best for you and to get some experience in designing and installing a system. One decision you'll have to make before you start depends on the water pressure you have available. Some elements will work with a gravity flow, but most require more pressure than that. And if you have too much pressure, you'll have to reduce it using a pressure-reducing valve.

If you're really frugal, you ought to know that there wasn't anything wrong with those early appropriate technology systems, and you can easily improve on them with some of the cheaper components available today. A 4×8 foot raised bed would require less than 50 feet of tubing, for under \$5. Drippers are less than 50¢ each. You can scrounge a five-gallon bucket, drill a hole near the bottom of the bucket, cement in an outlet, and set the bucket on a stand to increase the water pressure. Hook it up, fill the bucket with water, and you have it. Since a 4×8 bed needs about 20 gallons a week to supply one inch, you'll fill the bucket four times a week if it doesn't rain.

The Supporting Cast

Here again, the truly self-sufficient hardly need any advice on saving money, even though some people spend big bucks supporting their gardening habit with fancy cages and trellises. They must, or there wouldn't be so many for sale. But it must be hard to justify paying \$35 for a bean pole, when it's so easy to stick a tree branch into the ground, maybe tying some used baling twine to it for the beans to climb up.

You can find modern, manufactured versions of just about every useful item Grandma and Grandpa used to make for themselves, and some *are* improved a bit, in some way. But you can certainly get by with the homemade version, if that's your choice.

If you have or have access to a woodlot or brush pile, it's easy to find twigs and branches and poles you can use in a variety of ways on the homestead. Combined with the aforementioned baling twine, which piles up like fall leaves if you have any hay-eating livestock, you can construct any garden support imaginable. And if you have an imagination, you can probably come up with some pretty artsy stuff!

At our place, the best poles come from the speckled alder or tag alder thickets (*Alnus incana*). These small trees grow in clumps, and it's easy to cut a bunch of them in a hurry. (Don't worry: they'll quickly grow back. In fact, they often aggressively colonize cutover northern conifer swamps, which describes some of our land.) Poles a couple of inches thick at the butt can still have useable girth at heights of 10 to 12 feet or more. I once made a teepee from alder of that size, just for fun, and planted squash, cucumbers, scarlet runner beans, and peas around the perimeter. It produced a good harvest and was fun to work with.

Most teepees are much smaller: 6 to 8 feet is a good size for pole beans. You can also use a single pole, well-anchored in the ground. String baling (or other) twine from the top to the ground a couple feet from the pole, and secure it in place. I have a supply of pole barn nails—large spikes—that are handy for jobs like this. Or make a hoop from a piece of leaky old garden hose, tying the twine to that. Use whatever you can find and your imagination.

The commercial wire tomato cages we have used are too flimsy: the heavy plants simply caved them in. A good stout stake secured in the ground when the seedlings are planted costs less and works better. Or if you want to, use

two, three, or even four stakes for each plant. This is more work in the beginning, but less when the plants grow and need tying.

For peas, set poles at each end of the row; lash a cross-piece to the tops; and tie strings from the cross-piece to the ground. If you want to get fancy, make a net or mesh from the string or twine.



Lore of the Land

Baling twine has so many uses that if you don't have any hay-eating animals, you might have to buy twine just for the garden, to bind things together, obviously, and for plants to climb on. You can make a single strand into rope strength by simple braiding or with a rope-making technique or machine. And you can make it into sturdy netting to support tomatoes and other growing plants. To make your own rope-making machine, see www.countrysidemag.com/issues/87/87-2/Bob_Greenwood+Judi_Stevens.html.

Another neat way to get smaller, lightweight vines (like peas) off the ground is with twiggy branches. Just poke them into place—securely—and that's it. For stronger, more elaborate supports for heavier crops such as squash, make a fence from poles. If the verticals have branch stubs that will support the crossbars, so much the better.

If you have some unused field fencing or livestock panels lying around, an old gate, or a section of cyclone fence, you might have an almost ready-made plant support or trellis.

Other Garden Building Projects

We have already seen how simple and inexpensive cold frames and hot beds can be, but as a review:

Old windows are not trash on a homestead: they're a valuable asset. Even rotted-out old wooden windows have glass panes you can use to protect young plants from the wind, cloche-fashion. Windows headed for the landfill have been diverted to many a homestead cold frame or even a full-blown greenhouse. (Or a chicken or people house, for that matter.)

Plastic gallon jugs with the bottoms removed make good cloches to protect seedlings from wind and cold. Glass jugs would be even better: less susceptible to wind and more permanent. Unfortunately, I've never been successful in cutting off the bottom of one of these. I've been told it's the quality of the glass, but I haven't given up, yet.

Like most of what we're talking about here, tinkerer-designed compost bins are now commercially available in a wide range of styles and prices, including several electric in-the-kitchen models for around \$300. They make finished compost in as little as two weeks. The downside (in addition to the cost) is they use electricity.

Even more advanced kitchen composters, such as Bokashi and Sakura from Japan, use special microbial inoculation and anaerobic fermentation. Here the downside is you have to keep buying the inoculant.

There are also dozens of plans for constructing the outdoor variety. Back in the good old days, we piled up the materials in an odd corner, and it worked just fine. Today my preferred bin is a section of woven-wire field fencing. Any farm that ever had livestock is likely to have some of it lying around. A three-foot high piece roughly 9-10 feet long makes a cylinder a couple of feet wide, which works fine. Just twist the end wires together. I have several, and when one is full, I just go on to the next.

If you're careful or lucky enough to have the proper mix of green and brown raw materials in small enough pieces, these will make compost quickly in warm weather. If you must or want to turn the pile, it's a simple matter to untwist the end wires that hold it together. You'll have a free-standing pile of almost-compost. Set up the wire again, close to the old pile.

Fork the compost into the new bin, and it will be mixed and aerated, ready to go to work with new enthusiasm.

You can improve composting activity by shredding the raw materials to increase the surface area. Shredders do a good job and do make a big difference in the composting process. They cost money, but they're worth it in certain circumstances. They're especially valuable for leaves: unshredded dry leaves get wet and tend to mat, making them less valuable, either as mulch or as a compost material.

In other circumstances, a rotary lawn mower might do the job, especially for dry leaves. (Some leaf blower/vacuums also shred materials, but I don't want to be accused of promoting leaf blowers.)

The only real advantage to all the bells and whistles is that the compost will finish sooner. Under ideal circumstances it might take two weeks. But again, if you use nothing at all, the material will still decompose, eventually. Time is on your side.

The Least You Need to Know

- It's possible to spend thousands of dollars to get a few dollars' worth of vegetables.
- It's also possible to spend a few dollars to get thousands of dollars' worth of vegetables.
- Everything some people spend small fortunes on today was once made at home or people got along without it.
- Used and recycled items can find new life in the garden.

Chapter 15

Saving Seeds

In This Chapter

- Reasons to save seeds
- The miracle of a seed
- Choosing seeds for saving
- Selection, collection, and preparation
- Storing and testing

If no one saved seeds, there would be no gardeners or farmers; we'd still be foragers. Therefore, we can say that seed-saving was crucial to the rise of civilization, and it's just as essential today. Naturally, to be self-sufficient you must save seeds yourself.

Why Save Seeds?

One reason for saving seeds is that they're *food*. Our main food crops—rice, wheat, and corn—are seeds. And it goes without saying that we must save the seeds of all species to have them to plant when the next growing season begins.

But why you? Why not just leave it to all those companies that make it a business to grow and sell seeds?

One reason is that “all those companies” get most of their seeds from very few sources, and in some cases, from a single producer. In fact, one company you probably never heard of controls an estimated 40 percent of the United States seed market, including 75 percent of the tomatoes in supermarkets and 85 percent of the peppers. This company, *Seminis*, sells seed to nearly all the seed companies, including some well-known organic purveyors, and it's owned by *Monsanto*, which also owns *Cargill*

International Seed and DeKalb Genetics, as well as Roundup herbicide. This concentration of such an important asset worries some people.

Off the Beaten Path

Throughout history, nearly 10,000 different plants have provided food for humans. Today, only about 150 species are used anywhere in the world. More than 70 percent of our food comes from just 12 of these.

Another good reason is that those same few companies have been eliminating many wonderful old varieties, at least until recently. They concentrated on more profitable *hybrids*, rather than old-fashioned *open-pollinated* varieties.

This also bothered many people, and not just gardeners. The lack of genetic diversity could conceivably be catastrophic if some species or strains were wiped out, perhaps by disease. The Irish potato famine of the 1840s, caused by a blight, killed more than a million people and forced another two million to flee the country. In 1970, more than 14 percent of the corn crop in the United States was wiped out by blight. The solution to problems like these is genetic diversity. Nearly 75 percent of the genetic diversity of agricultural crops has been lost since the early 1900s. That's when farmers stopped saving and swapping seed and began to rely on seed companies.

What difference would it make if corn became scarce or expensive? Well, every one of the more than 11,000 of the 45,000 items in a typical supermarket that contain corn would be affected, and that's just for starters. (That's not a typo; most of it's in the form of sweeteners and oil.)

def•i•ni•tion

A hybrid plant is a cross between two dissimilar parents, while an open-pollinated plant is a result of the natural transfer of

pollen by insects, wind, birds, etc. So-called “heirloom” vegetables are open-pollinated. An heirloom is any open-pollinated variety that has been saved for at least 50 years.

The fact that many old or *heirloom* varieties have been reintroduced by popular demand (often by small independent companies) is proof that many growers still consider them worthwhile, even if the industrialized seed industry didn’t find them profitable enough. But these companies couldn’t have revived these varieties if home gardeners hadn’t preserved them by saving the seeds all along.

These heirloom seeds have obviously been saved and handed down through generations. In most cases the vegetables they come from, and produce, have unique characteristics that make them stand out from the crowd. It might be the flavor, color, or size, or maybe it’s well adapted to a certain locale. In more than a few cases it’s a true “heirloom,” having been brought from the Old Country (whether England, Russia, or Cambodia) to provide comfortingly familiar food in a new land.

Off the Beaten Path

There are about 1,400 seed banks around the world, vaults that protect seeds from plant epidemics, as well as both natural and man-made disasters. Perhaps the most famous is the Svalbard Global Seed Vault, drilled into the permafrost in a remote section of northern Norway. Opened in 2008, the vault holds more than 4.5 million seeds at a temperature of 0°F. Under such conditions, seeds are expected to remain viable for 1,000 years.

If a particular variety does well for you year after year and you keep selecting seed from the best of those plants, you’ll eventually have a vegetable that, if not entirely unique, will be admirably suited to your climate, soil, and preferences.

It's been said that seeds are cheap, too cheap to bother saving. But I don't know. It's tough for me to pay \$1.49, \$1.99, even three bucks or more for a packet of seed, without recalling when they were a nickel. (I'm not old enough to remember when the government handed them out, free!) It seems the price goes up every year, but the packets get smaller. In any event, when you have a large garden and a small income, even relatively inexpensive seeds are worth saving. After all, they're there for the taking, so why not? Finally, saving seeds is so ridiculously simple there is no reason not to!

The Miracle of the Seed

Planting a seed and watching it germinate and grow is one of the most profound and awesome experiences imaginable. How does that little dried-up speck of a thing know whether to be a tree or a tomato? Or a beefsteak, cherry, Roma, plum, red, yellow, or other kind of tomato?

A seed is a living embryo. It develops into an indeterminate potato-leafed, rich-flavored pinkish Brandywine tomato because all that genetic information has been passed down to it through more than a hundred generations. The root, stem, and leaves are already present and very much alive in the seed. You can see this in a large seed, like a bean. Soak it for a few hours to soften the hard skin, and cut it open.

Looking at it this way, a tomato seed is no more the beginning of a tomato than an egg is the beginning of a chicken, as in the old "which came first?" conundrum. They are links between generations. Seed savers preserve those links.

Also like the egg, a seed contains food for the sleeping life it protects. A seed has a supply of carbohydrates, fat, protein, and minerals. (That's why we eat some of them.) When conditions are right—moisture, temperature, light, etc.—the embryo awakens and uses that food supply to send out the roots and leaves that will nourish further growth.

Those proper conditions for awakening are important to the seed and the seed saver. A seed must start growing when conditions are suitable for the survival of the plant. A tomato or pepper seed that sprouts in a northern garden in September won't survive the winter, and therefore won't continue

the species. The seed saver must provide an environment that will keep the seed dormant until the proper time. When that time arrives, the environment is changed to one that will awaken the embryo and start growth.

Seeds form inside fruits; fruits develop from flowers; and pollination is required for the whole process to work. This brief recap should remind you of what you learned in a biology class you probably thought was useless or at least bring back an image of birds and bees busily pollinating flowers. The importance of this to the seed saver is that pollination affects the genetic makeup of the seed. If the seed came from a hybrid plant, it was cross-pollinated, which means we have no way of knowing what the next generation will be like. That's why we only save seeds from open-pollinated plants, not hybrids.

def•i•ni•tion

Self-pollinated is the transfer of pollen from the male part to the female part of the same flower or a flower on the same plant.

Better yet, start with seed from *self-pollinated* plants. These are plants where pollination occurs within each individual flower, not from other flowers or other plants. These include beans, peas, lettuce, and tomatoes.

These, by the way, are all annuals, which are the easiest plants for beginning seed savers to work with. Other annuals include broccoli, Chinese cabbage, corn, cucumber, eggplant, melon, squash and pumpkin, and most radishes.



Lore of the Land

We always let some radishes go to seed—for eating. The pods that form provide a delightfully spicy addition to late-summer salads and other dishes. We also pickle them. But pick them when they're still green and tender. Radish seeds are also popular for sprouting; the sprouts add zest to salads and sandwiches. For these uses it doesn't matter if the seed is a hybrid or open-pollinated.

Saving seed from biennials requires a little more work and patience. Biennials produce an edible crop the first year, but it doesn't come from a flower and therefore doesn't produce seed. Think of beets or carrots. The flowers and seeds appear in the second year. Then the plant has no edible parts, so it isn't normally kept that long. The big problem in most cases is keeping the plant alive over winter. Unless you have a special reason, it's easier to stick with annuals, at least at first.

Some Basic Info

Every gardener, seed saver or not, should know some basic information. One is the difference between hybrid and open-pollinated seeds.

Hybrid plants are crosses between two dissimilar parents. Usually the cross improves one of the pair; perhaps it increases resistance to a certain disease or makes it tough enough to withstand shipping. On the farm, hybrid seeds have almost totally replaced all others, and of course, the giant seed companies have gone even further with genetically modified (GM) and bio-engineered seeds. Some of these are patented, which means it's illegal to save seed from them, so farmers are forced to go back to the source. Most are just impossible to propagate from the hybrid resulting from crossing two dissimilar parents.

Garden seeds were headed in the same direction until a significant number of gardeners said, "whoa, enough is enough!" One of the first organized

efforts began in 1975, when Kent Whealy wrote letters to the few organically oriented magazines then available, suggesting that gardeners swap seeds they had been saving, many of which had been handed down through generations. This developed into Seed Savers Exchange, which reportedly has arranged for over a million swaps since then. The idea has also been widely copied. You can go to the website at www.seedsavers.org. These seeds are not hybrid. A seed from a hybrid plant will not duplicate itself. The offspring might be like either parent of the hybrid—or it might be something entirely different.

Some gardeners believe seeds from hybrids won't grow at all. Except in rare cases, this isn't true. The real reason we don't save seeds from hybrids is that the results are almost certain to be inferior. The only way to duplicate a hybrid plant is to go back to the seed dealer, year after year.

The alternative to hybrid is open-pollinated (O-P). This basically means the transfer of pollen happens by natural means, not by the hand of the scientist. Heirloom has become a common term. Only recently has a consensus formed that heirloom seeds are those that have been passed down for at least 50 years. Some say 100. Either way, they've been around a while and are O-P.

Some hybrids have many good qualities, and most home gardeners aren't going to do without them entirely. But anyone interested in self-sufficient living can't do without a few open-pollinated and heirloom varieties, as well.

Beans

Peas and beans are among the easiest seeds to save because they're annuals, they're self-pollinated, and we eat the seed. Seeds are produced the first year; there is little danger of cross-pollination; and no processing is required. In other words, if you grow peas or beans to maturity so they're dry, to be baked or used in soup, you've saved seeds whether you intended to or not. If you pick the peas or beans while they're still green, perhaps to eat the pod and all, as with snap beans, the seeds will be immature. They must ripen and dry on the plant.

There are many kinds of beans besides the familiar green or yellow (and even purple) bush or pole, snap beans, and filet beans which we use fresh. Less commonly grown in gardens, but ideal choices for self-sufficient gardening, are the equally familiar navy, kidney, great northern, and pinto beans, along with lima, garbanzo, cannellini, black turtle, red adzuki, Arikara Yellow, and, of course, Vermont Appaloosa and Jacob's Cattle, just to get you started. One source for all of these and more is Vermont Bean Seed Co., www.vermontbean.com.

These are dry beans and are left on the plant until they're mature: the pods are dry and papery. You can pick and shell a few by hand. But if you have lots, pull or cut the entire plant when completely dry; pile the plants on a clean wooden or concrete floor, and stomp on the beans to thresh them. Kids of all ages love the stomping part. The bean seeds will easily separate from the stems, pods, and leaves, and you can rake off the trash. Pulling out the plants by the roots might result in pebbles and soil particles that will be difficult to eliminate later. So try to keep the roots as clean as possible, or cut them off.

To finish cleaning, pile the beans in the center of a blanket, position a helper at each corner, and toss them into the air on a windy day. Most of the remaining chaff and dirt will blow away. You'll still have to check them carefully for small pebbles, just as you do with the store-bought ones, where the package warns that the beans are "a natural product of the earth." Dry beans are easy to grow and easy to store; no freezing or canning is necessary. Store beans in a cool, dry place—but not in airtight containers. Cloth bags are ideal. They'll keep for several years.

You can cook them in many ways, and they're loaded with nutrition. And if you've come this far, reserve a few to plant again next year and you've become a seed saver.

To save seeds of the snap beans, simply leave the pods on the plants until they are dry and papery, and process them like dry beans.

However, here you have to become something of a plant breeder: you must decide which ones to keep. The earliest, biggest, plumpest, and all-around most delicious-looking pods are the ones you're eager to pick and eat first, of course. But if they're that wonderful, they're also the ones you want to save for seed.



Lore of the Land

You really can improve your crops by selecting seed from plants with qualities that are important to you. Those qualities might include earliness, flavor, size, plant health and vigor, heavy yield, or storage life. Continued selection over the years will strengthen the attributes you choose for.

Mark the plants from which you want to save seed. If more than one person works in or harvests from your garden, mark those plants extra well! Tie a strip of brightly colored cloth or ribbon to the selected specimens, and be sure everyone knows what that means.

Tomatoes

Tomatoes are a favorite of seed savers, probably because they're a favorite of gardeners in general. In addition, many heirloom varieties, which are frequently valued for their flavors and other unique qualities, aren't always available. Saving tomato seeds is only a little more complicated than saving bean seeds, and certainly worthwhile.

The big difference, of course, is that the tomato seed is surrounded by juicy pulp. To separate the two, scrape the seeds and pulp clinging to them from a very ripe tomato into a jar, add just enough water to cover, and let this

ferment for three to four days. Most of the good seeds will sink, while everything else will float. You can easily

Off the Beaten Path

How do you plant seedless grapes, if they have no seeds? The same way you plant any other grapes: from cuttings. Cuttings are simply sections of the vines containing several buds. Put them right side up in soil, sand, or vermiculite, and they'll develop roots and leaves.

remove whatever remains stuck to the seeds when the seeds are dry or repeat the soaking if necessary.

For preservation, seeds must have a moisture content of 10 to 15 percent. This only requires drying them in an airy place for a week or so, on screens or perhaps on newspaper or paper toweling, turning or mixing occasionally. You're not likely to get them too dry, especially in humid weather, so don't rush this step. But also don't be tempted to use artificial heat; rapid drying can damage the seed, and temperatures much over 90°F can kill it.

Store your thoroughly dry seeds in tightly covered containers, with complete labels. The more information you include, the better.

Peppers

Saving seeds from peppers introduces some interesting problems. While members of the *Capsicum annuum* family are grown as annuals and are self-pollinated, there is some slight danger of cross-pollination. This means that the fiery hot jalapeño you so enjoyed and wanted to preserve just might disappoint you because it happened to cross with a sweet bell pepper or the other way around.

The solution is to isolate varieties. You don't have to widely separate them; just don't plant different varieties next to each other. By the same token,

remove any undesirable plants that might be growing next to those you want to save for seed. Your goal is to improve the variety. A plant that's not up to snuff will degrade it.

Again, select and mark the best specimens early in the growing season. Allow peppers to ripen well past the eating stage; let them shrivel even. You want fully mature seeds, and you'll discard the flesh anyway. Then simply cut the pepper in two, remove the seeds, dry them, and they're ready to store.

Squash

Squash takes it up another notch because these plants definitely need isolation to prevent cross-pollinating. If you talk to other gardeners, you might have heard the myth that cucumbers, squashes, and melons will cross. They are all members of the *Cucurbitaceae*, or gourd family, but they will not cross. Unfortunately for the seed saver, it gets a little more complicated.

There are four species of squash, and varieties within those species will cross. The catch is, there is no logical way to distinguish which species a given variety belongs to:

- *Cucurbita maxima* includes buttercup and Hubbard squash and hokkaido pumpkin.
- *Cucurbita moschata* includes the butternut squash and a number of "cheese" pumpkins.
- *Cucurbita pepo* includes zucchini and other summer squashes, acorn and spaghetti squashes, and Lady Godiva, and some types of pumpkin.
- *Cucurbita mixta* is both the white and the green-striped cushaw.

Varieties within species will cross but so will some varieties *between* species.

To keep it simple, if you want to save squash seed, don't plant more than one variety of each species, or separate varieties by at least 500 feet. Note

that this doesn't mean you can't plant several varieties if you're just going to eat them; cross-pollination only affects the next generation.

def•i•ni•tion

A polleniser is a plant that provides pollen. A pollinator is the agent that moves pollen: wind, bees or other insects, birds, etc. Some fruit trees require a tree of another variety as a polleniser in order to bear fruit.

Winter squash (Hubbard, acorn, butternut) will keep for months after harvesting. You can keep their seeds when you cut them for eating. All you have to do is scrape out the seeds as usual, but dry them instead of tossing them on the compost pile (where we invariably have a few volunteers start growing every spring). Store the dried seeds in tightly closed containers in a cool, dry, dark place until it's time to plant them. Be sure to label them!

You must leave summer squash, such as zucchini, on the vine to mature, which is well beyond the prime time for harvesting for the table. Then treat the seeds the same way.

Corn

As with other vegetables, be sure to use open-pollinated, not hybrid, corn if you intend to save seed. Because the wind pollinates corn, you must separate it from any other variety by at least 250 feet, or for assured purity, 1,000 feet. Sweet corn will cross with field corn, popcorn, and other varieties of sweet corn.

You can grow corn varieties closer together if they're not being pollinated at the same time. Achieve this by planting varieties with different maturing dates or by different planting dates.

If all else fails, corn can be hand-pollinated. This involves placing a nonplastic bag over every ear you want to save before the first silk shows.

Fasten it securely. When pollen appears on the tassels, cut one off and rub it on the silk of an ear on another plant, replacing the bag afterwards. Again, be sure no other pollen can reach the silks, at least until after they turn brown.

Do this to all the ears you want to save, and mark them with colored yarn or ribbon in addition to the bags.

Leave these ears on the stalks until the first frost threatens. (Although a light frost won't harm mature corn, a hard freeze can impair the germination rate.) In the old days, seed corn was picked and husked, impaled on spikes driven through a board, and kept in the barn until the seed was thoroughly dry. Today it's more common to just peel back the dry husks, braid several ears together, and use them as fall decorations in the house. When dry, remove the kernels and store them in tightly covered containers in a cool place.

Potatoes

Seed potatoes aren't seeds: they're potatoes. In the agribusiness world, they're potatoes grown specifically for propagating more potatoes, with strict attention to disease control and often size, as well as the genetics of eating, storage, and shipping quality. These are inspected and classed as certified seed potatoes.

On the homestead, seed potatoes are often the smallest ones left over from the previous crop. Don't worry; this is not neglecting genetic improvement; potatoes are tubers, not seeds. Small ones have the same genetics as large ones on the same plant. Large tubers are generally cut down to two or three eyes, which requires labor, and makes them susceptible to mold and rot. Small tubers avoid all of this.

On rare occasions potatoes do produce seeds. These are used in breeding programs to develop new varieties and can provide an interesting experiment. Watch for flowers that develop into seedballs, which look like small green tomatoes. Let them mature and dry on the vine; then save them to plant the following spring. This definitely is not a part of self-sufficient living because you have no idea what you'll get, if anything.

Biennials

Plants that don't produce seed until their second year are called biennials. In the realm of garden vegetables, these are plants that will not survive freezing over winter. (Some weeds, such as burdock, and a very few vegetables, such as parsnips, are both biennial and cold-hardy.) Therefore, unless you live in zone 8 or 9, where the temperature never drops below 10°F or so, the big challenge to saving seed from biennials is getting the mother plant to survive the winter.

Biennials include beets, Brussels sprouts, cabbage, cauliflower, carrots, celery, onions, parsley, parsnips, rutabaga, Swiss chard, and turnips.

The root crops are the easiest to overwinter. Even here in the far north, we commonly store carrots and parsnips by leaving them where they grew and covering them with a foot or more of leaves, preferably shredded so they don't mat. If you store them like this for eating, dig them before they start to grow in spring. If you want them for seed, just let them resume growing.

However, the recommended and much better way of growing carrots for seed is to harvest them in the fall. Naturally, you will select the finest and fattest and eat any that are small, forked, or less desirable in any way. If you store them over winter, you'll get a second chance to eliminate culls and choose those that kept best. You can't do this with those left in the ground.

Cut off the tops, but leave about an inch of leaf stalk. Note that when storing for eating, you want to cut into the growing point of the crown to prevent sprouting, but don't do that if you're saving them for seed! Don't cut off the root end, either.

Either way, plant them at least a foot apart, in rows three feet apart, with the crown just below the surface. Be sure the ground is loose and friable, and water well.

Why plant them three feet apart? Because the plant you are now growing will be nothing like the carrots you planted last year! This one might get five to six feet tall and have branches and a large flower head that looks like Queen Anne's lace. In fact, carrots and Queen Anne's lace (*Daucus carota*) will cross-pollinate. If you grow carrots for seed, you must eliminate Queen Anne's lace. This might be a problem because the plant is now included in many wildflower gardens.

When the seed heads turn brown, they're ready to harvest but not dry enough to store. Some people pull the entire plant and form piles of them to cure. I prefer cutting off the tops of the stalks and placing them in paper bags and storing them in a protected area. Curing might take two to three weeks, but with the bag method you can leave them for a month or more without worrying about them.

Thresh the seeds by rubbing the heads together, and clean them with a screen that will let the seeds pass through but block out the trash.

Cabbages

Cabbages are among the more difficult vegetables to save seed from. For one thing, they can be self-sterile, so to ensure getting seed, grow at least half a dozen plants.

In addition, the mother plant must be over-wintered, and this isn't as easy with cabbages as it is with carrots. Unless you have a really good root cellar—one that stays close to 32°F with high humidity—the best way to store cabbage is in a pit.

Dig a hole about two feet deep, and line it with straw or leaves. Lay the cabbages on this, close together but not piled up, and pile more straw or leaves on top. In the north, make it several feet thick. It's okay to remove the large outer leaves.

In spring, remove the cabbages and discard any that are rotten or spoiled. Plant them about two feet apart, in rows four feet apart, a little lower than they were growing last fall. Place the head at ground level. Cut an X in the top of each head, about an inch deep, to encourage growth of the stalk. Then place a very stout stake near each plant to support the stalk, which in good soil should get five feet tall.

The seeds grow in green pods that will turn yellow, then brown, and then will split open and drop the seeds. The problem is, you will have pods at all four stages at the same time.

One solution is to cut the stalks when the first pods start to turn brown. Put them in a brown paper bag, upside down. Tie the top of the bag around the stem, and hang it in a dry and airy place. When the pods are dry, pick them

off, put them in a cloth bag or pillowcase, and crush them to release the seeds. Clean the seeds with a screen.

Other members of the cabbage family, or *crucifera*, are handled in much the same way, with one exception: broccoli. Broccoli is an annual and will set seed in its first year. In fact, if you pick the first heads, side shoots will appear. These are small, but edible, and often comprise the bulk of the crop. However, if you don't keep them harvested, you will soon have broccoli plants loaded with yellow flowers on elongated stalks.

To grow broccoli for seed (again, O-P only, of course), start it indoors about eight weeks before the last frost, and plant it out about two weeks before the last expected frost. This plant can stand moderate freezing. Plant each two feet apart, and eliminate any plants that don't measure up to your standards.



Watch Your Step

Broccoli will cross with Brussels sprouts, cabbage, kale, and kohlrabi, so raise only one of these at a time, for seed.

Let the buds develop into flowers, again eliminating any plants that are weak or below par before the blossoms are open enough to pollinate. Harvest and process the brown pods as for cabbage.

It isn't necessary to grow seeds of every plant every year. Corn, onion, and parsnip seed might remain viable for only a year or two, although under ideal conditions, even they can last much longer. But tomatoes, peppers, beans, and carrots should be good for at least three to four years. Where two species might cross, such as broccoli and kohlrabi, grow one for seed one year and the other the next.

The Others

Some vegetables and fruits are not grown from seed. We have mentioned potatoes. Jerusalem artichokes are propagated the same way, with the added advantage that they can be left in the ground over winter. Because root cuttings propagate horseradish, if you dig a horseradish root to use, you will almost certainly have more growing in the same spot. If you want more, simply plant a piece of a root, or better yet, a crown (the top part of the root).

Asparagus seeds are in red berries that form on female plants in fall. Hybrid all-male varieties are popular now, and obviously these don't produce seed. You'll need an old variety, such as Mary Washington, if you want to save asparagus seed. It will take three years to get a crop from seed, but an asparagus bed can last for 20 years. Most people start out with year-old roots.

Strawberries spread by runners, which can be allowed to fill in the bed, or taken up (after they root) for transplanting into a different bed. And rhubarb plants can be divided every few years.

The Least You Need to Know

- Genetic diversity in plants is extremely important, but it's disappearing.
- You can improve the vegetables you grow by selecting the best and saving seed from them.
- Store seed in a cool, dark, dry place.
- Most seeds will remain viable for three to five years; under ideal conditions, they'll last even longer.

Chapter 16

Adam and Eve Did It

In This Chapter

- Gardens without gardeners
- Weeds to know—and love
- The ubiquitous and valuable dandelion
- Daylilies and mushrooms
- The case for entomophagy

The Garden of Eden didn't have raised beds or drip irrigation—or rows, hoes, or hoses, for that matter. The way we use the term today, it wasn't really a “garden” at all.

Adam and Eve weren't gardeners; they were foragers. They harvested free food without planting a seed, pulling a weed, or spraying a bug.

This is one aspect, at least, of the Garden of Eden that we still have today. We just have to know how to forage.

A Walk on the Wild Side

No matter where in America you live, somebody else was there long before the supermarket you now patronize was built, before the first European settler arrived, even before Native Americans started planting corn, beans, and squash.

And what did they eat? That's the clue to foraging.

True, you won't make much use of bison meat in most cases, and you won't get even a taste of passenger pigeon, but chances are, most of the *plant* materials the native peoples lived on are still available. Factory farming has made some of these as rare as passenger pigeons in some areas, but others

are abundant in abandoned or neglected out-of-the-way places. In addition, there are aliens brought in as food plants by the new settlers.

Some people consider dining on wild foods as gardening without the work: let nature do it. That's taking self-sufficiency to the max. Others see foraging as a supplement to the garden. Cultivate that skill, and you won't have to cultivate the soil. Actually, you probably have wild food growing in your garden!

Some Weeds Are Edible

One of the first things we think of when discussing wild foods is, "How do we know what's edible?" Everybody who ever had a mother knows you can get sick or even die from eating pretty berries and such growing wild. Knowing the difference between good and bad seems a formidable task.

Samuel Thayer, one of our local gurus, has the best explanation of this I've heard. He's written an excellent book, *Forager's Harvest: A Guide to Identifying, Harvesting and Preparing Wild Foods*. (www.foragersharvest.com) When I participated in one of his workshops, which was a walk along an abandoned railroad, he compared learning about wild foods to how we learn to differentiate between head lettuce and cabbage. If you were to look in a book about vegetables, the way most beginners learn about edible weeds, a head of lettuce and a head of cabbage would look awfully similar. So are the descriptions: balls of tightly packed green leaves. The book isn't going to be terribly helpful.



Lore of the Land

Very few wild plants are widespread—like dandelions and milkweed. Books devoted to edible weeds are often very local in scope. Fortunately, every locale has at least one ardent and knowledgeable forager who is often delighted to introduce newcomers to their passion.

But then, go into a supermarket. If you ask for a head of iceberg lettuce and the produce manager hands you a head of cabbage, you'll know at once that something is wrong. This is the kind of knowledge the forager needs, and has.

I agree, this isn't much help to those who don't know a pigweed from a potato. But it's a fact—and one that applies to many, many other areas of self-sufficiency. The best and easiest way to learn these things is from our elders, from childhood on. Anyone with a disadvantaged youth, say, one spent in a classroom learning algebra and history, is going to have a hard time later, even taking a crash course. (Keep this in mind if there are any children in your life.)

Most of us are already way behind, so where do we start? The books, of course. You have little choice, unless you're fortunate enough to come into contact with a Samuel Thayer or an Art Schmaltz first.

Art Schmaltz lives in Madison, Wisconsin, but studied ethno-botany, the study of how people of a particular culture and region use indigenous plants, at the University of Chicago, with emphasis on the Cree tribe of Manitoba. He also studied art and philosophy and is a retired college teacher and sculptor.

Wild foods are a big part of his diet, and he shares his enthusiasm through foraging workshops but is less enthusiastic about books. Even more than garden vegetables, wild plants look different at different stages of growth, he points out, and their food value changes as well. But you only need to know about a handful to start having fun, he says.

He suggests burdock as a starting point because it's easy to identify and very versatile. Yes, burdock is classified as a noxious weed and is a dickens to get rid of on the farmstead, but you can actually buy burdock seed, usually called Japanese gobo. It's a common food in several Asian countries, especially Japan. The first-year roots are what the forager wants

from this biennial thistle, genus *Arctium*. In other words, identifying the plant isn't enough; you also have to know what it looks like at different stages of its life or growth cycle. The roots can be three feet long and two inches in diameter. Immature flower stalks are also edible if they're harvested before the flowers appear. Again, how the heck do you know when the flowers are going to appear, without experience or a mentor?

The stalks supposedly taste like artichokes, to which burdock is related (*Asteraceae* family). Not to complicate matters, but some articles say that Italian Americans enjoy burdock stems, but refer to them as "cardune." That very well may be, but cardoon is yet a third plant, also in the aster family, but distinctly apart from artichokes or burdock. While artichokes and cardoon are warm-climate plants (zone 7), burdock is hardy almost everywhere.

Art thinks an entire cookbook could be devoted to burdock—but he doesn't believe in cookbooks, either. He says just add burdock to any dish that calls for roots such as carrots, parsnips, turnips, or rutabagas.

Book learning might not be perfect, but most people don't have any alternatives. If you ever get the opportunity to participate in a wild foods workshop, grab it. Even if you don't learn very much in a couple of hours, you'll be inspired by seeing somebody plunge into the bushes and come out with an armful of dinner. After that, the books will mean more.

Off the Beaten Path

George de Mestral enjoyed walking his dog in the Swiss countryside, but he didn't enjoy picking off the burrs that stuck to fur and clothing. One day in the early 1940s, his irritation turned to curiosity, and he looked at those seeds under a microscope. Examining the hook-and-loop system the seeds use to hitchhike on passing animals gave him an idea; we now call it Velcro.

If you're serious about foraging, you'll want more than one book, hopefully covering your locale. At least one that does cover a very wide area is worth reading. *Stalking the Wild Asparagus*, by Euell Gibbons, isn't very helpful in plant identification, but this 1962 classic contains a great deal of information about foraging in general and background information on many common plants, including preparation suggestions.

Gibbons, by the way, said he got started in foraging through his mother. But he also lists a number of mentors and attributes much of his knowledge to books. In other words, grab whatever you can.

Dandelions

Some weeds are so notorious they need no introduction. Take dandelions—please.

Entire books have been written about dandelions. I'd be surprised to meet somebody who never heard of dandelion wine, and some people know you can make a coffee “substitute” from the roasted roots. If anybody has tasted just one wild food besides the familiar nuts and berries, it's most likely the dandelion.

And most likely, they detested it. After a bad first experience, why try again? One good reason is that in many cases if not most, the first try involved “dandelions”—you know, those lawn weeds with the yellow flowers. The flowers might make the plant easier to identify but not easier to digest.

The secret to dandelions, to any wild foods, or to any cultivated foods for that matter, is to harvest the product at its peak. Do you eat lettuce from your garden after it has bolted and gone to seed? That can be as bitter as a dandelion, to which it's related. Why expect a wild vegetable to be any different? When flowers appear, the dandelion season is over, for all practical purposes.

Also consider growing conditions. A closely cropped lawn is not the best place to look for vegetables, and that's where dandelions are commonly found. They flourish in rich, moist soil, in full sun, and in “disturbed habitats,” which must include just about all the civilized world by now.

The very best dandelion eating is available even before the last frost of spring, which makes this plant special even for gardeners. But you'll have to be able to recognize the small tangle of reddish leaves, long before the familiar blossom appears and even before the characteristic "lion's tooth" leaves develop. Dig out the entire plant, roots and all.

The crown sprouts from the root, which is usually a couple of inches beneath the ground surface. The underground growth of the crown is white and tender. Slice the crown from the root (include enough of the root so the leaves hang together), and cut off the green part of the leaves. Discard the leaves, or if you have chickens, rabbits or goats, offer them a treat. Wash what's left thoroughly to remove any grit.

Some people prepare dandelions and any wild food like kidneys; they boil them.

Euell Gibbons boiled almost everything, most often with "a pinch of soda" and usually in several changes of water. This does eliminate bitterness even in summer-gathered greens, but it isn't necessary with the white crowns. They can be lightly sautéed or steamed and used in salads or as a vegetable.

The roots you dug with the crowns have two uses. You can peel them with a regular potato peeler, then slice and boil them. (Okay, use two waters and a pinch of soda if you must.) When they're very thin, I find that just scraping them with a knife works better than trying to use a peeler. You can use them like any other root vegetable, but they have a flavor of their own.

These young and tender roots also make the best beverage. Clean them; roast them in a slow oven, try 200°F, until they turn brown inside, about four hours; and grind them. Use the result just like coffee. You can harvest roots year around, for medicinal use as well as food, but the early harvest is better.

A little later in the season, the more familiar greens are at their prime. Yes, even then they can be a mite bitter. But boiling in one or more changes of water will take care of that, although people who have learned to appreciate such salad makings as radicchio don't find the bitterness unpleasant.

Euell Gibbons writes of "developing blossom material found inside the crown as a yellowish, closely-packed mass." Cut out and lightly cooked, these "little chunks of embryonic blossoms" reminded him of the flavor and texture of the finest artichokes. I don't know about that, but they are quite

good. It does seem like a lot of bother to get enough for a meal, but maybe it gets easier with practice.

Off the Beaten Path

Dandelion leaves are more nutritious than anything you can buy in the supermarket. They're higher in beta-carotene than carrots. The iron and calcium content is phenomenal, greater than spinach. They contain vitamins B₁, B₂, B₅, B₆, B₁₂, C, E, P, and D, biotin, inositol, potassium, phosphorus, magnesium, and zinc. The root contains the sugar inulin, plus many medicinal substances. One wag said that if the FDA knew what was in dandelions, they'd ban them.

The blossoms are used for wine. My dad made a lot of dandelion wine when I was too young to appreciate it. Some people reportedly eat the blossoms. One source says to cut off and discard the bitter green sepals at the base and add the yellow part to salads. You can also dip them in batter and fry them as fritters.

The Gardener's Advantage

Gardeners with some experience have several advantages over the average person, and certainly over the average city person, in learning to forage for wild foods. If you have a garden, you have weeds! It's not hard to learn about wild plants you have regular contact with. Chances are, some of the weeds you're fighting are edible. In my own northern garden, I have lambsquarters, amaranth, purslane, and sheep sorrel, with burdock, milkweed, dandelion, and others close by. These would make a great start for any aspiring forager.

If you're eating the weeds out of your garden, why not try a few flowers, too? Many are edible. Many flower gardeners are familiar with the tangy

flavor nasturtiums add to a dish, because the seed catalogs frequently tell them. The seed pods are a substitute for capers.

Many years ago I purchased a small box of lily buds in an Oriental grocery. Only later did I discover these were the common daylilies (*Hemerocallis fulva*) that grew in profusion along our road. The flower buds are gathered when they are nearly full-size but still unopened. Treat them like green beans: simmer for just a few minutes, and serve with butter, salt, and pepper. They can also be dried, like the boxed ones I bought that came all the way from China!

Off the Beaten Path

A University of Wisconsin horticulturist told a Master Gardener class of her experience working with a Hmong group weeding a community garden. She wondered why some of the gardeners were setting aside some of the weeds they pulled. It seems they were saving the purslane to eat! She tried some and liked it. Even Ph.D.s can learn new things by working in a garden.

You can add both buds and flowers to soups and stews during the last few minutes of cooking. In addition to contributing an interesting flavor, they act as a thickening agent, much like okra.

But that's not all. Daylily tubers are also edible and good-tasting. (The two don't always go together if "edible" merely means "nonpoisonous.") They are small—only about an inch long—but they're abundant and easy to gather. Preparation is only slightly more bothersome. Gibbons compared it to shelling peas, which is a good analogy. It consists of removing the connecting rhizomes and feeder roots. You can dig them anytime, but the young and tender snowy-white ones are most common in spring and summer.

The sprouting stalks are also edible, which, of course, are only available in early spring. Cut them off just above the roots, and remove the outer leaves

to get at the tender inner portion. Many wild edibles have tough outsides, but tender centers. Slice them into salads, or prepare them like asparagus.

If you paid 10 bucks or more (and it's possible to pay *much* more) for a daylily, you might not think eating one is such a good deal. But every hemerocallis grower knows that after a few years, these perennials should be divided to maintain their vigor.

If you have a patch of wild ones, removing a shovelful here and there will actually improve the stand. Some states classify the common orange ones as a weed.



Watch Your Step

When you eat a plant, or even take a tiny taste, be absolutely certain that you know what it is and that it's safe to eat. While some cultivated common flowers that don't look like food are edible, many that do look like food are not. Castor beans look delicious, but they're exceedingly poisonous. On the other hand, the beautiful red flowering runner beans, usually grown as an ornamental, are as edible as any vegetable garden variety.

Wild Foods Everyone Should Know

Most plants have specific ranges. You'll certainly run across some that sound interesting but simply don't grow in your neighborhood. That's why

you have to do your own research and editing, which is easier if you can find some local information sources.

Samuel Thayer says many books on foraging are faulty because the writers simply borrow material from other books that were wrong. Not even pretending to be an expert, I'm going to avoid this trap by not going into any details beyond those supported by my own limited experience.

However, dipping into the books that have helped me get as far as I have, I can tell anyone who doesn't know a thing about wild foods that cattails are called the supermarket of the swamps because they have so many uses. We've used everything from the roots and shoots to the pollen. Although we have plenty of them, we haven't been motivated to make them a staple part of our diet. We could, though, if the garden failed us. Milkweed is almost as useful, and widespread. Acorns were the staff of life before humans made much use of the cereal grains. At the same time, plants that some books say I should be able to find don't really grow here. (Yes, poke and knot-weed grow in Wisconsin, but neither one has been documented in Taylor County.)

And I can tell you that there are many poisonous plants that you can mistake for edible ones, which brings us to mushrooms.

Mycology

Mushroom hunting is only a branch of the wild food avocation, but a huge one. You can easily find more books on mushroom identification than on all other wild edibles combined.

Mushrooms are also arguably more dangerous than any other class of wild food. Here, many experts consider a mentor a necessity. At the very least, consult two or more field manuals, and know how to make a spore print, which is often critical in identifying fungi.

But again, learning to identify two or three that are common in your particular area will get you started, and for many people, that will be enough.

One problem with mushrooms is their ephemeral nature. One year we gathered literally bushels of *Agaricus campestris*, the common field or

meadow mushroom. That was 10 years ago, and I haven't seen even one since. They can spring up overnight, like, well, like mushrooms, and disappear just as fast. Many kinds of insects and animals love mushrooms as much as any human gourmet does. There are good years and bad years. And all of this just adds to the excitement when you find a good patch.

I've never found a morel. But we often have an abundance of oyster (*Pleurotus ostreatus*) and probably the most easily identified of all, the giant puffball (*Calvatia gigantea*).

We've also tried growing mushrooms, including shiitake. Shiitake involves drilling holes in a log and inoculating it with spawn which we had to purchase. They will not grow wild, unfortunately. It was an interesting experiment, but a mixed success. Foraged "shrooms" are cheaper, much less work, and more fun.

There's another fungus every gardener should know about. In Mexico it's a delicacy called *huitlacoche*. You might know it by the much less appetizing name, *corn smut*. It's a fungal disease that replaces the normal corn kernels with large distorted galls or tumors. While they look like huitlacoche (which reportedly is translated as "raven's excrement") they really are quite delicious, lightly fried in butter. So use the name the James Beard Foundation prefers: Mexican truffles. Harvest them about two weeks after the ear of corn is infected, while they're still moist and tender.

Other Wild Edibles

We haven't even mentioned the foods that are so common we often forget they're wild or at least don't hesitate to enjoy them: the tiny strawberries, raspberries, and others often found in wild places, as well as hickory nuts and black walnuts—and, of course, wild asparagus. We've made a lot of elderberry jelly over the years, as well as wine. I've enjoyed picking wild blueberries, and one of the shallow lakes on our land used to yield wild rice, but it was always infested with some kind of bug and the whole patch eventually died out.

Maple syrup fits into this category. If you don't have any sugar maples (*Acer saccharum*), use the sap from any of its relatives, including even

silver maple and box elder (*Acer negundo*), although the sugar content is lower, and it will take more sap per unit of syrup. It takes about 10 gallons of sap to make a quart of syrup, but that varies. The year it rained in our uncovered sap buckets it took a *lot* more than 10 gallons!

Sap runs best when days are warm and sunny, over 40°F, but nights are still below freezing. Drill a $\frac{7}{16}$ -inch hole two to three inches deep in a tree that has a diameter of at least 10 inches. Trees larger than 20 inches at breast height can handle two taps. Insert a metal or plastic sap spile, available at hardware stores in maple sap country, and attach a bucket or bag. We use large, strong plastic bags that fit into special holders that attach to the spile. Every hardware store in the area has them.

Off the Beaten Path

Most maple products are produced in the Northeast and Upper Midwest.

The collected sap is merely boiled and evaporated to concentrate the sugars. (Do *not* try to reduce 10 gallons of sap to one quart of syrup in your kitchen unless you don't mind 9½ gallons of sticky moisture covering your ceiling, walls, and everything else.) If you make very much, you'd do well to secure a hydrometer, to measure sugar content, which should be 66 to 67 percent at 7.1°F above the temperature of boiling water at your altitude. For a small amount, just cooking it until it looks or tastes like maple syrup will suffice. If it's not concentrated enough, it can sour over time, but it probably won't last that long. Too concentrated, and sugar crystals will form. That's maple sugar. The problem will be getting it out of the container.

Mel Koelling, a Michigan State University forester, notes that maple syrup is one agricultural commodity that isn't bothered with a surplus, and it's a good part-time occupation. Even more interesting in the context of making use of resources: less than one maple tree out of a hundred is tapped.

Beyond Plants: Entomophagy

Hunting and fishing are certainly part of this branch of self-sufficient living, but one we won't go into in a section on gardening. Of course, there are uncommon foods to be had here, too: sportsmen don't usually go after crayfish or turtles—or insects.

Chocolate-covered grasshoppers are more of a joke than a real food in our part of the world. But reportedly more than 1,000 species of insects are an important food source for an estimated 80 percent of the world's people. And many are considered delicacies.

In Mexico, where people consume more than 200 different species, demand is so high that 40 of those are considered threatened, according to scientists. This includes the white agave worms found in bottles of tequila. (Technically, the genuine agave worms are coral, not white, and they're in mescal or mezcal, not tequila, but that's *way* off the beaten path.)

The fact is, many insects are highly nutritious and, to some people at least, delicious. You should also be aware that you've probably eaten a lot more insects than you realize. Guess what happens to all the flour beetles, weevils, and other insects found in grainaries? And insects are said to be common in canned fruits and vegetables.

The United States Food and Drug Administration (FDA) has a list of allowable "unavoidable defects" in foods that you'll *never* see on the nutrition label. Tomato juice can legally have up to 10 fly eggs per 100 grams, or 5 fly eggs and a maggot, or 2 maggots. Ten grams of ground thyme can contain up to 925 insect fragments and 2 rodent hairs. In eight ounces of golden raisins, there might be the equivalent of 10 whole insects and 35 *Drosophila* eggs.

Entomophagy is the practice of eating insects. People who study such things say that nearly 3,000 ethnic groups regularly eat 1,417 species. Topping the list is the beetle, with 344 varieties to put on the menu. Ants, bees, and wasps are close behind. Butterflies and moths, grasshoppers, and crickets are also said to be popular. The giant water bug is an Asian favorite, roasted and eaten whole, or ground into a paste for sauces. Crickets are dry-roasted for snacking or cooked with rice.

Some people have seriously suggested that in the future, everyone will have to eat more bugs, intentionally. The benefits of insect protein in space travel are pretty obvious. Imagine trying to raise cows, along with the necessary grass and grain, on a spaceship.

Oh, but we've been saying *Earth* is a spaceship ... hmm.

If entomophagy doesn't appeal to you right now, consider that cultural bias is learned behavior and can be unlearned. Remember, some cultures find eggs disgusting.



Lore of the Land

Few insects are poisonous. The nastiest ones are brightly colored or have such a strong odor you'll want to avoid them. But some are toxic and can make you sick.

If you're ever lost in the woods for a few days and get hungry enough to eat a bug, try to remember this: "Red, orange, yellow, forget this fellow; black, green, brown, wolf it down."

It's also kind of odd or even hypocritical. Some spiders—arachnids—are delicacies although few Americans or Europeans would be tempted to even try one. But many of them do enjoy a good arachnid now and then without realizing it; lobsters and crabs are both arachnids. Worse yet, they live on the ocean floor. Imagine what they find on the ocean floor—that's what they eat.

The Least You Need to Know

- Many weeds are edible and taste pretty good.
- Everybody recognizes a few common weeds, but gardeners know more than most people.
- You need at least two or three good books on foraging, preferably written for your bioregion.
- Insects are a very good high-protein food, widely used today, and will probably be of much greater importance in the future.

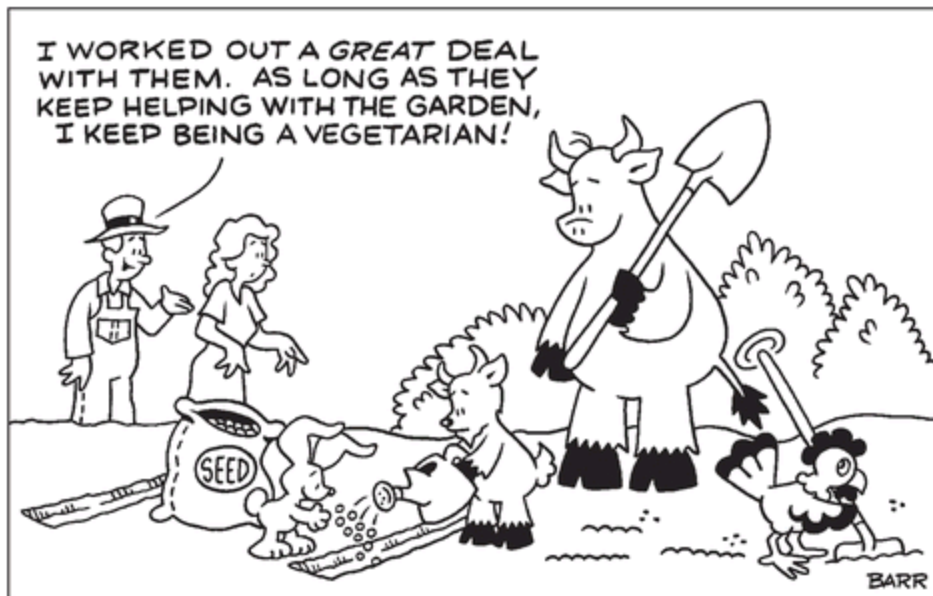
Part 4

Meat, Milk, and Eggs

Animal proteins are controversial. Some people find fault with them on various grounds, while others count steak, eggs, and ice cream among their favorite foods.

One thing is undeniable: they are costly. The typical family spends nearly a third of its food budget on meat (including fish and poultry), milk (including all dairy products), and eggs (not including those used in cereal and bakery products). That would seem to be one excellent reason for producing your own.

However, there are plenty of other good reasons for raising your own animals for food. Some of them might surprise you.



Chapter 17

The Truth About Meat

In This Chapter

- Meat consumption increases with wealth
- Most meat production today is neither economical nor sustainable
- The smallholder can do it better
- Consider these things before you start

What is the role of animal husbandry in a sustainable world? Should meat even enter into a discussion of self-sufficient living?

This is not an easy question to answer although it sure is an interesting one. Like most of sustainability, and self-sufficiency, it involves a wide array of considerations, not all of which are readily apparent.

Meat and Wealth

Meat is not an absolute necessity for human survival. It does have certain nutritional advantages over plant protein, but they're not crucial. The fact is, we eat meat because we like it and because we can afford it.

Most inhabitants of the planet today eat little or none, although often not by choice. Generally speaking, meat consumption increases with income. In Mexico, the poorest 10 percent of the populace eats 22 pounds of chicken per person, per year; the wealthiest 10 percent, 68 pounds. Canadians also eat 68 pounds of chicken a year, but Americans put away 87 pounds each.

China provides another example as one of the world's fastest-growing economies, with an average annual expansion of more than eight percent since 1990 and recently nearing 10 percent. Mirroring this increase in wealth, meat consumption went from about 44 pounds to 120 pounds per

person per year in little more than a decade. (In the United States it went from 193 to 211 pounds during the same period.)

In the past 20 years, McDonald's has gone from zero outlets in China to 800; KFC, from one to 2,000. Still, the average European eats 83 percent more meat than the average Chinese, but the average American consumes 129 percent more.

The question many ask is what happens if or when the Chinese catch up to the Americans? This isn't an idle query. When the Chinese consumed 44 lbs. of meat a year per person, that country's population was still less than a billion. Today there are 300 million more of them—each one eating almost three times as much meat as the average person did less than 20 years ago. And they've been getting richer at a rate of 10 percent per year.

As a nation, China now accounts for the slaughter of the equivalent of 240 million cows a year, 600 million pigs, and 24 billion chickens. And that meat represents an awesome amount of grain and water. And remember, on a per capita basis, Americans consume 129 percent more than that.

China is not alone. The consumption of meat in developing countries has been increasing by more than five percent per year. World meat production soared from 44 million tons in 1950, to 211 million tons in 1997, to an estimated 284 million in 2008.

It would be wonderful to know that the rest of the world is catching up to the American standard of living, if that standard of living weren't under fire for its detrimental effects on Spaceship Earth. The effects stemming just from meat consumption are both numerous and well known. Let me name a few:

- It's not efficient to feed grain to animals and then eat the livestock products.
- Grain consumed directly by humans instead of being fed to animals will feed about five times as many people.
- A pound of beef produced in the United States requires 2,500 gallons of scarce water, by some estimates.
- Ruminants (cows, sheep, goats) account for as much as 25 percent of the methane in the atmosphere, the leading cause of global warming.
- Livestock in the United States produce 130 times as much waste as the human population.

- Humans with diets rich in meat have more problems with lifestyle diseases such as heart attacks, strokes, and cancers.

Holding up America as a role model for the rest of the world is as inane as a decent young girl looking up to one of those show business floosies. It should be the other way around.

The Role of Culture

Perhaps it's ironic, but meat consumption has been declining in the United States since the economic downturn. Apparently, if meat consumption goes up with income, it also goes down with it. We can only speculate what this might mean for the long term, but it's also a reminder of the other factors that make animal husbandry somewhat elastic.

Consider culture, for example. Several cultures exclude pork from the diet. But in China, pork is the primary meat, and it's more than half the meat diet of Germans. Japanese consume almost equal amounts of beef, pork, and poultry, with pork in the lead. In Argentina and Brazil, beef is the clear winner, while in New Zealand beef competes with mutton. In much of the Middle East, poultry is preferred.

The French relish horse meat, and some Asians favor dog and cat, just the thought of which makes most Americans gag. But some people have the same reaction to chicken eggs or milk. And wide swaths of the planet, including India and Indonesia, pay little attention to animal products of any kind because they're vegetarians.

Although we eat animal products because we enjoy them and can afford them, those aren't the only factors.

The human body requires protein, which is made of about 20 different amino acids. We need all 20, but no protein contains all 20. Animal proteins are more complete than plant proteins, with eggs being the most complete and ideal. So while it is possible to have a healthful diet without meat, it's easier and more satisfying to include it.

Are there really 2,500 gallons of water in a pound of beef? Possibly. If the cow or steer was raised on irrigated alfalfa or other hay and fed liberal amounts of grain grown on irrigated land, then yes, probably.

But if the animal was raised mostly or entirely on grasses growing on land too rough to cultivate in a humid climate where the grass grows with natural rainfall, then no, that's ridiculous. Grass-fed beef from humid regions is becoming more common and available even while beef from places like California is becoming more scarce and expensive. As of 2009, California has severely restricted water for agriculture, with broad implications for everything we're discussing. This is the third year of serious drought; no relief is in sight; and even a return to normal precipitation will not alleviate the situation, according to the state's water experts and authorities. We can only speculate what this will mean for food prices and availability, including beef.

Taken to its logical conclusion, this would lead to less beef, but more healthful beef (less fat), produced in different regions, with a different cost structure. There would be less concentration of manure and no dependence on irrigation.

The Question of Sustainability

The sustainability of grass-fed beef is seldom considered, but worth mentioning. Here's why:

The sun is the source of all energy. Differential heating causes wind; evaporation produces precipitation and, hence, water power; and photosynthesis powers all plant life, along with all the animal life that depends on plants. And, of course, fossil fuels are nothing but fossilized sunshine.

Less than one percent of the solar energy reaching Earth is fixed by photosynthesis. Only a minute fraction of that is in a form that humans can use as food. Therefore, converting more of that energy into a form that can be used by humans would be one way to avoid a food shortage crisis. Currently, the best way of doing that is through animals.

In other words, irrigated hay and grain aren't essential to meat production, and animals can convert otherwise "wasted" solar energy into food for humans.

China produces and consumes half of the world's pork. But primarily waste products, such as rice hulls, produce this meat. Much rabbit meat is also produced from so-called waste: weeds, and such. These are examples of converting more solar energy into food for humans. Industrial agriculture wouldn't consider this efficient, but that brings up another point seldom acknowledged today: *industrial agriculture is not energy efficient*.

In 1974, the FAO (Food and Agriculture Organization) of the United Nations issued a chart showing the utilization in food production in the United States in 1940 and 1970. In 1970, farmers used 2.5 calories of energy to produce one calorie of food: 2.7 times more than in 1940. Even more important to self-sufficiency, food processing went from 2.2 calories expended per calorie of food in 1940 to 4.1 in 1970.

Going back even further, before machines powered by fossil fuels were used in agriculture, one calorie of energy input on the farm resulted in 16 calories of food energy. In 1970, 2.5 calories went in to get one calorie out. Now almost 40 years later, it is certainly worse.

Do you get the picture? We spend 2.5 calories to get one! And that's just on the farm, not including processing and marketing! This is nonrenewable fossilized solar energy that sooner or later will run out and cannot be replaced on a spaceship, at least not for many millions of years. This is what we mean when we say modern agriculture is not sustainable.

The implications for self-sufficient living overall should be obvious, but there's still more to say about animal husbandry specifically.

One cow eliminates as much waste as 16 humans. North Carolina's 7 to 10 million hogs excrete four times as much waste as its 6 million humans. The EPA says livestock have polluted 35,000 miles of rivers in 22 states and have contaminated groundwater in 17 states. A hog concentration camp in Utah produces more waste than the city of Los Angeles. These are all used as arguments against meat consumption, but they make better arguments against large-scale agribusiness.

On the homestead, where it can be properly managed, manure is transformed from a waste product and a pollutant into a valuable commodity. Ideally, it's composted with bedding, another "waste" product in so-called efficient agri-business. The result is a fertilizer that not only replaces the chemical products made from nonrenewable resources but

which also has the added benefit of building up humus in the soil, which synthetics do not.

If the feed for these animals is produced on land not suitable for crop production, with only sunshine and natural rainfall and no artificial fertilizers or other chemicals, then you have a sustainable system. This is what we strive for on the homestead—and on the planet.

“But we would all starve to death!” many agribusiness types, including an outspoken United States Secretary of Agriculture, protested. “Farmers can’t feed the world with 40 acres and a mule!”

Actually, that would be much easier over the long haul than trying to feed the world by burning 10.6 calories—which is what it takes to produce, process, and market food—to get one back. This is subsidizing food with energy; providing food for this generation by using energy that rightfully belongs to future generations. This is what’s insane.

Off the Beaten Path

“Get big or get out” was the farming mantra in the 1970s. Economy of scale was the only way to stay in business. So it was odd to discover the law of diminishing returns in energy.

Modern agribusiness has increased yield per acre and output per man-hour by 50- and even 100-fold. But in an astounding number of cases, a 10- to 50-fold increase in energy input, including electricity, results in merely doubling the food energy retrieved. Further inputs fail to produce any appreciable increase in yields.

The modern quest for increased size has gone way beyond any economies of scale. Small is more beautiful than many realize.

The Case for Homegrown

Artificially cheap food has made it seem uneconomical to produce your own. This is especially true of meat. None of this has kept homesteaders from raising livestock in the past, and it probably won't now. Let's rephrase the reasons and list them again:

- Homegrown is better. You know your animals are well cared for and have not been treated with antibiotics, growth hormones, or anything else you don't want in your meat, milk, and eggs.
- If you can make use of homegrown feed, perhaps waste, you are recycling resources and producing food economically.
- Especially if you are unemployed or underemployed, using some of your time to produce food, including meat, is a form of self-employment.
- Raising animals on a small labor-intensive scale does not involve the energy subsidy: it does not rape the planet, and it's sustainable.
- Salvaging and recycling the manure will benefit your land and crops and eliminate the need for industrial fertilizers, while adding all-important organic matter.
- By interacting with the creatures that provide your food, you become more closely aligned with the universe.

Before You Jump In

There are other considerations as well, including a long list of why you perhaps should *not* become involved with animal husbandry.

Location is obviously important. You aren't going to raise swine in a city or suburb, or a cow, either. Even if you live in the country, you won't necessarily have the room or facilities for certain species. A few chickens or rabbits might be possible where larger stock might not be, but even the smaller ones aren't possible everywhere. Butchering chickens might not be allowed, even if egg-laying hens are okay.

Then there are facilities. A chicken coop or rabbit cage or hutch need not cost much, but they'll probably cost *something*. If you start raising animals so you'll have something to eat when the money runs out or gets tight, you

have to start before you get hungry. Facilities for hogs, sheep or goats, or cattle will be correspondingly more complex and expensive.



Watch Your Step

Give careful consideration to the type of fencing you will use, and investigate its local cost. Fencing can be a very expensive element in animal husbandry!

Speaking of complex, do you have any experience with animals, beyond a dog or cat? There might be more to it than you expect or are ready for. Even experienced professionals encounter problems, including bad luck. That's why we have been saying, for many years, don't *go* into a livestock enterprise: *grow* into it. Start out small, learn, gain experience, and if you're comfortable with it, go on from there.

Yes, you have to enjoy it. Working with animals requires commitment, even dedication. You'll have to water and feed those chickens or rabbits every day, rain or shine, summer and winter, on your birthday and holidays, and when you're under the weather.

Milking a cow or goat is even more demanding. You must adhere to the twice-a-day schedule no matter what comes up, including weddings and funerals. At the very least, you must have a trustworthy replacement.

Regular cleaning is imperative: pens, feeders, and waterers. If you have fencing, add maintaining it to the list of chores. Goats and sheep require hoof trimming and other grooming.

And finally, how will you handle butchering? You must raise meat animals with kindness and treat them with reverence and respect; slaughter seems

contradictory to that. It's not, if you understand life, but it's difficult anyway. You must be able to cope with that.

All animals can outlive their productive lives, and all animals die. What's your exit plan for laying hens and milking animals? Half of all creatures are male, and males produce neither milk nor eggs. So how will you deal with male dairy animals or chickens?

If you consider all these aspects and are still interested in raising animals, you're ready for one of the most memorable and hopefully enjoyable experiences in your life.

I wish you luck and give you this bit of advice: have your housing, equipment, and feed in place *before* you bring any animal home!

The Least You Need to Know

- Meat consumption tends to rise with income.
- Animal proteins are more complete than plant proteins.
- Different cultures view foods, especially meats, differently.
- Modern food production is highly subsidized by energy; it uses 10.6 calories of fossil fuels to produce one calorie of food.
- Small scale production of animal products provides many benefits to the homesteader and the planet.

Chapter 18

Chickens in Your Backyard

In This Chapter

- Our ancient feathered friends
- Space and equipment requirements
- Care and feeding
- Butchering

Man has domesticated chickens since the dim beginnings of human history. Today chickens provide a major source of protein, with eggs considered the ideal. While most people are familiar with these products on their plates, few know very much about them or how they got there.

The history of the people/poultry relationship is fascinating; the story of the rise of broiler and egg factories is unsettling; and the role of the chicken among self-sufficient people today is encouraging.

Today, people almost everywhere are raising their own chickens. They're not just for country dwellers anymore.

The Chicken Came First

Chickens have been associated with humans for more than 8,000 years, spreading both east and west from southern Asia. Ancient Egyptians, Greeks, and Romans held the fowl in high esteem. An American president promised to put "a chicken in every pot," demonstrating how highly regarded they were as recently as the early twentieth century.

Unfortunately, poor, innocent chickens were also in the vanguard of the industrialization of agribusiness and other developments that affected so many of the ideals dear to those who believe in self-sufficient living. So it

seems only fair, as well as auspicious, that people today are rediscovering that there's much more to chickens than McNuggets.

The Chicken Book, by Page Smith and Charles Daniel, explains the entire story. Smith and Daniel wrote the book, one of the best I've ever read, as the result of a college course, "The Chicken," taught at the University of California, Santa Cruz in the early 1970s. It was *not* taught by professors of poultry science, but by a historian and a biologist. What's more, the students examined chickendom from every angle imaginable: not only historical, biological, agricultural, and culinary but also from the standpoint of art, religion, culture, sociology, and philosophy. The book will delight any renaissance man and most women.

Here, for example, is a wonderful passage that addresses much more than poultry: "Chickens confined, and especially chickens confined in large numbers, like people confined in large numbers, are at their least appealing. In such circumstances, chickens, like people, give off offensive odors; disposing of their cumulative wastes becomes a major problem; they behave badly to each other, bedeviling and pecking each other in boredom and frustration; they become neurotic and susceptible to various diseases of the body and the spirit. This is what happened to chickens."

Obviously, there is much more to *Gallus gallus* than meets the eye or than people who only associate chickens with Colonel Sanders are aware of. For our purposes we'll have to confine ourselves to little more than a quick mention of how rapidly and drastically industrialization changed chickens, our relationship with them, and the way homesteaders of all stripes are reversing that. Then we look at how *you* can join the crowd—and the fun.

Where Egg Money Comes From

Raising chickens was traditionally left to the farm wife. It was an incidental part of farm life, but chickens were often raised in towns, too.

The hens hatched the eggs and tended the chicks. They foraged for their food, which was supplemented by kitchen scraps and waste grain from the more important farm animals. Eggs were most plentiful in the spring, the natural time for birds to lay eggs, and nonexistent in the winter. Any surplus

could be taken to the general store in town and either traded or sold, resulting in the farm wife's "egg money." A surplus rooster would be sacrificed for a Sunday dinner, especially when important company was coming. "Chicken every Sunday" described luxury as far back as the fifteenth century when King Henry IV of France reportedly said that God willing, he would ensure that every working man in the kingdom would have the means to enjoy chicken every Sunday. And it was still a luxury centuries later when Herbert Hoover promised a chicken in every pot.

Among the many reasons chicken remained a luxury was the fact that meat production was merely a by-product of egg production, which occurred in the spring and summer. Very little was known about the importance of vitamin D or the fact that photoperiod (the cycle of day and night) affected egg-laying. No chickens were bred specifically for meat.

That changed, drastically and rapidly, in 1923 when Mrs. Wilmer Steele of Sussex County, Delaware, raised a flock of chickens to sell for meat. That was unheard of, as was the size of that flock: 500 birds on one farm!

However, she was so successful that before long she was raising 10,000 at a time and had competition. Egg producers followed suit. By 1955 the typical laying flock was 20,000 birds, and by 1975, 80,000, per chicken house.

In the 1940s, hatcheries, feed mills, farms, and processors began working together in various ways. Feed mills lent farmers the money to buy chicks from hatcheries (and feed, of course). The farmers repaid the mill when they sold their broilers. Eventually, all these operations were integrated. By 1952, specially bred meat chickens (broilers) surpassed ordinary farm chickens as a meat source for the first time. Vertical integration really took off, and chicken raising on the diversified family farm was doomed.

Off the Beaten Path

In 1910, the average American ate about 10 pounds of chicken a year. By 1970 that soared to 27.4 pounds, and by 2007, to 87 pounds. "Chicken every Sunday" has become a cheap everyday food, thanks to industrial farming, but at what expense to society ... and the poor chicken?

The poultry industry continued to become more industrial, with genetic modifications, nutritional discoveries, and a drive toward technology and automation in general. Chickens that a few years before had been sold “New York dressed” (that is, with only the feathers and blood removed) were now not only mechanically eviscerated but also even cut up for the modern housewife. (Please note that all this was a mere 50 years ago!)

In 1986, chicken consumption surpassed pork consumption. In 1992, for the first time, Americans ate more chicken than beef.

In the span of a lifetime, chickens went from being a part of family farm life to a major industrialized agribusiness. Now in some small but significant ways, appropriate-scale poultry production is returning.

Off the Beaten Path

Kentucky Fried Chicken has more than 11,000 restaurants in 80 countries, serving nearly eight million customers a day.

Almost half the chicken consumed comes from two companies: Pilgrim’s Pride and Tyson Foods. In early 2009, Pilgrim’s Pride announced that by May it would close three plants, leaving hundreds of its contract farmers struggling with millions of dollars of debt and useless, empty poultry houses, another example of economies of scale run amok.

Is There a Chicken in Your Backyard?

The revolt against egg factories and broiler concentration camps has resulted in the proliferation of free-range eggs and pastured poultry. Both are becoming common in grocery stores across the country; both have given rise to hundreds of small producers, selling locally, who have been able to compete with the giants. And there are even smaller producers.

Off the Beaten Path

Garden and home tours, often used as fundraisers, have been around for quite a while. In a new twist, there are now tours of urban chicken habitats. A group in Austin, Texas, is sponsoring a “Funky Chicken Coop Tour,” and the practice has been going on in Raleigh, North Carolina, for several years.

A hen and her chicks scratching in the cottage door-yard has always been a part of the dream of country living. Now you don’t even have to live in the country to realize that dream. Raising a few chickens in towns, and even cities, is growing at a phenomenal pace.

From a practical standpoint, chickens require little space, will prosper with a minimum of knowledge and experience, and are readily available at low cost. As an additional attraction, they provide eggs, which are a joy to gather as well as to eat. Unlike the 12-hour schedule of milking, you can harvest eggs at your convenience. Children love to find them in their strawy nests and might even learn responsibility if given the task as a daily duty.

There are more than purely practical reasons for raising chickens. We can also attribute homegrown poultry’s popularity to the spreading dissatisfaction with factory farming and the food it produces. Then we have the growing realization that chickens are very interesting and entertaining and make wonderful pets.

Getting Started

Which comes first, the chicken or the egg, is not an idle question for the beginning chicken raiser. Actually, you have three options.

You can buy eggs and hatch them in an incubator, which isn’t the best choice for several reasons, the overriding one being that you need an incubator! Incubation can be a tricky business. Success is by no means assured, and the neophyte needs more immediate gratification.

Off the Beaten Path

Mechanical incubators must maintain a temperature of 99.5°F for chicken eggs, which normally hatch in 21 days. Hold the humidity at 50 percent for the first 18 days and 65 percent for days 19 to 21.

These conditions are much harder to control in low-cost incubators. The cheapest ones, made of Styrofoam, are also hard to disinfect, and sanitation is of the utmost importance for a good hatch.

Of course, if you have a broody hen (one who wants to hatch eggs), just trust to her instincts, leave her alone, and neither one of you will have to worry about the niggling technical details.

Day-old chicks used to be the preferred way to start a home flock, and that's still a good choice. Newly hatched chicks are inexpensive and cute. They can be shipped by mail, so you're not confined to local sources and can choose from a wide range of breeds. They will be quite happy with nothing more than a cardboard box, some feed and water, and an electric lamp to keep them warm. Your cash outlay is minimal. Your reward is immediate if, like most people, you find yourself mesmerized and sit watching the little fluff balls for long periods at a time. You will acquire experience and more equipment as the chicks mature. Of course, you'll have to wait five months or more for the first egg, but that time will pass quickly as you watch the chicks grow and develop.

Newly hatched chicks are still living off the nutrients of the egg's yolk and don't require food or water for their first three days, so they are easily shipped. However, you can't just get two or three. Most hatcheries require minimum orders, usually 25, since a certain number are needed to keep the chicks warm during shipping. This is more than most backyarders want, need, or can handle. So for this group, grown birds are often the answer and seem to be more available since the surge in popularity of the backyard

chicken. The egg-laying breeds are also commonly offered as “ready to lay pullets” for those who need instant gratification.

Choosing Your Chicken

One of the first fun aspects of raising chickens is choosing a breed. If you’ve never paid much attention to chickens before, you’ll be amazed at how many choices you have. You’ll probably be attracted to one breed or another because of its size, shape, or coloration, but there are other important considerations, too.

First, is your primary reason for getting chickens to have fresh eggs or meat, to exhibit at poultry shows, or just to have as pets? The answer to this question should play a large role in your choice of breed.

Naturally, all hens lay eggs; if they didn’t, the breed would die out. But some hens lay many more than others. If two hens eat the same amount of feed but one lays twice as many eggs as the other, those eggs are only half as expensive, roughly speaking. And no, you do not need a rooster to get eggs. The rooster is only essential for *fertilized* eggs.

Likewise, all chickens are made of edible meat, but some is more edible, and economical, than others. Breeds and hybrids (mixtures of two or more breeds) bred for meat are seldom good layers; those bred for laying are seldom a good choice for meat. Fancy or show chickens are usually far down the list in both categories.

Finally, you can exhibit all breeds, and any chickens can become a pet, but they have very different personalities. White Leghorns, for example, are the premier laying breed, but they’re hardly worth butchering and much too flighty and nervous to be ideal pets.

There are several dual-purpose breeds, chickens developed by farmers before the industrial era, that do a reasonably good job of providing both eggs and meat. These jack-of-all-trades types of birds are usually masters of none, which is why the technologist farmers replaced them with the specialists. But they often appeal to homesteaders. Three examples include the Rhode Island Red, White, Barred, and Plymouth Rocks, and

Dominiques. One of several websites that picture dozens of different breeds is www.ansi.okstate.edu/poultry/chickens/.

Unlike the vast factory farms where all the chickens are the same breed and white, many small home flocks contain several colorful breeds. This is a Dominique and two Buff Orpingtons. The Dominique is an old dual-purpose breed developed in the United States.

(Photo by Shana Reiley, courtesy of Backyard Poultry magazine.)



There are standard-size chickens and bantams. Standards can range from 4.5-pound Leghorns to such breeds as 9-pound Brahmas and the champ, the

10-pound Jersey Giant. Bantams are usually about one fourth the size of their standard counterparts.

Most bantams, which are called diminutive bantams, have a large counterpart. But true bantams do not. Bantams are the choice not only of people with limited space but also of those who simply prefer smaller birds. Their eggs are the same as regular chicken eggs, only smaller, although remarkably large for the size of the bird.

Another class that deserves mention here is the group of rare birds that are, in some cases, near extinction. People who like chickens and dislike industrial chicken production can take it a step further and help preserve genetic diversity by raising heirloom or endangered breeds. Obviously, it would make sense to gain some experience with more common breeds before endangering a breed further through incompetence. For information on these, contact the American Livestock Breeds Conservancy (www.albc-usa.org) or the Society for Preservation of Poultry Antiquities (www.feathersite.com/Poultry/SPPA/SPPA.html).

Raising Day-Old Chicks

You can order day-old chicks of many breeds from mail-order hatcheries and sometimes from a local feed mill or farm supply store. In most cases you will have to specify whether you want *pullets*, *cockerels*, or *straight-run*.



Lore of the Land

Pullets are young hens, females, while cockerels are young cocks or roosters, males. Some chicks are sold as straight-run: you get both sexes, just as they come from the incubator (and the hen).

Be Prepared

I always advise new animal owners to have the housing ready *before* bringing an animal home, and with chicks this is absolutely mandatory!

The good news is, all you need is a space providing about ½ square foot per bird. A sturdy cardboard box will suffice. You will also need a heat source, usually provided by a lamp that you can raise or lower to maintain a temperature of 95°F at chick level, about two inches above the floor. Check this out carefully before the chicks arrive.

If you use a heat lamp on a chain, it should have a wire guard as a fire safety precaution. For a few chicks, any gooseneck-type desk lamp with an incandescent bulb will work.

You'll also need a waterer and a feeder, and the small plastic chick waterers that use ordinary quart fruit jars work fine for a few birds. If you have many, figure on at least two one-gallon waterers for each hundred birds. You can get equipment at any farm supply store and most rural-oriented hardware stores. Don't use any open type of container that a chick can get into! The chicks must not get wet and chilled.

Put a good layer of absorbent, dust-free litter in the box, using what's available. Ground corncobs, peanut hulls, and sugar cane fiber are fine, but straw is not.

Curious newly hatched chicks will eat litter, so cover it with newspaper for the first few days, and spread some chick feed on the newspaper. Crumple the paper so it's not too smooth or slippery, which can cause leg problems. Even then, don't leave the paper in the box more than a day or two.

Also for the first few days only, provide a circular fence to keep the chicks near the heat source and out of the box corners where they can pile up and smother. We usually just tape some cardboard strips together to make a ring a few inches high. Monitor the temperature closely to be sure it's neither too hot nor too cold; aim for that 95°F.

Caring for the Chicks

As you remove each chick from the shipping container, dip its beak in the water. It probably won't drink any, but this will help them know where to find it. Drinking is more important than eating, at this point.

Observe the birds carefully and frequently. (As if you had to be told! Don't plan on getting much of anything else done the day you get your first chicks.) The biggest concern is the temperature. After they settle down, you can tell by watching them if they're too hot or too cold by the way they crowd under or avoid the lamp. Happy chicks are quiet, with contented chirps. Shrill chirps mean something's wrong. If they all gather at one side of the hover, check for drafts.

We could discuss feed at great length. Organic feed is obviously ideal, but not widely available. For a beginner with only a few birds, the best feed for chicks, and in many cases the only choice, is a crumbly mash called chick starter, with 20 percent protein. Provide at least one inch of feeding space per chick to begin with and more as they grow. Full feeders waste feed, but keep the feeder about $\frac{1}{4}$ full. Be sure the chicks always have plenty of clean water, the most important food for any animal.

Your other chicken chores now include washing the feeders and waterers every day and turning or replacing the litter to keep it clean and dry. Each week, gradually lower the temperature by about 5°F, by simply raising the lamp higher, until it reaches the outdoor temperature.

By the time the birds are a month old, they'll need at least $\frac{3}{4}$ square foot apiece, three inches of feeding space, and larger waterers. If the weather is agreeable and you have a safe and clean outside yard, the young birds can go outside. Also by this time broilers (meat chickens) should be switched from the chick starter to what is usually called a "grower" feed. At around six weeks future layers are switched to pullet developer, and after about 18 weeks, laying mash or layer feed. These are all scientifically formulated to meet the needs of the birds at each particular stage.

Off the Beaten Path

Some people are dismayed by the amount of dust chicks seem to raise, even with relatively dust-free litter. One reason for the dust is that the birds produce a natural lubricant, a sort of talc, that accompanies and eases feather growth.

If you are raising a good strain of broiler chickens for meat, they should be ready to butcher (three pounds) in about 9 to 10 weeks. If you're raising them for eggs, they can go into the chicken coop about the same time.

The Modern Henhouse

The old-fashioned henhouse is almost as rare as the outhouse today. By old-fashioned, I mean the kind I wrote about in 1974. *Homesteader's Handbook to Raising Small Livestock* had plans for an 8×10 foot house that was eight feet high, with ten nests. Not many people build them like that anymore. One reason is that flocks of less than a dozen birds used to be rare, but today many coops only house three or four. Three birds don't need a house big enough for a human to stand up in.



Lore of the Land

A chicken coop or henhouse used to be relatively simple. Now there are entire books on the topic. People in town who have just a few as pets are the most likely to build chicken condominiums, but some of them are pretty neat. Chickens living in a doll house,

a miniature castle, or something that matches the architect-designed human abode does seem a bit much for a homestead, but a rickety shack is probably worse.

The point is, a henhouse doesn't have to be unsightly or a shack; it doesn't even have to look like a chicken coop. You can have a lot of fun designing and building one.

The basic requirements for a coop of any size or style are simple. A good chicken house is well-ventilated but draft-free, predator-proof, and easy to clean.

The size naturally depends on the number of birds you intend to keep and the size of them. Chickens sleep scrunched together, wing-to-wing, and three or four hens will share a nest. So the minimal space requirements aren't much. Of course, they need room to move around when they're not sleeping or laying, and you'll probably have the feed and water inside, at least in inclement weather. If they'll be inside for prolonged periods, such as a northern winter, you should obviously increase the floor area. But bigger isn't necessarily better; a properly sized coop will keep them warmer than a huge one.

The Have-More Plan from the 1940s had plans for a "summer-range shelter" that provided one square foot per bird and suggested at least one *hundred* square feet of outdoor range for each chicken. Most coop gurus today recommend anywhere from three to five square feet of coop per bird, so you can see you have a lot of leeway.

Moveable chicken coops have been around for many years, but they were basically regular coops on skids and required a horse or tractor. With the downsizing of recent years, these coops (now commonly called chicken tractors and fitted with wheels) are moved by hand. You can easily move the chickens to clean grass on a daily basis, which is great for both them and you.

Moveable chicken coops such as this one provide fresh grass for the birds every day, helping to keep them clean and trimming and fertilizing the lawn at the same time.

(Jerome Belanger)



Chickens give off a tremendous amount of moisture, which you must remove from the house. This can be a problem in cold areas, especially because drafts are as bad as the moisture. Vents or windows opening near the top of the wall are called for.



Lore of the Land

Chickens and other birds have only one posterior opening, or vent, to eliminate urine and feces and for reproduction (eggs). This is the *cloaca*, a latin word meaning sewer.

Clean the chicken house on a regular basis. If the birds spend most of their time outside, the area under the roosts where they sleep will require the most attention. Make it easy to reach, perhaps with the roosts being removable or at least movable. Today's smaller coops often have hinged walls that make cleaning the entire floor easy. Add the manure to the compost bin. It's excellent for the garden, but compost it first or it will burn plants it comes in contact with.

Predators and rodents can be major problems if you don't confront them from the start. It seems that almost everybody enjoys a chicken dinner, and that includes foxes, hawks, raccoons, weasels, coyotes, and the neighbors' dogs (or even your own). Skunks and others, including snakes, will eat eggs. The ideal poultry house will lock down like a maximum-security prison.

Chicken wire, that cleverly woven mesh that comes in rolls of various widths and sizes, will keep chickens in, if properly installed, but it won't do much to keep predators out. Many of them can easily rip through a wire enclosure you thought was bulletproof. And nothing is as sickening to a chicken lover as seeing what's left of a hen after a raccoon has had at it ... through the one-inch mesh of chicken wire.

For enclosing windows and vents, use hardware cloth, which is a much finer mesh than chicken wire, and sturdier. It obviously isn't cloth, but that's what it's called. One-half-inch mesh is good.

Your feed, as well as hiding places, will attract mice and rats, so keep feed in covered metal containers and clean up spills. Eliminating piles of junk, including lumber and brush, will help as well.

Care and Feeding

Chickens will scratch up (literally) a good deal of their food when free to do so in good conditions. Bugs and worms, weeds and seeds, all contribute to the diet. So do tomatoes, cucumbers, and other crops in unprotected gardens. In a newly planted garden, *nothing* is safe.

However, don't plan on raising poultry with no feed expense whatsoever. It's much better and more realistic to provide all the feed they need and let them forage whatever they want to. A light breed hen, such as a Leghorn, will consume four to five ounces of a complete ration per day, heavier breeds correspondingly more.

A complete ration, as the name implies, contains everything a chicken needs for survival. Other feeds, such as scratch, are made up of common grains chickens love, but they don't contain all the nutrients a healthy chicken requires. Think of them as candy. Kitchen scraps and garden surplus are similar.

You know how rare hens' teeth are. Because they can't chew, chickens that are fed grains require grit, which consists of small pebbles. The grit grinds up hard foods, such as seeds, in the gizzard, a powerful muscle that is, in effect, a second stomach. Free-range birds will pick up small bits of gravel to help with digestion. Birds fed mash or crumbles don't need grit. All others need the caretaker to provide it, usually in special feeders where it's available free-choice, meaning they can take as much as they want.

Laying hens also require calcium to build egg shells. This is usually in the form of ground oyster shell, but again, it's part of a complete ration.

So the easiest way to feed a chicken is to patronize the nearest feed store. They no doubt have special mixes for various ages and classes, as finely ground mash and/or grittier crumbles. You will want to switch from chick starter to broiler or layer feed, according to the recommendations printed on the bag.

You're not likely to find organic chicken feed at the average feed store, at least not yet. I've come across organic zealots feeding their chickens (and goats!) granola from the health food store, probably at a hundred times the cost of regular feed. I can't even imagine having that kind of money to throw around. A better solution is to find some like-minded poultry raisers, enough to justify buying organic ingredients and having them mixed to your specs. Of course, one or more of you will have to be an expert in animal

nutrition, and you'll need a source of organic ingredients. Considering the obstacles, most people decide just being home-raised is organic enough.

Butchering

The first step in converting a live, squawking chicken into a well-browned spicy piece of barbequed meat, a steaming bowl of chicken noodle soup, or a golden-roasted fowl hot from the oven is to kill it. This is quite simple, mechanically, but not easy, psychologically. I'd be very wary of anyone who claimed it was at all pleasant. But if you choose to eat meat, you choose to butcher, whether you do it yourself or delegate it.

Most people, whether dining at a hot dog cart or Delmonico's, give no thought to where the meat comes from or how it's converted from animal to meat. Some people dwell on this too much and become vegetarians. Homesteaders, if they don't do their own butchering, at least regard meat with profound respect and a certain sense of gratitude.

As with everything else, you have a number of alternatives to nearly every step of butchering a chicken, from dispatching it and getting the feathers off, to cutting it up or leaving it whole for the pot. We'll keep it simple.

The traditional homestead method is still the easiest for most people: the chopping block, which is usually a hefty chunk of firewood or a tree stump. Holding the chicken by the legs, stretch the neck over the block and chop off the head with a good sharp hatchet or axe. Be bold. Some people act like they're afraid of hurting the bird and, consequently, botch the chop. Sever the head completely on the first try.



Lore of the Land

Another way to kill a chicken is with the sticking knife, a very narrow-bladed knife inserted through the mouth and into the brain, causing instant, painless death. This usually involves placing the bird head down into a special cone, which then also holds the bird until it's bled out.

The headless fowl will flap its wings, making it difficult to hold until it bleeds out, or thrash about “like a chicken with its head cut off” if released, soiling the feathers and spraying blood over a wide area. A compromise is to place it under an overturned box or other container until the thrashing stops, but hanging on to the legs and constraining it is best if you can manage it.

The next step is to remove the feathers. Dry plucking is possible, but the easiest and most common method is to dunk the bird in hot water, ideally 126°F. If the water is not hot enough, the feathers won't easily release, but if it's too hot, the skin will tear when you begin plucking. Swish or plunge the bird in the water for about 30 seconds to thoroughly soak the feathers. To penetrate the feathers better, some people add a few drops of dishwashing soap to the hot water.

Lay the bird on a clean table, breast up. The wing feathers come out hardest, so start with them, then the tail. Then work on the breast, the back, and the legs. You might need to redunk the bird when the going gets difficult, although there can be a great deal of variation in plucking difficulty, depending on the bird.



Lore of the Land

Meat birds are bred to have white feathers, and therefore white pinfeathers, which present a more attractive carcass than the more noticeable black pinfeathers.

When you think you're done, you or, more likely, a bystander (and you know who I'm talking about) will notice tiny little quills on the carcass, which are called pinfeathers. One relatively easy way to remove them is with a strawberry huller, although a small pliers will work. Some people just grasp them between the edge of a blunt knife and the thumb. These often come out easier after the bird is cooled and dry, so don't rush.

To remove the entrails, use a sharp butcher knife and make a horizontal cut just below the keel, or breastbone, between the breastbone and the vent. Make the incision large enough to get your hand in, so you can pull all the insides out through this opening. Carefully cut around the vent to remove it, and be sure to get the crop and windpipe, which often require an extra bit of effort.

Know how to identify the liver; you'll have to cut the gall bladder from it, very carefully. Cut off a bit of the liver, if necessary, to avoid the bile. If you don't succeed, immediately wash the liver in cold water because the bile will impart a bitter taste.

Slice the gizzard lengthwise, remove the contents, and peel off the lining. Cut off the legs at the joints. Slip off the skin and claws and the feet will make wonderful soup stock, or if you're into oriental cuisine, many other delectable dishes. Cool the carcass in ice water for no more than 30 minutes. Your homegrown chicken is now meat. A final word: if you're going to freeze it, cool it down completely first, or it will be tough.

Bury the waste in the compost bin, deep enough to deter dogs and other scavengers, or in the garden.

The Least You Need to Know

- There are many chicken breeds: some for eggs, some for meat, some for a little of each, and some for entertainment mostly.

- Chickens eat grass, weeds, bugs, seeds ... but mostly a nutritionally balanced special chicken feed.
- Standard chickens need three to five square feet of space in a house if they have access to the outside (100 square feet).
- You don't need a rooster to get eggs.

Chapter 19

Raising Rabbits for Food

In This Chapter

- A common meat, and a nutritious one
- Housing requirements and suggestions
- Care and feeding
- Harvesting and using

Rabbits are a common food in many parts of the world, but the United States isn't one of them. American consumption is estimated at 8 to 10 million pounds, compared to around 30 billion pounds of chicken. While commonly considered a cottage industry, the United States and Canada have commercial rabbit farms—but we import a large portion of the rabbit we consume from China, the world's largest producer.

One attraction for homesteaders is that rabbits are easier to purchase and transport, maintain, breed, and butcher than a steer or a hog. Another is that rabbits are among the “greenest” of meat animals. Also, we have many wonderful recipes for preparing rabbit meat, and no, it does not “taste just like chicken.”

The Ideal Meat for Small-Scale Agriculture

For anyone involved in self-sufficiency, the ideal meat animal is the rabbit. Nothing else can put as much highly nutritious, good-tasting food on the table with so little impact on the environment and such a small investment in space, time, and labor.

Off the Beaten Path

The domestic rabbit has evolved, with a great deal of human selection, from a wild European rabbit, *Oryctolagus cuniculus*, which is not related at all to any North American wild rabbits. The cottontail is *Sylvilagus audubonii*. The jackrabbit isn't a rabbit at all: it's a hare. Hares are born fully furred, with their eyes open, and can hop shortly after birth. Rabbits are born naked, blind, and helpless. Domestic rabbit meat is all white and not at all gamey.

From their origin in Spain, domestic rabbits have been distributed around the world. Almost one third of global production comes from China. Per capita consumption is highest in Malta (19.5 pounds a year), Italy, Cyprus, and France. Average consumption in the United States is estimated at a paltry 3.2 ounces, and according to the United States Department of Agriculture (USDA), most of that goes to high-end shops and restaurants. In other words, in America, it's an expensive gourmet food most have never tasted. We have French *Lapin à la provençale* and Italian *Coniglio alla cacciatore*, but not plain ol' fried rabbit.

But things are different elsewhere. The United Nations Food and Agriculture Organization (FAO) has been promoting rabbit farming in areas where poverty and hunger are widespread for the same reasons that attract homesteaders and Greens.

Their short gestation (31 days) and legendary prolificacy (as many as 40 offspring a year, compared to 0.8 for cattle and 1.4 for sheep) set them apart from other meat animals. An 11-pound female rabbit that weans 30 four-pound fryers a year produces 120 pounds a year, more than 1,000 percent of her weight. And 30 is a very conservative number. A 400-lb. brood sow that has two litters of eight a year, with pigs weaned at 25 pounds, produces 400 pounds or 100 percent of her own weight. A 1,000-pound range cow with a 400-pound weaned calf returns only 40 percent.

This meat is produced mostly on grasses. In many places and situations this includes weeds and waste. While some grains are used to produce the pellets commonly fed to rabbits in overdeveloped countries, studies at the former USDA Rabbit Research Station (now closed) have shown that rabbits do fine on alfalfa hay, with no grain.

During the Great Depression, as well as during the meat rationing of World War II, many a rabbit was raised on weeds gathered by hand from abandoned areas, perhaps along with some garden waste. In developing countries where pelleted feed is not available, daily weed harvesting is still the norm.

If it takes four pounds of feed to produce one pound of rabbit meat and that feed was not usable as food for humans nor did it require irrigation or fertilizer and was harvested without fossil fuels, then that meat is much kinder to the earth than beef, pork, or even chicken. And women and children often harvest the feed.

The FAO sees this kind of rabbit farming as an income-earning opportunity for impoverished people as well as providing nutrition. When a family butchers a steer or a hog for its own use, hundreds of pounds of meat must be frozen for future consumption. A rabbit can be butchered and eaten even when no freezer or electricity are available.

In any event, rabbit raising doesn't lend itself to factory farming. Efforts have been made to automate rabbit production, but the results haven't been enough to attract any serious agribusiness involvement or investment. It's an ideal cottage industry.

Off the Beaten Path

Chicken meat was once considered an expensive delicacy, but this changed when chickens were taken away from the farm wife and installed in what developed into highly automated broiler factories. But rabbits are different because there don't appear to be any significant economies of scale in rabbit farming.

If industrial agriculture could find a way to mass produce rabbit meat, you can be sure there would be a finger lickin' rabbit

restaurant next to every chicken and burger joint.

Another reason rabbits appeal to homesteaders is the low capital requirement. A trio of good rabbits capable of providing at least 150 pounds of dressed meat per year will cost less than a calf for beef or a feeder pig. The rabbits obviously require less space and can be kept in places where larger animals would be prohibited.

Getting Started

Not all rabbits are created equal. No one knows this better than an experienced rabbit fancier or judge.

Most people who look at a rabbit can tell you its color and relative size, and that's about it. A fancier will identify its breed (one of 75 or so, plus varieties), name its disqualifications (the shape of an ear, the size of a spot, the color of a toenail, etc.), and probably spout from memory the breed's history and who has the best specimens in the land today.

Meat rabbits are judged, not only by official judges on the show table but also by the people who buy and sell them for breeding, the breeders, the meat buyers and processors, and ultimately, the diner.

As a homestead rabbit farmer, you are all of these. You'll need to know at least a smidgeon of what makes a good meat rabbit, but the color of the toenails doesn't matter like it does on the show table. What does count in a meat animal is not only the meatiness but also reproductive efficiency, *feed conversion ratio*, *dress-out percentage*, and other factors affecting the cost per pound of edible meat.

def•i•ni•tion

The amount of feed required to produce a pound of meat is the feed conversion ratio. This varies between species, breeds, and types of feed and is affected by other factors such as weather.

The dress-out percentage is the amount of edible meat in proportion to total carcass weight, eliminating the hide, entrails, etc.

Size does not make a good meat rabbit, either. Full-grown rabbits can range from miniatures under two pounds to giants weighing more than 20 pounds. All are edible, but very few even come close to being economical. The giants that logic and intuition might suggest would be the best meat animals simply aren't as efficient as the meat breeds in terms of reproduction and feed conversion.

Off the Beaten Path

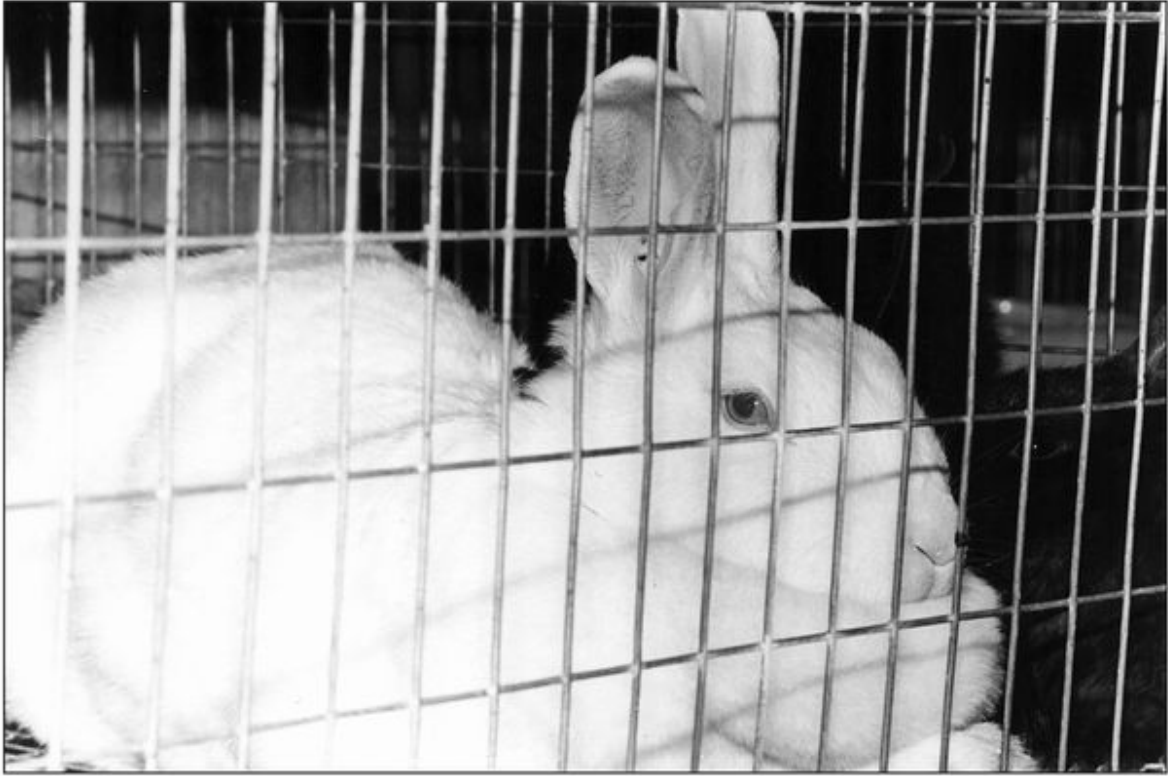
In the early 1900s, there was a rabbit boom that almost matched the famed Dutch Tulip-mania of 1636 or the Housing Bubble of 2008. People paid vast sums for Belgian hares that were supposedly going to become a household staple. Unfortunately, Belgian hares were not meat rabbits. The bubble burst, and fortunes were lost.

By the way, Belgian hares are rabbits, not hares. And jackrabbits are hares, not rabbits.

The standard meat rabbits today are the New Zealand White (NZW), and the Californian (Cal). The NZW is all white; the Cal is white with black foot and head markings that don't reach the pelt. Processors prefer white pelts. Both breeds average 9 to 12 pounds, mature weight.

What sets these two apart from the others is their ability to consistently raise litters averaging seven or eight kits, to around four pounds each, in eight weeks.

The New Zealand White is the predominant meat rabbit and a good choice for self-sufficient living. It provides more meat, more economically, than most other breeds. Note the cage: do not use chicken wire. (Photo courtesy of Countryside Magazine.)



Here's an important lesson in animal husbandry: *strains* are more important than *breeds*. You might find a rabbit of another breed that meets or exceeds the standards set for the NZW and Californian. Even more likely, you'll find a NZW or Californian that *doesn't* meet the standards; not every animal is potential breeding stock. (A breed is a subdivision of a species, a group with homogeneous appearance and other characteristics. A strain is a family, a selected group within a breed.)

So how do you get started? Ask around. Ask the feed dealer who's buying rabbit feed; ask the 4-H leader if any kids in the area are raising meat rabbits; or attend a rabbit show and find out who is entering the meat pen category. Explain what you want; ask questions and learn; and then buy the best you can find and can afford.

Housing

The *Oryctolagus cuniculus* progenitors of our modern domestic rabbits lived in underground burrows. The first rabbitries, some 3,000 years ago, tried to replicate this environment, but in walled gardens, which protected the rabbits from predators and made harvesting easier.

While this method of raising rabbits is sure to appeal to homesteaders who are green and concerned about the welfare of the animals they are responsible for, there are problems with it.

There is no selective breeding, and the quality of the stock will deteriorate over time. Young invariably die in the nest and can't be removed. Rabbits fight, sometimes to the death. In brief, it just doesn't work as well as you might think if your goal is economical food production.

Neither is the old-fashioned wood-and-wire backyard hutch. Dogs, raccoons, and other predators can tear up chicken wire; rabbits chew wood; and urine-soaked wood smells awful and is impossible to clean.



Lore of the Land

A rabbit's teeth continue to grow throughout its life. "Buck teeth" (malocclusion) is a flaw on the show table and can be fatal in the rabbitry. It can be genetic and bred out of the herd, but it can also be due to injury, often caused by chewing on wire-covered wood.

No matter what your feelings are about caged animals, with a little experience, you'll probably agree that the all-wire cages used in the vast

majority of rabbitries today are the best way to go, for both you and the rabbits.

A rabbit cage is not made of chicken wire. Even if predators or the rabbits themselves don't tear it apart, rabbits can injure their teeth trying. A proper cage is made of one-inch 12 gauge galvanized-after-welding mesh, with a floor of one-half by one-inch mesh with the smooth side up.

A nine-pound doe and her *litter* will do well in a cage 36×36 inches, 18 inches high. The door should swing out, to leave room for a nest box. Inexpensive feeders and ball point waterers are best located outside the cage.

It's easy to make your own cage with the right parts and tools. Most home and garden centers will have the pre-cut wire and aluminum J-clips, and even the special pliers that make clinching the J-clips easier, faster and neater. Since these are often for small pet rabbits, such as the Dutch breed, be sure to get the right size for your rabbits. If you want to make a lot of cages cheaply, use the first one as a pattern and buy the wire in rolls.

Ideally, you should hang these cages from the ceiling or rafters of a building or shed, using 14-gauge wire, at a height convenient for the caretaker, rather than setting them on posts or benches, for several reasons. One is the urine-soaked wood already mentioned. Another is that wooden supports enable some predators to get too close to the cages. Even if a rat or raccoon can't get into the cage (and don't underestimate the size hole a rat can squeak through), they can kill an animal through a wire mesh.

The nest should be about 12×24 inches and 14 inches deep. However, half of the top is covered; the sides of the other half slope down to six inches at the open end. That six inches is important because it keeps the babies in the box. They can sometimes become so attached to a nipple they get dragged out of the nest. When they get old and big enough to explore, they'll be able to get out, but you don't want them out before they're able to get back in.

The doe hops into the nest box through the opening. After the *kits* are born, she'll spend a lot of time sitting on the top of the box to get away from them.

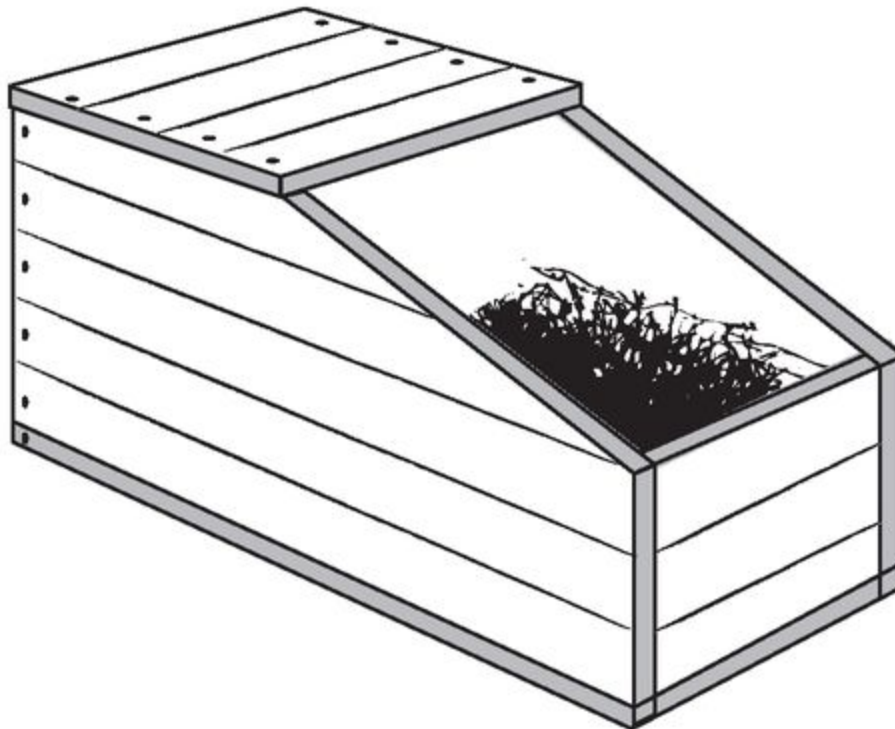
The buck doesn't need a nest box if the cage is in a protected building. He'll just make a mess and extra work for you. Same for the doe, except that she needs a box to have babies in. Keep track of when she was bred, and put the box in the cage about five days before she's due to *kindle*.

def•i•ni•tion

To kindle means to give birth to baby rabbits. And kits are baby rabbits. A family of baby rabbits is called a litter.

You'll have to replace wood nest boxes periodically, but it's easy to build one, probably out of scrap found laying around any average homestead.

You can purchase metal nest boxes, but you can easily make them from wood.



You'll need three one-inch boards 12×24 inches for the sides and bottom; two pieces 12×12 inches for the back and top; and one piece 12×6 inches for the front. Cut the sides at an angle as shown in the diagram, which is six inches from the floor in the front and 12 inches from both front and back on

the top. (Sizes are nominal: a 1×12-inch board is neither 1 inch thick nor 12 inches wide anymore, and we're not allowing for the thickness of the boards in the assembly.)

To clean a wooden box, after scraping and scrubbing, lightly singe it with a propane torch to get rid of the remaining fur.

Metal rabbit nests are widely available, at nominal cost, and are both sturdier and more sanitary than wooden ones.

Feeding Rabbits

Equipment for feeding and watering rabbits is minimal and inexpensive, but there are options. The following sections discuss some of them.

Water

During warm weather, a doe and her litter will drink as much as a gallon of water a day, so you'll have to replenish any container holding less than a gallon several times a day. And water is just as important in cold weather, when freezing might be a problem.

Anything that holds water will work, but there's a thin line between frugality and foolishness. If a rabbit can pick up a water dish in its mouth and empty it before you're even 10 paces away, that dish isn't a good deal at any price. The same goes for a waterer that can be fouled, as dish types can.

The best watering device is called a ballpoint waterer because it works like a ballpoint pen. A little ball is held inside a small tube by a beveled edge, and it's attached to a cap that screws onto a plastic bottle. Although these are sold as a set, the cap screws onto a regular soda pop bottle, in case you need a replacement.

You'd be surprised to see how quickly a rabbit learns to lick the ball to get a drink. The same general principle is used in dewdrop systems, where the drinking devices are connected directly to a water line. This eliminates hand watering entirely, but it's not practical for a small rabbitry.

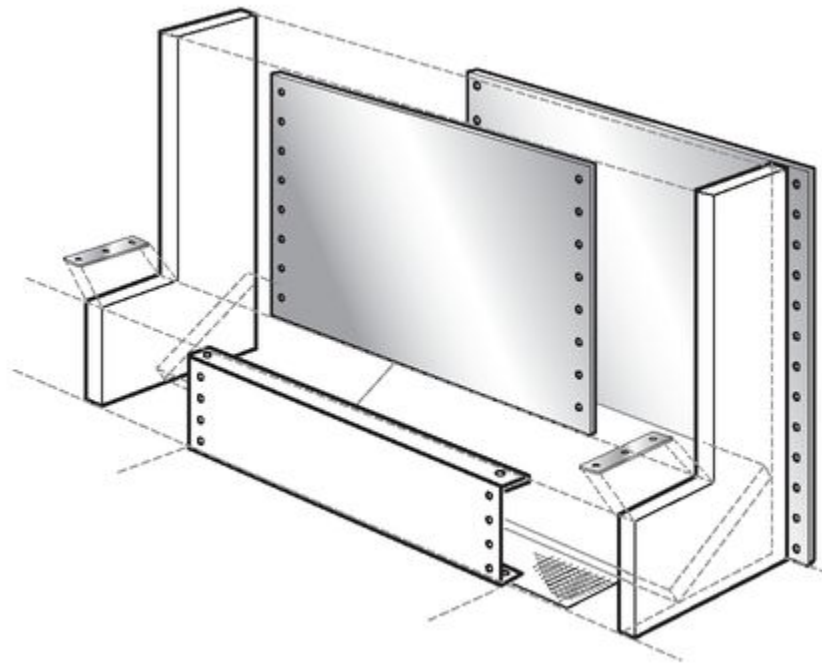
Clean and sanitize any watering device at least weekly, more often in hot weather.

Feeders

You can use tin cans with smooth edges as feeders, with the usual drawbacks. Rabbits will dump them and waste feed, or they will become contaminated. Heavy crocks are much better, but still far from perfect.

The best feeder, and therefore the most widely accepted one, is made of metal and can be filled without opening the cage. They're not expensive, but the self-sufficient can easily make them with scrap lumber and a little sheet metal. (Visit a construction site to scrounge for scrap pieces of sheet metal at least 10×12 inches, more or less.)

A hopper feeder like this is easy to make, and use.



Using a fine mesh screen for the bottom will allow the dust common in pellets to fall through. If those “fines” accumulate, especially if they absorb

moisture, you'll have a problem with mold and a difficult mess to clean up. Incidentally, the tendency of feed pellets to break and crumble, creating dust and waste, is one of the barriers to large-scale automated rabbit raising. The pellets can't be handled mechanically, making rabbits labor-intensive.

Hay

Commercial rabbitries, with hundreds of animals to feed by hand, daily, couldn't possibly function without pelleted feed. This mixture of ingredients is finely ground, moistened with steam, and forced through a die just like a pasta maker. The strings that emerge from the machine are clipped into $\frac{3}{8}$ -inch pieces, dried and hardened, and become pellets.

Most people who raise rabbits, whether one or a thousand, feed pellets. It's by far the easiest way to feed a rabbit. You can be reasonably sure your animals are getting a nutritionally balanced diet, much more certain than if you feed them an ounce of this and a cup of that. It will be worse if you know little or nothing about the nutritional needs of the rabbit at the various stages of its life or about the nutritional value of the products fed to the animal.

One of the main ingredients in pelleted feed is hay, generally alfalfa. Therefore, additional hay is seldom provided because it would throw off the carefully balanced ration, and it's a lot of extra work.

But the self-sufficient might disagree. Those rabbits the United Nations is promoting in Third World countries are not fed pellets. And during hard times, plenty of good rabbit meat has been produced without the use of pellets. Anybody seeking self-sufficient living can raise rabbits without purchased feed, as long as he makes a study of it and is willing to spend the time and effort it requires.

All living creatures need a balanced diet. A rabbit needs vitamins, protein, minerals, and all the rest, as much as you do. Maybe more, if you're not gestating, nursing, or doubling your weight within six days of your birth.

Rabbits are herbivores—vegetarians. Human vegetarians are careful to meet their nutritional needs with a variety of foods containing different elements. Those who feed rabbits must do the same with their charges.

A doe and her eight-week-old litter could get the protein they require in a day by eating 50 pounds of cabbage. One problem with this is, that diet would kill them because that much cabbage contains about six gallons of water. Another problem is that a percentage of protein by itself means nothing. What are the amino acids that make up the protein the animal needs and the food provides? And most people who pay any attention to all the information about healthful diets and food labeling that has become so common know that protein is just the beginning.

My book *Homesteaders' Handbook to Raising Small Livestock* (Rodale Press, 1974) lists half a dozen recipes for rabbit rations. Looking at them now, I wonder why. Who is going to mess with 44 percent protein soybean meal, 28 percent linseed meal, 15 percent alfalfa meal, along with wheat bran, ground milo or barley, ground oats, and salt? You can't make these ingredients at home, and you have to do all the measuring and mixing. This is what I consider the old style of self-sufficiency. You and the rabbits could certainly survive without pellets if need be. But if you don't live in a Third World country and Armageddon hasn't struck yet, why not just give in and buy the pellets!

If you ignore this advice (as you almost certainly will to one degree or another, for one reason or another) be aware that a handful of cabbage or other succulent green can kill a rabbit or a whole pen of young rabbits. Offer any new feeds in moderation, especially watery ones like cabbage. In fact, some breeders say not to feed cabbage at all.

Be certain that anything you give the rabbits, especially dandelion greens and fruit tree branches, has not been sprayed. Dark green leaves are more nutritious than light green leaves. Lawn clippings, on the other hand, are not food, sprayed or otherwise. Turf grasses contain few nutrients, compared with weeds. A few other things rabbits will enjoy include comfrey, carrots, and carrot tops. As with human nutrition, moderation and variety are the keys.

Breeding

Your new trio of rabbits (three is a good number to start with) is settled in their new cages and accustomed to the feed you provide. If the does were not bred when you acquired them, now is the time. The first step in breeding is being able to tell the boy from the girl or, in rabbit parlance, the buck from the doe. I am not being facetious: many a new rabbit raiser has waited and waited and waited in vain for the first litter to appear. Only then do they discover that both their rabbits are females.

Testicles on adult males are quite noticeable upon close examination. This entails holding the rabbit on its back in your lap and spreading the hind legs. Watch for the sharp toenails. Hold the animal very firmly, and gloves might be a good idea. Because anything without testicles is, by default, a doe, it pays to be certain.

Young animals can be more difficult. Again, hold it on its back, the head toward you. Hold the tail out of the way with your left index finger. Use your left thumb and right thumb and index finger to press gently but firmly on the sexual organ. This will expose the membrane. In the buck it will be somewhat round and might or might not protrude a bit. In the female it will be a slit.

Sexing becomes easier as very young animals grow older, and with practice.

Mating

You can breed rabbits when they're six to eight months old. One buck can service up to 10 does.

After determining their sex, be sure the animals are healthy. Fat rabbits often fail to conceive. Underfed or sickly animals should not be bred.

There is no need to determine if the doe is in heat. Rabbits do have an estrus cycle, according to researchers, but apparently egg cells are developing and disintegrating in overlapping periods. For practical purposes, you can ignore heat periods.

Take the doe to the buck's cage, not the other way around. She is apt to defend her territory, and more than a few bucks have been castrated that way. Don't leave them together longer than necessary in the buck's cage, either; they'll fight there, too. Usually, a few minutes is all it takes.

Some breeders believe copulation induces ovulation, so they return the doe to the buck a few hours later as a means of improving the conception rate. Then mark your calendar: the due date is 31 days after mating.

Gestation

Normal gestation periods vary in all animals, including rabbits, but the average is 30 or 31 days. As the young develop, the doe's body requires both more protein and more food. Provide as much of a high protein ration (17 percent) as she will readily clean up and, of course, a constant supply of fresh water.

Put the nest box in the doe's cage about five days before day 31, along with a supply of nesting material; hay or any dry grasses will work. Avoid woody stems or stiff straw that might injure tender babies and, of course, anything moldy. The doe will arrange it (and some will rearrange and rearrange it again) to her liking, then line it with soft lush fur pulled from her own belly.

If all goes well, the young will be born in the nest, not on the wire—which is a disaster, as the doe will almost certainly neglect them there. The only way you'll know they're in the nest is by seeing the fur move or by feeling. Most breeders like to check to make sure. If you've spent some time with the mother and she's accustomed to being handled, she won't object to your checking her babies. If you have merely fed and watered her, it might be best to wait a day or two, or she might reject the newborns. Count them for your rabbitry log or journal, and dispose of any dead.

Continue the high protein feed, increasing the amount as necessary. Don't overfeed, which results in waste and spoilage, but provide just enough so it's cleaned up from one feeding to the next.

The kits open their eyes when they're about 10 days old and will be tumbling over the sides of the nest box soon after. Remove, clean, and sanitize the nest box when all the young are able to leave it: otherwise it will just become a filthy mess. At eight weeks, they should weigh at least four pounds and are ready for slaughter. If they're not that big, it could be because of genetics or feed. If you're serious about rabbit farming, you'll want to uncover the cause and correct it. I don't recommend moving the

young to a “fattening pen” because they’re more likely to lose weight, rather than gain it, after you move them. The extra feed and labor aren’t worth it.

In any event, rebreed the doe at this time.

Rebreeding

A doe left barren for several months is likely to become permanently sterile. Homesteaders commonly rebreed the doe when the young are weaned, at two months. Gestation is a month. So she’ll have four litters a year. If she averages seven kits per litter, that’s 28 fryers a year. With two does, you should have rabbit on the table about once a week.

Rebreeding schedules can vary widely, with commercial operations obviously striving for the optimum production. If you enjoy eating rabbit, have a large family, or can sell the extra fryers, you can either have more does, speed up the rebreeding schedule, or both. Some does are rebred 21 or even 14 days after kindling. Some strains have been selected and bred for such production; others will flame out. Proceed slowly and with caution.

Butchering

Killing an animal is never easy. But if you choose to eat meat, somebody has to do it. The honest way is to do it yourself, with respect and gratitude. The first time is the hardest.

Back when I edited a rabbit magazine and visited many commercial rabbitries and processors, I saw teenage boys process a hundred fryers an hour. My best effort was, maybe, 10. Even so, that was better than plucking chickens.

You can dispatch a rabbit in many ways, but the easiest for a beginner is with a stout stick about 18 inches long. With one hand on its back to restrain it, give it a good clunk on the head just in front of the ears. If you can’t hold the rabbit that way, hold the ears and strike it behind the ears.

Either way, be determined. A light tap is far, far worse than a good solid blow.

Cut off the head and let the carcass bleed thoroughly. Suspend the carcass from a gambrel hook through the tendons of either hind leg. (Fashion a hook from a piece of heavy wire and attach it to a wall or a tree.) Cut off the other three feet. This is more easily done with a pruning shears than with a knife.

With a small, very sharp, knife, cut the skin around the hock of the leg on the hook. Make a slit from that cut, on the inside of the leg, down to the groin. Make the same two cuts on the other hind leg and peel the skin off the legs. Cut off the tail inside the skin. Then it's just a matter of peeling and pulling until the skin is pulled off the carcass like taking off a glove inside-out.

To eviscerate a rabbit, carefully make an incision along the center of the stomach. Remove the entrails, using the small knife to cut around the anus. Save the liver, heart, and kidneys, and carefully remove the gall bladder from the liver. Cut off the remaining hind foot and wash the carcass in cold water.

With a good butcher knife, separate the carcass into three pieces by cutting just behind the shoulder and just in front of the hind legs. Divide the middle section in two, and cut the saddle portion into two pieces, lengthwise. Split both leg portions into two pieces.

You now have seven pieces of highly nutritious, easily digested, fine-grained rabbit meat ready for any of dozens of delicious recipes.

The Least You Need to Know

- Of the 75+ breeds of rabbits, only a few are used for meat.
- Domestic rabbit meat is all white and highly nutritious.
- Rabbits are best kept in all-wire cages, 36×36 inches.
- Commercial rabbit pellets are the best feed.

Chapter 20

Dairy Goats

In This Chapter

- Poor man's cow: the basics
- Things you need to start
- Breeding, feeding, and management
- Dairy products

No discussion of self-sufficient living would be complete without mentioning the goat. Goats have always been associated with people of limited means, perhaps living on marginal land, often with a self-sufficient lifestyle. At the same time, goat products are now considered classy! This combination is perfect for the new self-sufficiency. If you use dairy products and want to be self-sufficient, you need a goat.

Basic Facts About Goats

Most milk in industrialized countries comes from cows, because cows have become industrial animals. Like the monotonous white chickens bred to be egg-producing machines and housed in factorylike cages, huge black-and-white Holstein cows are the products of industrial agribusiness.

But goats are different. They've been called "the poor man's cow" for good reasons, and those reasons are just what we're looking for in a sustainable and self-sufficient lifestyle.

From a practical standpoint, most subsistence farmers and homesteaders simply have no use for the seven to eight gallons of milk an industrial Holstein produces each day of her lactation. Even the smaller breeds, such as Jersey and Milking Shorthorn, produce far more than the average

household needs or can use. A decent goat will produce a more reasonable gallon or so a day.

A goat, or even several, costs less than a cow—to buy, feed, and house. A 150-pound goat is easier to handle than a 1,100-pound cow. And from the housekeeping standpoint, cow pies splatter, but nanny berries neatly bounce. Caprines, goats, are more labor intensive than bovines, which might have helped save them from being industrialized, but they're more efficient at converting roughage and scrubland into high-quality protein.

Members of *Capra hircus* have been humanity's companions and benefactors for perhaps 10,000 years, as they were among the first animals to be domesticated. Domesticated goats lived in Switzerland in the Early Stone Age. Commonly found aboard sailing ships as a source of milk and meat, goats were thus distributed around the world by early explorers and merchants.

Because goats are probably better known in the funny papers than through more reliable information sources, let's start by examining some myths and misconceptions about them.

Odor

The infamous goat odor applies only to the bucks (males) and primarily during the breeding season. A doe (female) has no goaty aroma; she doesn't even have bad breath, such as dogs are notorious for.

It follows that properly handled goat milk does not have a goaty smell or flavor. "Properly handled" means it was drawn from a healthy animal in a sanitary manner and quickly chilled, often in ice water, which is colder than the average refrigerator. Off-flavors can sometimes develop for various reasons, such as certain feeds, but this also applies to cows. Even wine can be terrible if the winemaker is lax or incompetent, which is the most common problem with milk that tastes bad.

Goat Milk

Many people say goat milk is “richer” than cow milk. That could be because they’re accustomed to standardized cow milk, which contains three percent butterfat. Two and even one percent milk have become common, making the comparison even more noticeable. The truth is, most raw cow milk has more butterfat than that, especially from some breeds like Jerseys. But the butterfat, which gives milk its flavor and richness, is removed. Both cows and goats produce milk with varying fat content based not only on breed but also on such factors as the stage of lactation, seasonality, and feed.

In composition, there is very little difference between the two; raw goat milk tastes almost like raw cow milk. Simply put, goat milk is delicious. In a side-by-side comparison, goat milk is whiter, but in flavor, few people can tell the difference.

Goat milk is often said to be naturally homogenized. But this fact has little meaning for those who have no experience with raw cow milk or who are too young to remember bottled milk, delivered by a milkman, left on the doorstep, with frozen cream (and the cardboard cap) rising up from the bottle when it froze. In a container of raw cow milk, the cream rises to the top, but that doesn’t happen with goat milk, at least not as fast and not as much. This can be a problem when it comes to making butter or when you want cream. A cream separator will be a big help.

Expect the “average” goat to produce about 750 to 1,000 quarts of milk a year. Be aware that goats typically produce milk for only 10 months of the year; they need the other two to rest up before kidding (giving birth) again. The amount of milk production is also affected by the lactation curve. This means after a goat kids, milk production increases quickly, peaks, and then slowly decreases in a usually lopsided bell-shaped curve. You won’t get 2½ quarts of milk a day for the entire lactation. You might get a quart at first, work up to a gallon or more, and wind down to barely enough to feed the barn cat a few months later.

This is one reason most people have several goats. If you can have them freshen (kid or give birth) at different times, you can even out the household milk supply to some degree. Another reason is that goats are social animals and get lonely without a companion. A third reason is that goats are like peanuts: you can’t have just one.

Goatkeeping Considerations

A goat should have at least 15 to 20 square feet of protected housing, along with an outdoor pen. (Do *not* stake out a goat as if it were a dog!) The more time they spend indoors (think three feet of snow), the larger their quarters should be. If the goat shed functions mainly as a dormitory, it can be smaller.

A goat shed or barn must be well-ventilated but draft-free. A dirt floor is preferable to concrete or other material because it will stay drier. Pens must be accessible to a cart or wheelbarrow for cleaning.

In most cases, the outdoor pen is an exercise yard and playground, not a pasture. Goats are browsers, not grazers. They prefer reaching up, not down, for food and certainly won't mow your lawn. Like deer, they love twigs and branches, including raspberries and roses, and will relish your young fruit trees and evergreens. In other words, good fences are essential. It's easier and cheaper to fence an exercise lot than a pasture.

You have many fencing options, not many of which are suitable for goats. The picturesque board or rail fence won't confine a goat. Picket and barbed-wire fences can be dangerous. Wire fencing—woven-wire or field fencing—won't last long because goats love to stand with their front feet on a fence, even a wire one. They'll put their heads through it, rub against it, and, pretty soon, run it into the ground. You can train them to respect electric fences, but some are always exceptions, and electric isn't ideal for small areas or where there are young children who will certainly be attracted to the goats.

My preference for smaller areas is the stock panel or cattle panel. These are fences 16 feet long and 5 feet high, made of welded steel rods with variable spacing, smaller holes being closer to the ground. Shorter versions, called hog panels, might be suitable for smaller goats. They're not cheap, but they're practically indestructible; I have some that must be 30 years old at least, which I still use, when cheaper fences are long gone. Stock panels are lightweight and much more portable than any wire fencing that's stapled to wooden posts. And you can fasten the panels to metal T-posts with wire or baling twine. They're available at farm stores, such as Tractor Supply, although you'll find them in hardware stores, too.

Special goat feed called “concentrate,” containing grain and other ingredients that are quite necessary for good health and milk production, comes in 50-pound bags, which conveniently fit into garbage cans with covers.

You’ll need room for kids. If you plan to raise them, don’t leave them with their dams (mothers) if you expect to get any milk. If you get all your hay at harvest time in the summer, it’ll probably be half gone by kidding season. Depending on where and how you store it, you might use that empty space for a kid pen.

A separate room for handling milk is a requirement in Grade A dairies, whether cow, goat, or sheep, and is advisable where larger numbers of animals create more odor and dust. Small herds are commonly milked in the aisle of the goat shed.

A milking stand is handy, as it’s easier on your knees and back and it’s easier to keep the milk clean. A milking stand is simply a bench the goat hops up on, at least once she knows that’s where the grain is, and you can easily make one.

A manger is essential and a major headache. Goats are notorious wasters of hay; they grab a mouthful, then back off to chew it, and drop most of it on the floor, where they refuse to touch it again. Quality hay makes expensive bedding. Goats, especially young ones, love to crawl into a manger that isn’t built to keep them out, which can be a source of contamination. Don’t plan on feeding goats from an open trough or flat table. The feeder needs a barrier to limit access, usually some form of stanchion. This can be as simple as vertical boards. A “keyhole” manger is an improvement: the boards can be set 4 inches apart, with an 8-inch hole for the goat’s head.

A constant supply of fresh, clean water is essential. A rubber bucket works fine for a few goats, but fasten it in a corner and elevate it to help avoid contamination. Having a water supply nearby will help ensure that you change it often.

You’ll need milking equipment, of course. The gold standard is a stainless-steel hooded four-quart pail, although the stainless isn’t essential. But here again, this is something that will last a lifetime, so the initial cost will be spread pretty thin. The half-moon hood or cover is very helpful in keeping dust and debris out of the pail. In any event, don’t scrimp so much that you

end up using a plastic pail or anything else that can't be thoroughly sanitized. Milk is a delicate product.

You must strain the milk. You can use small strainers that fit into wide-mouth canning jars, as well as one-, two- or four-quart metal containers made for milk, with disposable milk filters (also available at farm supply stores). Do not use cheesecloth or a similar material. And here's a case where recycling is not a virtue; use a filter once, and add it to the compost bin.

These are the essentials. Other equipment is optional or has substitutes we'll talk about later.

Getting a Goat

There are many breeds of goats around the world, as well as many grades or mongrels of mixed heritage. But not all are suitable for the home dairy. Meat goats, often of the Boer breed nowadays, have become quite common in recent years. Angoras, raised for mohair, are less frequently seen. (Angora wool comes from rabbits, not goats.) Pygmy goats are generally considered pets. They do produce milk, of course, but are hardly practical for self-sufficiency.

Off the Beaten Path

Note that in both cow and goat dairies, milk is measured in pounds, not quarts or gallons. It's difficult to measure fresh foamy milk and much more accurate to weigh and record tenths of a pound rather than tenths of a quart or gallon. For all practical purposes, a gallon weighs eight pounds.

Dwarfs, on the other hand, although smaller than standard-size animals, are good milk producers. The goats selected for Biosphere II were Nigerian

Dwarfs. A dwarf can produce around 800 pounds of milk a year, compared with close to 2,500 for Saanens.

The most popular of the dairy breeds, and their production averages (in pounds) in 2007 according to the American Dairy Goat Association (ADGA), which registers them, are: Alpine (2439); LaMancha (2231); Nigerian Dwarf (806); Nubian (1795); Oberhasli (2208); Saanen (2470); and Toggenburg (2302).

According to registration numbers, Nubians are the most popular breed and are easily identified by their long, drooping ears and Roman noses. On average—beware that word—Nubians produce less milk than the other large breeds, but it's higher in butterfat. This makes them similar to the Jerseys of the cow world. Nubians can be any color or combination of colors.

Saanens are large and all white, with erect ears and dished faces, the opposite of the Nubian's Roman nose. Saanens originated in Switzerland and are generally very good milk producers.

Toggenburgs, another Swiss breed, are said to have the oldest breed registry of any animal in the world and have long been popular in North America. "Toggs" are identified by their brown color with white face and rump markings. They also have erect ears.

The LaMancha is an American breed, most notable for its very short ears, almost like none at all. The most common question LaMancha breeders hear when they're showing at fairs is, "Why did you cut their ears off?" Or if they know something about animals, it's a knowing nod and, "Their ears froze off." Nope, they were born like that. LaMancha ears are a breed trait, just like the Nubian's.

Incidentally, crossbreeds can produce interesting results. Crossing a goat of a Swiss breed with a Nubian commonly results in "airplane ears"—rather longish ears that are neither erect nor droopy. Knowing this can help you identify part of the parentage of some mixed-breed animals.

Alpines or French Alpines vary greatly in color, often with several colors and shades on the same animal. They also have several recognized color patterns, including the chamoisee, which can be tan, red, bay, or brown, with black markings on the head, a black stripe down the back, and black stripes on the hind legs.

Formerly classed as a Swiss Alpine, the Oberhasli has a rich red bay coat with black trim. The trim includes stripes down the face, ears, back, and belly. Their average milk production is in the middle range when compared with the other breeds.



Watch Your Step

Most goats of any breed and either sex can have horns, which are (or should be) prevented from growing at an early age. These decorative growths cause all kinds of problems with feeders and fences and can be dangerous to other goats and people. Goats should be disbudded shortly after birth, as soon as you can feel the horn buds starting to grow. A “disbudding iron,” a tool much like an electric soldering iron with a point about the size of a nickel, is heated and applied to the bud for 15 seconds. Hold the kid firmly by the muzzle: this is not pleasant or comfortable, for either you or the kid. But it’s far preferable to the injuries and problems horns can cause, and much easier and safer than removing grown horns, which is a job for a veterinarian.

Averages, of anything, can be convenient when you want some idea of what to expect. But they are also meaningless. This is dramatically demonstrated by the Toggenburg stats. While the average is 2,302 pounds of milk per year, the *range* is 880 (not much more than the Nigerian average) to a bucket-busting 5,100 or about 637 gallons—more than two gallons a day! You obviously aren’t going to get a champion milker to be self-sufficient. Nor would you want one. They tend to be pricey, and it takes extraordinary

management skills to get results like that. But neither do you want a scrub that isn't worth milking. The figures just cited pertain to animals owned by members of ADGA, which suggests that these goats are more valuable and cared for by people who are both more knowledgeable and involved in good goatkeeping than most of the goats you'll encounter. The averages are nothing but a rough guide.

Also remember this: a registered or purebred goat isn't necessarily a better milker than a grade, a goat of mixed or unknown ancestry. A pedigree is not a license to milk.

The best way to buy a goat is to visit several breeders, ask questions, register your impressions, and take it from there. A good place to meet breeders is at a goat show or a fair, where you'll probably encounter some pretty decent animals and some very involved goatkeepers who will be delighted to give you advice.

Feeding a Goat

Goats are ruminants, meaning they chew their cud and have stomachs divided into four compartments, (not four stomachs, as is commonly said of cows and other ruminants). In connection with this adaptation of the digestive system, their diet consists largely of cellulose and other carbohydrates and water, usually hay and pasture or browse. Mammals cannot digest cellulose; the goat depends on vast numbers of protozoa and bacteria that live in the rumen and reticulum, two of the stomach compartments. The microbes digest and ferment what the goat has eaten, breaking down the protein, starch, and fats, as well as the cellulose. The larger, coarser material is periodically regurgitated, rechewed, and swallowed again. This we refer to as the cud. And this fascinating process is what makes the goat an ideal animal for a sustainable homestead and planet. It also governs how you feed the animal.

Most of this cellulose is in the form of roughage: grasses and other coarse plant material, either green or dried. This is the bulk of a goat's diet. Each animal should get as much roughage as it wants. (Grain, on the other hand, must be limited. Most goat-herds provide about a pound a day per animal,

or one pound of grain for each two pounds of milk produced.) The dried form is hay, either leguminous, made from clover or alfalfa, or carbonaceous, made from timothy, brome, or other grasses. The carbonaceous hays have less protein and calcium than legume hays, so you must make up the difference in the concentrate ration. This is a blend of grains and other ingredients (such as minerals) needed for good health and production. The concentrate ration is high in energy but low in crude fiber. The only way for a beginner to do a good job of feeding concentrates is with a prepared ration formulated for goats, such as Purina's Goat Chow. The alternative would be to learn about nutrition, physiology, and bacteriology, for starters, and then do a lot of math. You simply cannot give a goat a scoop of corn or oats and expect it to thrive, much less produce milk.

In addition, producing milk in large quantities requires more protein than is required for body maintenance. A dry doe or buck will do well on 12 percent protein, but a milking doe should have 16 percent. So again, the only practical way to meet these requirements in a small herd is by feeding a prepared ration.



Watch Your Step

Some people confuse hay and straw. Hay is a plant such as alfalfa or timothy that is grown as feed, cut when green, and then dried and stored. Straw is the residue of plants grown for grain, such as oats or wheat. Good hay is green, although improper drying or handling, like allowing it to be leached by rain, can darken the color. Straw is yellow or golden, has very little food value, and is used as bedding.

If you have a goat, or two or three, you probably don't grow hay or grain. But in a self-sufficient or survival situation, you can grow feed in your garden if you adhere to basic feeding principles, primarily by introducing new feeds gradually to avoid upsetting the intestinal microbes and by providing variety. Sunflowers are ideal; the seeds are high in protein, and goats will eat the entire plant. Many homesteaders grow a patch of comfrey for animal feed. Carrots, Jerusalem artichokes, kale, and pumpkins all provide feed, but avoid cabbage. You can feed cull apples and sweet corn stalks and husks, but again, do it gradually and sparingly. A milking doe will still require at least a pound of concentrate ration per day.

And then there are weeds. Just as weeds can be food for humans, they are even better for goats. Dandelion, lambsquarters, nettle, and many others are nutritious and palatable. Some people raise goats for the sole purpose of controlling kudzu or brush, not milk.

Poisonous weeds are seldom a problem with goats, perhaps due to their browsing nature. They take a bite here and a nibble there and aren't likely to ingest too much of a dangerous plant. However, pine needles have been linked with abortion, and wild cherry leaves can be poisonous when they're wilted.

Breeding

When you have your facilities, a neat and clean shed, proper fencing, manger, and water bucket or trough, along with straw or similar bedding, hay, and a grain or concentrate ration, you can bring your goat home—but not a moment before!

You can begin in several ways. If you can find someone who is willing to part with a decent-producing milking animal at a reasonable price, you can start milking right away. However, be aware that production will probably drop when the goat is moved to a new home.

In many cases, though, it's better to select a bred doe. If you get used to each other before she kids, you'll both do better at milking time. This would also be true with an open (unbred) doe, but then you'll have the hassle of

getting her bred. If you're not familiar with such matters, mammals such as goats and cows produce milk for their young, not for you. They must be bred and give birth before they will have milk. There are exceptions, called precocious milkers, but let's not get into that here.

Alternatively, you might start out with kids. They'll be cheaper initially, but you'll have to invest the time and money to raise them to milking age yourself. It can be a good learning experience, and they'll certainly be at home when they start milking.

No matter how you start, eventually you'll have to face getting a doe bred, which can be a problem from several standpoints. You need to know the doe's estrous cycle, or heat periods, which generally occur only during the breeding season, between September and January. Most does will be in standing heat (they'll accept a buck) for only a day or two of the 21-or-so-day cycle.

Signs of heat often include increased tail wagging, nervous bleating, and a swollen vulva. Some does will mount or ride others when in heat. Depressed appetite or milk production can be indicators as well. Sometimes none of these are evident, especially to the inexperienced breeder. If there is a buck nearby, it doesn't matter what the breeder thinks: the goats know for sure!

But should you own a buck? It seems logical, for self-sufficient living, but there are several practical drawbacks.

First, we should establish that you want a herd sire, not just a doe-freshener. That means you want a high-quality buck with a family record of milk production. He is, after all, half of your herd of the future, and sustainability demands that your future herd improves, not deteriorates. This can become quite technical for serious breeders, trying to find bucks with strengths that might offset a doe's weakness, sometimes going back generations to check records.

To simplify matters, as a beginner, avoid the neighborhood "billy goat" and deal with an honest breeder who has some excellent animals, preferably including several bucks. Needless to say, excellent bucks are neither common nor cheap, which is one reason keeping one for just a few does doesn't make any sense. But there are even more serious problems.

One is inbreeding. You don't want to use the same buck on all your does, and then on their daughters, and so on. This is easily overcome when using

stud service. Also, bucks require much sturdier containment than does. And don't forget the aroma.

After all this forethought, preparation, and possibly even hauling the doe a hundred miles to the buck, breeding, in most cases, will only take a few minutes.

Then comes the waiting. The normal gestation is 155 days, but that's just another average. The doe needs some special care during this period. If she's milking, she should be dried off at least two months before kidding. This often happens naturally with pregnancy. Simply discontinuing milking is the common course of action, but reducing or eliminating grain will help. For the first three months, the kids are growing slowly, and a fibrous diet is called for. A dairy animal should never be fat, and certainly not during pregnancy. During the last eight weeks, the kids put on a growth spurt, so the mother should be fed a 12 percent protein ration. Minerals and vitamins are very important, especially iodine, calcium, and vitamins A and D. Many breeders like to provide bran or beet pulp for bulk and molasses for iron and the sugar that can help prevent ketosis, also known as kidding disease.

Off the Beaten Path

Goats commonly have twins, and triplets and quadruplets are not unusual. Cows usually have one calf. So it seems to be a quirk of nature that goats only have two teats while cows have four!

Kidding

About 140 days after breeding, start paying extra-special attention to the doe's condition. You can feel the kids on the doe's right side. Check them twice a day, and when you can no longer feel them, they'll be born within 12 hours. By then the goat should be in her own clean and bedded pen. As the time approaches, she may appear nervous, pawing at the bedding, bleating, repeatedly lying down and getting up again.

Unless you camp out in the barn, it's not unusual to find a pair or trio of kids licked clean and dry, standing on wobbly legs and perhaps nursing, the next time you go out. If you happen to witness the birth, you can help the doe clean the kid, especially if she is preoccupied with a second or third. Wipe the mucus from the mouth and body, and dry the newborn with a soft towel. In any event, your main duty is to disinfect the navels with iodine.

In rare cases does can have difficulties, and this is a good time to have access to a vet or an experienced neighbor. At the very least, be prepared with information from a book.

Raising kids is a topic in itself, with many different views and methods. In general, I advise you to remove the kids from their dam at birth. Milk the doe to obtain the colostrum or "first milk," a thick yellowish milk containing antibodies necessary for the newborn's protection. Be certain each kid gets an ounce or so within a half-hour of birth.

Suckling is natural for kids; drinking from a pan or dish is not, and they'll have to be taught. You can feed kids from bottles (with lamb nipples). Pan feeding involves less time and labor eventually, but to teach a kid to drink from a pan can be difficult. One method is to put your finger in the milk and let the kid suck on your finger.

There are many opinions on how best to feed kids. Here's one method. Provide colostrum three times a day for the first three to four days. (Colostrum gradually changes over to milk in that period.) For the next three or four days they get 8 to 10 ounces of warm milk three or four times a day, a total of about a quart. Give them as much warm water as they will drink, afterward. During the second week they might work up to 12 ounces per feeding in three feedings, 8 hours apart. By then they should be nibbling hay and a specially formulated grain ration, such as a high-protein feed for lambs. Each kid will drink about a quart of milk, twice a day, decreasing with the amount of solid foods they consume. Most kids are weaned by the time they're 2 to 3 months old.

How to Milk a Goat

You must wash the udder (not “bag,” please!) with warm water, an udder-washing solution (from a farm supply store), and a sponge, then dry it with a paper towel. Placing your hand on the teat, close your thumb and first finger near the top so the milk in the teat can’t get back into the udder. When you close your second finger, the milk should start to squirt out. Close your third and then little finger, so you’re squeezing with your whole hand. Do not pull down on the teat! Release the teat so it fills with milk again and repeat the process. Note: discard the first stream from each teat as it will be high in bacteria.

Strain and chill the milk immediately.

The Least You Need to Know

- Female goats, called does, do not have an aroma.
- There is little difference between cow and goat milk.
- Goats should never be staked out on a chain, like a dog.
- A good goat produces about a gallon of milk a day, but that varies widely.

Chapter 21

More Small Livestock

In This Chapter

- Ducks and geese
- Turkeys and guineas
- Sheep
- Pigs
- Honeybees: canaries in a coalmine

Some people are content to eat the same old hamburger or tofu, day after day. But others relish a roasted goose, duck confit, or maybe a suckling pig once in a while.

Such delicacies might be considered exotic or luxurious because you can't find them in the average supermarket and, certainly, not at a reasonable price. Yet on a self-sufficient homestead, you can raise them yourself at small cost. Some of the side benefits might surprise you.

Raising Waterfowl

Waterfowl are neglected on many homesteads. Some people mistakenly think they need a pond. Others consider them messy. But if you are one who finds them interesting, and/or delicious, it's easy to raise a few geese or ducks.

Geese

Chicken is plentiful and cheap because chickens can be raised by industrial agri business on factory farms. Goose is scarce and expensive because

geese are not industrial-type birds.

Raising just a few, however, is easy. Day-old goslings are expensive compared to chicks, but they are cheap to feed. Give them a commercial duck or goose starter at first, but do not give them chick feed: that can be deadly for waterfowl. After they're a few weeks old, they can live on grass.

Off the Beaten Path

The poultry “watch” list includes breeds with less than 5,000 breeding birds with 10 or fewer primary breeding flocks in the United States; “threatened” means less than 1,000 birds and seven flocks; and “critical” indicates fewer than 500 birds and five primary flocks. For more information contact www.albc-usa.org.

The white Embden is by far the most common breed. In fact, the next three most popular are on the American Livestock Breeds Conservancy (ALBC) “watch” list: the grey Toulouse, white Chinese, and African. Half a dozen breeds are on the ALBC critical list: American Buff, Cotton Patch, Pilgrim, Pomeranian, Roman, and Shetland. The Sebastopol is “threatened.” So in addition to the other pleasures of raising geese, you might be preserving a breed in danger of extinction.

Goslings can be brooded just like chickens (see Chapter 18), and subsequent care is also similar. One difference is that geese drink by immersing their entire heads, so they need a bucket or tub, rather than a chicken waterer. Clean and replenish it often.

Geese have been used to weed cotton and strawberries, before the berries get ripe. In a garden, however, they'll eat the corn, beans, lettuce, and everything else as well as or instead of the weeds.

When the grass dries up in fall, you can fatten geese on grain, usually corn. Butcher them just like chickens, but plucking them is much more difficult. One problem is that hot water doesn't penetrate the oil that coats duck and

goose feathers. Adding dish detergent or shampoo to the water helps, somewhat, but it's still a chore I don't relish.

And then there is the down, which is best removed by coating the bird with melted wax. I've simply poured it on when doing one or two birds; dunking takes a lot of wax and a huge container. Peel off the cooled wax with your fingers.

Down used to be too valuable to ruin with wax. In fact, there is a long tradition of plucking down from live geese, which can be done without harm to the goose if the timing is right and she's ready to molt. But in yet another case of the Industrial Revolution scorning the poor goose, synthetic materials have replaced their warm down, and ballpoints, goose quill pens.

A goose doesn't have as high a dress-out percentage as a chicken or turkey, so you might not get as much meat as you expect. But it will be delicious: dark, rich, and flavorful. It needs no special treatment or preparation.

Goose fat is excellent for frying potatoes, and knowledgeable cooks prize it highly for other dishes as well.

Ducks

Ducks are raised like geese, although they'll eat less grass and need more grain. Again, be sure their feed is formulated for waterfowl, not chickens.

White Pekins are the common meat breed, weighing eight to nine pounds at maturity. However, for efficient feed conversion and the best eating, you should butcher them at about six pounds or roughly nine weeks of age.

Off the Beaten Path

A self-sufficient homesteader ought to know that, as with many foods now considered epicurean, duck confit was once a French peasant staple. Before the days of refrigeration, meat was preserved in its own fat with salt and spices. Such meat could be kept for months in a stone crock in the root cellar. For a recipe

for duck confit, see
<http://themodernhomestead.us/article/Duck+Confit.html>.

Other breeds include Rouen, Cayuga, Blue Swedish, Buff, Khaki Campbell, and Indian Runner, the last two valued for their eggs, not meat. Again we see the threat of extinction: the Campbell, Rouen, Runner, and Swedish are on the ALBC “watch” list; the Buff and Cayuga are “threatened”; and six more are on the “critical” list.

Turkeys

Turkeys used to be raised for Thanksgiving and perhaps Christmas. But production has increased 300 percent since 1970 as turkeys have become an industrial product. Today, only 29 percent is consumed during the holidays, and in 2007, Americans ate 17½ pounds of turkey each.

Their industrialization is demonstrated not only by their current abundance and low price but also by the fact that they have become so deformed by genetic manipulation—in particular the profitable but abnormally huge breasts and rapid growth—that they can no longer breed naturally. The everyday supermarket turkey is the result of artificial insemination.

Consequently, homesteaders very seldom raise the standard breed, Broad Breasted Whites. Instead, there is a growing interest in “heritage” breeds. Somewhat like open-pollinated heirloom seeds, heritage turkeys are naturally mating, long-lived, slow-growing, and have been around a long time. They also taste much better, according to many breeders who have created niche markets for the birds.

Off the Beaten Path

It might seem strange to encourage *eating* rare breeds, but that’s one way to preserve them. If these breeds can become popular table fare, more will be raised. To this end, the founders of

Renewing America's Food Traditions (RAFT) include not only Slow Food USA and Chefs Collaborative, but also Seed Savers Exchange, Native Seed/SEARCH, Center for Sustainable Environments, and American Livestock Breeds Conservancy.

Notice that each of these breeds is on one of ALBC's lists:

- Study: Broad Breasted Bronze (this one is *not* considered a heritage turkey)
- Watch: Black, Bourbon Red, Royal Palm, Slate, Standard Bronze;
- Threatened: Narragansett, White Holland
- Critical: Beltsville Small White, Chocolate, Jersey Buff, Lavender/Lilac, and Midget White

Turkeys have a reputation for being difficult to raise, but some people have no trouble with them. We used to say *never* raise turkeys with chickens because they'll get blackhead disease, but I know quite a few people who ignore that advice and get away with it. (Blackhead is hosted by the small roundworm of the chicken. Chickens are highly resistant to it, but it's spread in their manure.) Turkeys can get other diseases from chickens, and if you do raise both, never go from the chicken pen into the turkey pen, or keep special boots for turkey chores only.

Start young turkeys, called poults, like chickens and waterfowl, but at a slightly warmer temperature of 100°F. Drop the temperature 5°F a week. Place an 18-inch-high cardboard ring centered below the heat lamp to keep them from crowding in corners and suffocating. If you start them in a large cardboard box, about 3×5 feet, in a fairly warm place, you can get by with a 100-watt light bulb in place of a 250-watt heat lamp.

It's even more important to prepare for poults before their arrival than it is for chicks, because turkey starter feed can be hard to find and you might have to special-order it. Chick starter is a barely acceptable substitute. For best results, use a medicated turkey starter to prevent coccidiosis, a common intestinal disease. If you feed the medication in a starter feed, they should develop immunity.

Do not use sawdust as bedding as the poults will eat it, and don't put newspaper on top of the litter (sliding on the paper can cause pulled

tendons). Wood shavings are best.

Dipping the beaks in water is more important for poults than it is for chicks. Many people put brightly colored marbles in the water; some say to keep the birds from drowning, and others, to help them find the water.

Experienced turkey raisers warn against leaving anything like open pails or boxes in the turkey house, where the young birds can roam after about 10 days. Curious poults have been known to jump into such containers, one on top of another, smothering those on the bottom. They can also pile up in corners and smother as a result of thunder, low jet planes, and fireworks. We had friends who raised turkeys commercially near a small town and hated the Fourth of July.

If the weather is cold, say in the 30s or 40s, the birds will need the heat lamp for as long as six weeks. Be sure to leave room for them to move away from it if they get too warm.

At six to eight weeks, switch to a turkey-growing ration containing a medication to prevent blackhead disease. If a bird six weeks or older dies rather suddenly for no apparent reason, perform an autopsy: cut it open and look at the liver. If it has white or yellow spots, you have a blackhead problem.

Most turkeys are ready to butcher at about six months. About a month before, switch from the growing ration to an unmedicated finishing ration. Remove all feed at least 24 hours before slaughter, and water for 12 hours.

As with chickens, the easiest killing method (at least in my opinion) is with an axe, but sticking the brain through the cleft in the roof of the mouth; cutting the throat just below the lower jaw, severing the large vein and the cross vein; and wringing the bird's neck are other options.

Scald the bird in 140°F water for 30 to 45 seconds, and proceed as for chickens.

Guinea Fowl

Guineas are related to turkeys and pheasants, but they originated in Africa. They eat seeds and insects, including ticks, which makes them welcome on many homesteads. Unlike chickens, guineas do not scratch much, and you

can trust them to eat bugs in your garden, among crops such as corn, pole beans, and winter squash. (They will destroy tender lettuces and cooking greens, and they like juicy ripe tomatoes as much as you do.)

Also unlike chickens and turkeys, guineas are monogamous in the wild although not necessarily on the farm, where the ratio can be one male to three to four hens. They are difficult to sex, although the male often has slightly larger head appendages. Hens make a two-syllable sound (usually described as “buck-wheat”) but sometimes mimic the cock’s one-syllable “chi-chi-chi,” making them difficult to distinguish. Hens don’t screech the guinea battle cry as much as the cocks. That distinctive shriek makes guineas good watchdogs, but it can also drive you nuts.

Pearl, White, and Lavender are three common varieties. Mature guineas weigh 2¾ to 3¼ pounds, which is less than you might expect, looking at the live bird. The meat is more like pheasant, chukar, or other game bird than chicken and is seldom seen except on higher-price menus. Here’s another winner for the peasant gourmet because they’re easily raised.

The young, keets, are smaller than chicks but raised the same way. A cardboard box and a lamp for heat will work fine. However, feed them turkey starter, not chick starter, which is lower in protein. They require a high-protein feed to replace their natural diet of insects and seeds. Keets need 24 to 26 percent for their first month. Then lower it to 18 to 20 percent the second month. After that, feed them regular 16 percent laying mash or allow them free range. In addition, keets should get warm water, not cold.

Free range is essential, naturally, if you want them on bug patrol, but they should be fully feathered adults before being released. Don’t allow young birds to get wet, even in damp grass.

Guineas are quite wild unless you take pains to train them from early on. They prefer trees to henhouses, and ours have roosted on top of the barn, even in winter. To butcher a guinea, you might have to shoot it out of a tree. Eventually they fall prey to hawks and other predators. Needless to say, if they are penned, the pen needs a top.

Training is simple but time-consuming; all you have to do is handle them frequently from Day One. When they mature, provide a little supplemental feed—they love millet—inside their coop, and you can train them to come home at night. Some people say that if keets are raised with chicks, they will flock together when grown.



Watch Your Step

Never grab guineas by the legs. This is an easy and safe way to catch chickens, but guineas are much more delicate and can be seriously injured.

Some guinea hens reportedly lay as many as 100 eggs a year, although they usually lay 20 to 30 and then go broody and sit on the eggs to hatch them. Their preferred location for doing all this is out in the brush and weeds where it will be difficult for you to find the nest. The fox and coyotes often have better luck, but if not, most of the keets will probably perish from dampness or predators soon after hatching. Guinea hens are decidedly disinterested mothers. If you're serious about propagating guineas, plan on confining the breeders or remove the eggs.

You can hatch the eggs in incubators, or put them under setting hens. A large hen can handle 20 to 25 guinea eggs. The incubation period is 26 to 28 days, compared with 21 days for chickens.

Sheep

As I have already mentioned *Five Acres and Independence* so often, I must tell you what author M. G. Kains had to say about sheep in that 1934 classic: "Sheep have no place on the small farm."

He might've been thinking in terms of the competition of the vast sheep ranches of the west, ranches that now face competition themselves from Australia and New Zealand. But with today's niche markets for quality

lamb and wool, there is profit potential in sheep and little question about their value as meat animals for the self-sufficient homestead.

You can keep a few sheep on a small place with very little equipment, expense, or labor, aside from good fencing. They can provide prime carcasses on very little grain in less than 6 months, instead of the 12 to 18 months for beef.

Good fencing is important not only to confine the sheep but also to deter predators. Sheep are defenseless, and dogs, to say nothing of ever-more-common coyotes and other sheep-killers, are major headaches for shepherds. For a couple of sheep, the fencing will cost far more than the animals unless you're in it for the long haul.

The traditional sheep fencing is woven-wire. A number of horizontal wires are held apart by vertical wires or stays. The number of wires, spacing, and overall height varies with the intended use, but for sheep, I recommend a fence four feet high with stays spaced 6 or 12 inches apart. The space between the horizontal wires varies from 1½ inches at the bottom to 9 inches at the top.

Woven-wire fences are commonly augmented with electric fencing, mainly for predator control but also to preserve the life of the fence by protecting it from the abuse sheep will give it. One or two strands of wire at the top will help deter unwanted varmints, and one near the bottom will discourage digging predators. An electric offset wire at nose height (to a sheep) on the inside will help keep them from poking their heads through the wire, which eventually results in a sagging fence.

A less expensive alternative is high-tensile fencing, commonly five to seven strands and electrified. The 12½ gauge high-tensile wires are spaced approximately 6, 5, 5, 8, and 10 inches (smallest spacing near the ground), pulled to a tension of 250 pounds, and electrified with a 4,000 volt fence charger.

There are more than 200 distinctive breeds of sheep in the world. The Breeders Directory of *sheep!* magazine usually lists at least 50. As with other animals, the best way to start is by locating and visiting local breeders, who you might find in such a directory. Even if they don't have what you want, you'll learn a great deal and, no doubt, get some leads as to other sources.

Some sheep are valued for their wool; others, for their meat; and increasingly, still others, for their milk. Dairy sheep are concentrated in the Northeast and Eastern Canada and the Great Lakes region, but sheep-milk cheese is gaining in popularity. Much of it is farmstead cheese: that is, it's made right on the farm where the sheep are milked.

You can handle and manage sheep much like goats and keep the two together. (No, despite periodic reports of “geep” or “shoats,” they will not interbreed.) One of the main differences between the two is that while goats are browsers, sheep are grazers; they are, in fact, the original lawn mowers. Among other things, this close grazing means they are more likely to have problems with worms than browsing goats are. Most sheep are routinely treated with worming medications (vermifuges), but pasture rotation is also very important. Don't let the sheep graze too closely. (Note that this has just increased your fencing requirements.)

Eight sheep can live on land that would support one cow. With excellent pasture—timothy, brome, orchardgrass, alfalfa, and the clovers—the stocking rate can be 15 ewes and their lambs per acre. Native grasses are fine but won't support as many animals. Without pasture, a sheep will eat two to four pounds of hay per day (depending on kind and quality) and about a pound of grain.

Like goats again, sheep are seasonal breeders, usually from December through April, with breed and climate differences. Gestation is usually from 143 to 151 days. During the first half, nutritional requirements don't change much, and overfeeding can be dangerous. Later, the lamb is growing rapidly, so the ewe's feed must accommodate that. Twins and triplets are common, making proper nutrition even more important.

Starting around the eleventh week, provide a quarter-pound of grain along with good forage. By the sixteenth week, double this. In late pregnancy the ration might consist of five parts oats, three parts shelled corn, and one part each of bran, soybean or linseed meal, and molasses, with each ewe getting from one-half to one pound.

Off the Beaten Path

Sheep manure is one of the best for the organic gardener. It contains 1.4 percent nitrogen, 0.5 percent phosphorus, and 1.21 percent potassium.

The first 48 hours of a lamb's life are critical. Among the many things that can go wrong are dry ewes (they have no milk for the baby), ewes refusing to claim their lambs, chilling, and general weakness. The dedicated shepherd is present, ready, and able to handle most circumstances—which means you'll need much more than part of a chapter here to be prepared, as if you didn't know that already. I recommend *Storey's Guide to Raising Sheep* by Carol Simmons and Paula Ekarius, but there are many others.

When the lamb is born, cut off the umbilical cord four to five inches from the body, and paint or spray it with iodine. If the lamb gets chilled, you might need a heat lamp to dry and warm the newborn. Colostrum, first milk, is important for any newborn mammal, so be certain the ewe has milk and that she doesn't have a plugged teat.

Do not overfeed the ewe after lambing, especially for the first week or two. If she produces more milk than the lamb can consume, udder problems are likely to develop.

Ewes on good pasture won't need grain until they're bred again. The lambs can be fed grain, in creep feeders, to produce greater weight gains more rapidly, but it isn't essential on a sustainable homestead. Creep feeders are designed to give young stock access to feed while excluding adults. Most good lambs will reach a weight of 90 to 100 pounds at five to six months, putting 35 pounds of meat on the table.

Hogs

The pig is another animal that has become industrialized in my own lifetime. In fact, I used to raise them commercially until one local buyer after another went out of business as the hog industry consolidated. By 2000, the least profitable farms finished fewer than 600 hogs a year; the most profitable, more than 16,000. One company, Smithfield Foods, Inc.,

butchered 27 million hogs in 2005. One of their facilities in Utah houses a whopping 500,000 animals.

If you raise a pig that is not the product of antibiotics, concentrated feed, or mass production—a pig that is not a corporate hog—you'll be amazed at the flavor and tenderness. And almost anyone can do it.

Start with a feeder pig, a weaned piglet weighing about 40 pounds and around eight weeks old. Or double your pleasure (and theirs) and get two. Buy it when the weather has warmed and you won't need any supplemental heat or special facilities. The pig should be weaned and wormed, and if a male, castrated, changing it from a boar to a barrow. A young female is a gilt. A pig, a pen, a feeder, and a water container are all you need.

Odors can be minimized with a properly built pen and a little labor—which will produce black gold for the composting organic gardener.

Piglets are a delight. Their intelligence is well documented, and they all have personalities. When raised with plenty of personal attention, a pig can become a pet. But don't forget why you're raising it.

You can raise pigs on pasture, perhaps with a simple A-frame shelter. That might be the ideal in some cases, but the problem is fencing. (You might have heard the old saying about a good fence being "horse-high, bull-strong, and hog-tight." For goats and small pigs I like to add "waterproof.") You shouldn't keep hogs with sheep, and they'll eat chickens alive, but if you spend big bucks on fencing for one or two pigs, the cost of your meat soars to an unsustainable level. Also, manure is easily recovered only with confinement housing.

This isn't nearly as onerous with one or two hogs as it is with a thousand or 500,000. One or two pigs will be quite content in a space 8×13 feet or so, including a 5×8 foot shelter. Shade is extremely important to swine because they can't sweat. That's the reason for hog wallows, and if you have room and the right location, you might consider providing one. Hog panels, those 16-foot-long sections of welded rod fencing, are ideal for a small enclosure. This is what they were designed for, and the expense is justified.

A 40-pound feeder will eat about 2.75 pounds of a 16 percent grain ration a day and should gain a little more than a pound per day. It will need at least a gallon of clean water a day and more in warm weather.

A pig's digestive system is similar to a human's. Now we get into all kinds of sustainable, homestead options. Most corporate market hogs are fed corn

and a protein supplement. Homestead hogs can get corn and a protein supplement and/or millet, barley, sunflower seeds, Jerusalem artichokes, peas, peanuts, apples, potatoes, tomatoes, cucumbers, or excess eggs, and don't forget the milk. If you have a surplus, milk or milk by-products are excellent food for hogs. It's generally agreed that dairy products help control some internal parasites. Milk-fed hogs gain weight more rapidly, and the meat quality is excellent.

Corporate hog farms couldn't begin to produce pork like that; smallholders can. They can also provide pasture feeds even without a pasture, by cutting the plants and bringing them to the pig's pen. Comfrey falls into this category, but you can also grow alfalfa, rape, field peas, and others, depending on your location.

Custom butchering can often erase any pecuniary savings you might have realized by raising a hog. Doing it yourself is not a major undertaking, especially if you have or know anyone who has experience in dressing out big game. Hogs were traditionally scalded in hot water and scraped with a bell hog scraper to remove the hair, but many backyard butchers find skinning the carcass to be much more convenient. You can find a primer on hog butchering at www.ars.usda.gov/Main/docs.htm?docid=15403.

Honey Bees

Okay, so bees aren't usually considered animals. But if we're going to raise insects for food, someday, bees are a good place to start. We can eat the honey instead of the insect. But there's another important reason to discuss bees.

Before we come to that, we should review the importance of the honey bee, *Apis mellifera*. Before the Industrial Revolution made it possible to extract sugar from beets, cane, and corn, honey was the world's premier sweetener. Any retreat from unsustainable industrial agriculture could have an effect on the importance of honey.

However, economically, the value of honey takes a backseat to pollination. Bees pollinate more than 125 different crops in the United States and Canada, from apples and oranges to animal food crops like clover. Their

economic value in the United States alone is estimated at more than \$14 billion a year. Obviously, bees are an essential element in not only self-sufficiency or sustainability, but survival.

A few years back the *American Bee Journal* said 56 percent of the honey input came from hobbyists and part-timer beekeepers. That, too, fits in with our model of self-sufficient living.

Getting started doesn't take much, but you do need a hive, of course. These are often for sale, used (for reasons we'll examine in a moment) or new, which you can purchase and assemble yourself. You'll need a hive tool, which is a simple gadget for prying apart wax-coated elements within the hive body, and a foundation, the wax base on which the bees will build comb. You'll also want a bee veil, gloves, and smoker, which helps calm the bees while you work with them. Bees are sold by mail, by the "package." And that's where the problem begins.

Honeybees are dying out. Their numbers have waxed and waned over the years for a variety of reasons, and in the past few decades, insecticides and new diseases have taken a toll, but now they are *dying out*—by the billions. And nobody knows why, at least for certain, even though experts have obviously been working around the clock for years to solve the mystery. This is a worldwide, multi-billion-dollar problem.

As with anything else agricultural, apiarists have always faced challenges: fungal infections, honey-loving animals, wax moths, and most notably, an infectious bacterial disease called American foulbrood. By 1984 the tracheal mite, a microscopic parasite that interferes with a bee's breathing, appeared, and beekeepers fought this with vegetable oil and other benign products.

In 1987, the blood-sucking Varroa destructor mite invaded North America and was blamed for catastrophic bee losses for the next two decades. Initially, pesticides approved for Varroa mites held the predators in check, but within a few years they had begun to develop resistance to the chemicals.

Then in 2006, a beekeeper headquartered in Pennsylvania arrived at a farm in Florida where he had set up hives for pollination. Only 30 of the 400 had any bees. The biggest mystery was that there were no dead bees on the ground and no sign of honey robbers of any kind. The bees had just ... disappeared.

He contacted researchers at Penn State who had been working on the Varroa mite problem, and they were just as perplexed. Soon other reports started coming in: bees everywhere were disappearing. The mystery phenomenon was soon dubbed colony collapse disorder (CCD).

Nineteen Penn State faculty and grad students began working on the bee mystery, and other universities and departments of agriculture joined forces. Through bee autopsies, they found that apparently the bees' immune systems had collapsed. The dead bees suffered from every bee ailment known to science, "like bee AIDS," one researcher said.

The phenomenon is global. Between 1995 and 2007, 300,000 to 400,000 hives have disappeared in France—*per year*. In late 2008, researchers in British Columbia launched a three-year \$2.8-million (Canadian) research project aimed at identifying strains of bees that are genetically resistant to certain infections.

Also, in late 2008, the British Beekeepers' Association estimated that two billion bees had been lost in the previous November through April winter, with a similar decline expected in 2009. Of the 274,000 hives in the United Kingdom in November, 90,000 did not survive the winter.

Some beekeepers say they know what the problem is: a class of insecticides called neonicotinoids or neonics, an artificial form of nicotine. Neonics have been banned in France, Germany, and elsewhere, but not in the United States or Canada.

The Penn State researchers dismiss the neonics theory, noting that the bees they examine—and also wax and pollen—contain almost every known category of insecticide, as well as some herbicides and fungicides. They identified 46 different pesticides, as many as 24 in one hive. The levels were much higher than expected when the chemicals were approved for use, and no one knows how they might interact to form the perfect storm.

Pollination by bees is so vital that Albert Einstein once observed that if the bee were to disappear from Earth, mankind would follow within four years. Is the clock ticking?

The Least You Need to Know

- Many foods considered exotic—including meats—can easily be provided on the homestead.

- Animals that haven't been "industrialized" are more labor-intensive and more expensive in the markets, making them ideal for the self-sufficient grower.
- Oddly enough, eating rare breeds is one way to help ensure their survival.
- If honeybees are equivalent to canaries in a coalmine, we're in deeper trouble than most people realize.

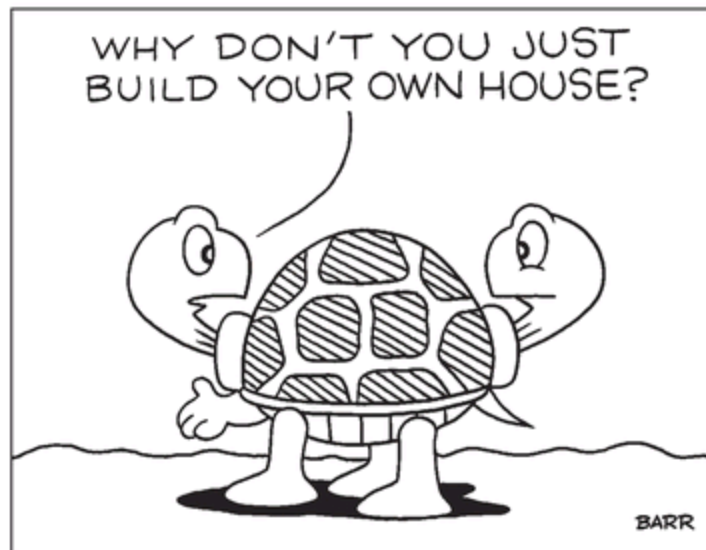
Part 5

Shelter and Its Appurtenances

Of the three basic necessities, food, shelter, and clothing, it's easy to see how most people can become more self-sufficient in food. But what about shelter? That seems a stretch.

The truth is, almost anyone can do a great deal to control the cost of his shelter, which in turn means the amount of life (work and worry) paid or traded for that roof and four walls. Some of these involve simple mathematics, while others, like so many aspects of self-sufficiency, require only a different way of looking at and thinking about a situation, a new mindset.

A self-sufficient home isn't necessarily one that runs on alternative energy. (Those are commonly called *independent* homes.) A self-sufficient home runs on what is, for most people, alternative *thinking*. Some of the ideas involved are so simple they might surprise you.



Chapter 22

Self-Sufficient Shelter

In This Chapter

- Affordable and sustainable housing
- About mortgages
- Cordwood construction
- The earth-sheltered home
- Teenagers and mortgages

It's relatively simple to become self-sufficient in food and, to some degree, energy. But shelter is another matter. The biggest problem is the insane cost of housing and that most demonic of economic traps, the mortgage. You can avoid both, when you know how.

The Trouble with Houses

Birds and animals live in cozy nests, dens, and burrows they build themselves out of cheap, accessible, biodegradable materials. And most humans followed that example, until recently.

Then something snapped. People went crazy. Year after year, houses grew in size and became more luxurious. Everybody wanted to live in his own private castle. Like the other cancers we've been discussing, this one grew and grew, threatening to kill its host.

Now the host is very ill. We are simply spending too much on housing. Most of us can't afford it, and Earth can't afford it. Something has to give. With the bursting of the housing bubble, we got a wake-up call, and the all-important change in attitude is underway. Now is the perfect time to change it completely.

Youngsters under 65 or so and people with short memories might not recall that in 1950 the average American home was 983 square feet. This was much larger than the cabins many people still alive in 1950 had been born in, and vastly more luxurious; most had such amenities as central heat, electricity, and indoor plumbing. But by 2005, a mere 55 years later, the average American home had more than doubled in size, to 2,434 square feet.

We can examine this phenomenal growth from several aspects. Because smaller families are living in larger homes, the square foot per person has soared dramatically. The most pertinent and practical aspect might concern cost—to the inhabitants and to Spaceship Earth. But to change our attitudes, we must also consider how we arrived at this point.

If you lived in a village in Africa (or most other places in the world, for that matter), any modest American home would seem like a castle. But if you live in one of those homes yourself and see the McMansions sprouting in nearby suburbs, you're likely to feel your modest American home is a hovel. Many people in the United States have a lot of money, and their lifestyle shifts the frame of reference for those a notch or two below them.

In 1950, kids rarely had their own rooms, and the whole family shared one bathroom. Seems we wore fewer clothes, too; at least the closets were a lot smaller. If there was such a thing as a king-size bed at the time, it sure wouldn't have fit in *our* house, which was normal and average.

Shortly after that, we began acquiring televisions, freezers, sound systems, microwaves, and then computers. Even toasters got bigger, while two-income families got smaller. Now one television and computer and car (garages enter into this, too) per household isn't enough. I just read about a house where the children had their own bathrooms, each with flat screen television.

But there are exceptions to the mega-mansion mania.

The Small House Movement

Although prosperous, Japan is an island nation with limited land area (not unlike our spaceship). The average family home encompasses 650 to 970

square feet, but a common form of housing for singles, called one-room mansions, comes in at 110 square feet.

Manhattan is also prosperous and crowded. The average apartment is less than 1,300 square feet but has a price tag of over \$1 million. Studio apartments on the Upper East Side run about 440 square feet.

Some people would consider any of these to be mansions. But they are part of a movement where people actually live, and function, in homes of less than 100 square feet.

The Small House Society (www.resourcesforlife.com/small-house-society) claims its website has gotten as many as 70,000 hits in one day. The society says its mission is “to support the research, development, and use of smaller living spaces that foster sustainable living for individuals, families and communities worldwide.” It notes that the small house movement results from concerns for the environment, a shifting economy, and because some people just want to live simply.

Off the Beaten Path

Long popular in Japan and Europe, micro-hotels have arrived in New York. The rooms are a scant 7×8—56 square feet—but “charming and special” with 350-thread count sheets, 23-inch flat-screen LCD television, iPod dock, and wireless Internet. You’ll have to use a public bathroom. The cost is \$100 a night.

Sarah Susanka is a residential architect. Her 1998 book *The Not So Big House* has sold more than 360,000 copies. Two later titles are also selling well. There is definitely interest in downsizing living space.

Gregory Paul Johnson’s “Mobile Hermitage” is one of the tiny homes that helped start the Small House Movement. Tiny houses don’t necessarily have tiny price tags: this one is listed at \$30,000. Johnson is the author of Put Your Life on a Diet: Lessons Learned from Living in 140 Square Feet, and is the director of the ResourcesForLife.com website.

(Photo courtesy of Gregory Paul Johnson.)



Little House on a Small Planet tells us that construction uses 40 percent of all the raw materials humans use. Half the copper we extract from the earth becomes wire and pipe for these buildings, and most of the trees we cut we make into lumber to build them.

We don't all have to live in *tiny* houses to affect the environment. If a modern house is $2\frac{1}{2}$ times as large as the average of 50 years ago (which was not tiny), it follows that we are using $2\frac{1}{2}$ times as much material to build it and heat it, and even more than that to furnish it. Then logically, it should cost $2\frac{1}{2}$ times as much money, but it doesn't.

We obviously can't compare prices; the 1950 average of \$8,450 is laughable today when the average is \$264,000 (but falling). But we can make another comparison. In 1950, the average household income was

\$3,210 a year; in 2005, \$46,000. So in 1950, the average house cost about $2\frac{1}{2}$ times the average household annual income. In 2005, it was nearly $5\frac{3}{4}$. Home ownership was theoretically more than twice as difficult to achieve in 2005 than in 1950, but during that period it went from 55 percent to 62 percent and later peaked near 70 percent.

That was a bubble, and it burst. As of January 2009, the median price of a home in the western United States was \$220,000, down 25.5 percent in one year. In other areas, Northeast, \$228,200, down 14.7 percent; South, \$152,100, down 7.4 percent; and the Midwest, \$138,100, down 6.8 percent from a year earlier. (Data source: National Association of Realtors.)

Off the Beaten Path

Consider some of the things that determine the cost per square foot of a house. A one-level ranch of 2,000 square feet needs a roof to cover the entire living area of 2,000 square feet. A two-story colonial with the same living area needs only half as much roof. Increase the roof pitch from $\frac{3}{12}$ (3 inches per foot of run) to $\frac{12}{12}$ and the roof area (including framing members, sheathing, and shingles), and the cost increases by 35 percent. Because the cost per square foot is nothing more than the total cost divided by the number of square feet, that number can quickly and easily be inflated with a couple of elegant bathrooms, 10-foot ceilings, a sweeping curved staircase, and, of course, the highly coveted gourmet professional kitchen.

Housing is becoming more affordable, but not in any sense of self-sufficiency has it become “reasonable” yet. For that we must still look elsewhere, to small houses or other alternatives. However, there are still pitfalls to avoid. Alternative housing isn’t the complete answer for those who don’t understand some of the basic facts about home ownership.

We’re saying that for self-sufficient living, a home isn’t reasonably priced if it requires a mortgage or one you can’t pay off in a reasonable length of

time. The time frame might depend on your particular circumstances, but 20 to 30 years is not reasonable for anyone, under any circumstances. The trouble is, too many people don't know enough about mortgages.

Off the Beaten Path

In a GfK Roper poll conducted in 2007, homeowners with mortgages were asked what type of mortgage they had. A stunning 34 percent had no idea.

When the 9 percent who had some variety of adjustable-rate mortgage (ARM) was asked what they planned to do when the interest adjusts, 34 percent again had no idea. By the end of 2008, one in five home "owners" had underwater mortgages: they owed mortgage lenders more than their homes were worth.

Few people understand the true cost of borrowing money for anything and would be astounded to learn that something can cost *twice as much* as they think they're paying. The culprit is compound interest.

Suppose you bought a house for \$100,000, with an interest rate of 7 percent for 30 years (360 months). To keep it simple for illustrative purposes only, you have no down payment: you are borrowing the entire \$100,000. (In the recent past this was actually possible. Today it's much less likely.) The lender or an online loan calculator (such as www.planningtips.com/cgi-bin/simple.pl or www.bankrate.com/brm/popcalc2.asp) says you will owe \$665.30 per month.

Do the math: $360 \text{ months} \times \$665.30 \text{ (per month)} = \$239,508$. For a \$100,000 house? How can that be? Here's what happens to that monthly payment.

Seven percent of \$100,000 ($100,000 \times 0.07$) = \$7,000. That's the interest for a year. You only used the money for one month, so divide 7,000 by 12, which is \$583.33. That's what you owe in interest the first month. So when you write a check for \$665.30, only \$81.97 has gone to repay the loan. You still owe \$99,918.03.

That means the second monthly check will be figured on that balance of \$99,918.03 the same way (the balance times .07 divided by 12), resulting in an interest cost of \$582.85. You have now paid \$1,330.60, but only \$164.42 went to repay the loan. The other \$1,166.18 was interest ... money down a rat hole. By the end of your mortgage payments, you'll have stuffed \$139,508 down that rat hole.



Watch Your Step

If compound interest exacts a shocking toll at 7 percent (as in our example), imagine what must happen when interest is two, three, or four times as much, as on many credit cards! People who want to be self-sufficient do not pay twice the asking price just for immediate gratification, much less four times as much. In fact, people who want to be self-sufficient do not use credit cards at all, unless they pay them off immediately.

One reason some people didn't pay much attention to this, or certainly didn't worry about it, was because home prices only went up. In some places, they doubled in one year, so why worry that they might not double in 30 years? With prices going in the other direction, more potential buyers will, hopefully, be aware of their mortgages.

There are many other aspects to consider in connection with mortgages. We could run through the example again but plug in different interest rates, down payments, or the near-magical effect of making larger payments or shortening the length of the mortgage. Someone not familiar with such things might be amazed at what a difference bi-weekly payments make,

compared with monthly payments. But make absolutely certain your lender can't stick you with a prepayment penalty; you want to pay it off as quickly as possible. If you're still interested in getting a mortgage and don't know much about it, learn as much as you can before you get involved.

The Owner-Built Home

Building an entire house from the ground up is the ultimate do-it-yourself project, but it happens. There is plenty of precedent for building your own home, as the birds do. Thoreau built his cabin at Walden Pond in 1845; the first homesteaders built their sod homes in the 1860s. A century later, hippies were building Buckminster Fuller- inspired geodesic domes out of old car hoods. Today, owner-built homes are made from logs, cordwood, straw bales, adobe, and even lumberyard boards, if you can imagine that.

One of the leaders in this field is Rob Roy. He has written 15 books at last count, including *Mortgage Free!*, which I recommend to anyone who lives in a house of any kind. Others include *Cordwood Building*; *Timber Framing for the Rest of Us*; and *Stoneview: How to Build an Eco-Friendly Little Guest House*.

But he's not just a writer and thinker. He and Jaki, his wife, have probably built more cordwood structures than anyone else. They run Earthwood Building School, which has been teaching cordwood building around the world since 1981. Diane and I have observed several of their classes and work sessions and can heartily recommend them if you have any interest whatsoever in this building method.

Cordwood construction isn't new: it was used a thousand years ago in Greece and Siberia. According to a researcher at the University of Wisconsin, the technique appeared again in Wisconsin, Quebec, and Sweden, apparently spontaneously, in the late 1800s. But like so much that's so old it's new again, there are plenty of modern twists thanks to technology and innovation.

Off the Beaten Path

Thoreau spent \$28.12 on what some designers today are calling a mini-cabin. At 10×15 feet, they don't usually require building permits. There are a number of designs, including Thomas Jefferson's Honeymoon Cabin.

But if you want to duplicate Thoreau's house at your own Walden Pond, it's easy. You can order the plans and blueprints for \$200. Or the company will ship you the fully assembled house for only \$22,500—F.O.B. Ashburnham, Massachusetts.

Of course, Henry used recycled shingles, bricks, and windows, which might partly explain his lower costs—maybe. In any event, “small” doesn't necessarily mean “cheap,” today.

“Cordwood” is a reference to logs cut into firewood lengths, often about 16 inches. It can be anything you can evenly divide into 48 inches. A standard cord is a 4×8 foot stack of 4-foot-long logs. Cordwood construction, also called cordwood masonry or stackwall construction, uses wood uniformly cut anywhere from 14 to 24 inches long. Lighter woods are preferable to dense hardwoods such as oak and maple because they are less susceptible to expansion and contraction. Obviously, woods resistant to rot, such as cedar and Pacific yew, are good choices. In our area, popple (poplar, aspen) is commonly used. In any case, the wood must be debarked and dry.

The actual construction is akin to laying brick or stone, with a special mortar mix. The wood will suck moisture from the mortar, causing it to dry too rapidly, which decreases its strength. To combat this, the mix usually contains damp sawdust. The common mix contains nine parts sand, three presoaked sawdust, three builder's lime (not what you use on the garden), and two Portland cement. The walls are built on a concrete foundation at least 24 inches above ground level.

One of many buildings Rob and Jaki have constructed is their guest house, which they call Stoneview. With an octagonal footprint and 320 square feet of usable space, it's considerably larger than the “small houses” mentioned previously. The total cost was \$5,000.

Rob and Jaki Roy's round, off-the-grid cordwood home has an outside diameter of 38 feet 8 inches, 16-inch-thick walls, a living roof, and 2,070 square feet of living space. The owners built it without a mortgage.

(Photo by Rob Roy, Earthwood Building School, West Chazy, New York,
www.cordwoodmasonry.com.)



The complete instructions—and by “complete” I mean everything from site preparation to forming and pouring the slab, to the living roof and a complete costing analysis—are in the book *Stoneview: How to Build an Eco-Friendly Little Guesthouse*, available at the Earthwood website, www.cordwoodmasonry.com.

The Incredible \$50 House

Most people would find the concept of a \$50 house incredible. And most would recoil at the idea of living underground. But this is a case where you have to see it to believe it.

Mike Oehler is another one of those talented and creative people who has contributed so much to self-sufficient living over the years. The house he built in 1971—underground and for \$50—should serve as an example and inspiration for anyone who has dreamed of living independently and sustainably or who is interested in creative design and architecture. And a mortgage on a \$50 house doesn't even enter the picture.

Dismiss any ideas you might have about U-housing being dark, dank, and airless. Mike's designs are nothing like that. And yes, you can spend a great deal more if you want to. Some homes of this type have cost thousands, and he himself put on a \$500 addition. (The original would no doubt cost more than \$50 today, too.)

You might have seen pictures or at least have a mental image of an underground home using what Mike calls "the first thought design." This most often involves digging a hole in the side of a hill and plunking down a more-or-less conventional structure, probably made of cold hard concrete. A bank of windows faces downhill, while the uphill side is a blank, dark wall. Leaks are almost inevitable; there is little or no airflow; and the view is limited at best.

A Mike Oehler U-house couldn't be more different, due to what he calls the "Five Approved Methods of Design." These are the uphill patio, the off-set room, clerestories, the Royer foyer, and gables, all with specific purposes and all of which provide light, views, and ventilation. Incorporating these elements transforms a hole in the ground into a wide variety of enchanting, eco-friendly, eminently livable, and very interesting earth-sheltered dwellings. (I personally think they would be a much greater asset to Frank Lloyd Wright's Broadacre City than the Master's own Usonian homes.)

Mike Oehler said it's hard to get a good picture of an underground house because of the way it blends in with its setting, which of course is one of its attributes. Even a 2,000-square-foot home like this one can be a part of nature.

(Photo courtesy of Mike Oehler, author of The \$50 and Up Underground House.)



While Mike's design features suggest artistic genius, the building method itself is an engineering triumph. He calls it the PSP method, for post-shoring-polyethylene. I can cram an overly-simplified explanation into one sentence. The space is excavated; posts are sunk; boards (shoring) are placed against the posts on the earthen wall side; the shoring is covered with the plastic sheeting; and the space is backfilled.

Off the Beaten Path

Greens frequently complain about plastic: in landfills it will last for hundreds of years. But when you use it to build an underground house where you want it to last, that's making a lemon into lemonade on a grand scale!

The roof is basically the same. Girders are secured to the posts; beams are placed over the girders; boards go over the beams and are covered by roofing felt or tar paper, poly, and earth. You can add insulation to provide a higher R-value with less soil and weight.

Such a house can cut your heating costs by 80 percent and eliminate air conditioning. It's obviously a good place to be during a tornado.

I actually built one of these, and I have to admit, even though it's tiny (8×12 feet), it cost a lot more than \$50. I cut the posts, beams, and girders from my own land but bought OSB (oriented strand board comes in plywood-like sheets) for the shoring and roof and poly, tarpaper, and insulation. It's a nice place to visit, but I wouldn't want to live there, although those people who enjoy their under-100 square foot habitats might enjoy it—and it was much cheaper than most of theirs.

However, I can certainly see the possibilities as a temporary or emergency storm shelter or a quaint guesthouse. If I were one of those now living in a tent city, I would definitely prefer a U-house. And a larger version would not only provide a comfortable and artistic living space but would also be the ideal choice for the suburbs of the future, such as Broadacre City.

Another Oehler book, *The Earth-Sheltered Solar Greenhouse Book*, will have even broader appeal. You don't have to live underground to take advantage of the benefits that construction method provides to growing plants. In many parts of the country you can grow vegetables year-round, without any energy input. It's hard to beat that for self-sufficient living. (See www.undergroundhousing.com.)

Alternatives to Ownership

The simplest and most straightforward way to avoid a mortgage is to not buy a house. After all, not everyone can be, needs to be, or even should be a homeowner.

If your heart is set on a traditional homestead lifestyle, ownership is attractive. Renting a small farm is possible, but it puts serious restraints on long-term planning. You'll naturally be reluctant (and properly so) to make any serious improvements or to plant things like fruit trees. But if you see it

as a temporary situation while you accumulate capital and the rent is reasonable enough to enable you to do that, it's a good way to experience country living before you totally commit.

On the other hand, you can be quite self-sufficient on a rented place, even in a town or city, especially if the rent is attractive.

There are "in-between" scenarios. A rental unit might be considered temporary, but so can other options. Many a homesteader has bought bare land, with no money left to build with and an aversion to mortgages. Some rent living space in town and commute to their land; others live in mobile homes, RVs, or tents while building. I've known several who built and lived in a garage or other small structure while building a house, including one who built a small cordwood structure as practice for building the cordwood house.

Increasingly, there's a new twist on the cherished idea of starting from scratch on bare land. The sloburbanization of America has reached far beyond the suburbs, and many question the wisdom of continuing to convert five-acre chunks of wilderness or farmland to more of the same. A much greener approach, and frequently a more economical one, would be to purchase something that's already in place and bring it up to self-sufficient living standards. This can take several forms; one is to rehab a white elephant.

Our first real estate purchase was a large, brick, two-story cheese factory on the edge of a small town in southern Wisconsin. We couldn't get a bank loan because the bankers said we could never make it into a home and it wasn't laid out right for a bowling alley. But it was dirt cheap. We got private financing, and after building up some equity, we tripled our investment (I said it was dirt cheap) by doing a major rehab. We found a creative architect who made fools out of the bankers who said it would never be a home and did much of the labor ourselves. A few years later we sold it at a modest profit and moved to our 80-acre dream farm, purchased with a substantial down payment.

Note that this was not during a housing bubble or a period of generally escalating prices. We didn't make any money through speculation. We took on a hopeless case nobody else wanted. We made a silk purse out of a sow's ear and were compensated for the risk we took, our vision, and our labor.

If you really need or want space for some reason—maybe your wife wants the printing press out of the bedroom, like mine did—you might find some fascinating possibilities by looking at old barns, factories, warehouses, and such. One couple made a veritable castle out of an old feed mill they bought for a song. Imagination, vision, and sweat equity can often make up for lack of money.

We can't give up on cities yet, either. Most cities don't have much to recommend them in their current condition, but they do have possibilities for green living, at least. We'll visit some of these a little later.

What Every Teenager Should Know About Mortgages

Teenagers? Mortgages? What do teens care about mortgages! No, a teen isn't going to buy a house. But most of them will, or will want to, some day, and some day always comes before we're ready. The time to prepare is now. The way to prepare is to understand the importance and the techniques of saving, the folly of borrowing, and the way interest works (whether you borrow or lend/invest).

If some of the former teens now in their 30s, 40s, or 50s and facing foreclosures and losses of both money and dreams had learned more about money management and personal financial responsibility when they were younger, it's possible that many of them would not be in the situations that ensnare them today. If enough of them had been properly educated, the housing boom and resulting bust might never have occurred at all, and the entire country would be different today. They would be a lot closer to self-sufficiency.

Off the Beaten Path

If you were offered a million dollars or a penny—the penny to be doubled each day for a month—which would you choose? Take the million, let your sister take the penny, and in 30 days she'll have about \$4 million more than you. That's how compounding

works. (Make it a 31-day month and double the \$5 million once more ... get the picture?)

Most people who are aware of these facts learned them from their parents, not in school:

- Debt is bad; saving is good.
- Paying interest is dumb; collecting interest is smart.
- Living beyond your means is crazy and unsustainable. Spending less than you earn is sensible and the only way to get ahead financially—or even survive.
- If you really want something, save until you have enough to purchase it.
- Start saving early and make compound interest work for you.

For those who learned all this at a young age, it's only common sense, although another example of the kind that is not common enough. If you don't believe that, explain why the average credit card now carries about \$7,000 in debt, much of that at interest rates we should consider ruinous if not usurious.

People who treat their credit cards like geese that lay golden eggs have no reason to change that attitude when making what is usually the biggest purchase of a lifetime: a home. And that's exactly what happened. People treated their homes like ATMs. Many now regret it.

The Least You Need to Know

- Self-sufficient living is debt-free living, mortgage included.
- You probably don't need as much space, or as many amenities, as you think you do.
- Consider rehabbing an old building or building on marginal land.
- Consider some of the eco-friendly alternative building methods.
- Understand compound interest and how to use it; it can destroy you or be your friend.

Chapter 23

Cool Ways to Keep Warm

In This Chapter

- The (very) short history of heating and cooling
- Zero Energy Buildings (ZEBs)
- The well-insulated nest

Once you have an abode, heating and cooling are major hits to both your pocketbook and the environment. In Florida, heating and cooling account for 40 percent of the energy the average home uses. In Canada, that figure is 80 percent.

Relieving this burden is becoming easier, thanks to new technologies that, unlike older ones, acknowledge both costs and environmental concerns. Whether you're building new or rehabbing and recycling, you can do a lot with technology and common sense.

Keeping the Home Fires Burning

Most people today take central heating and air conditioning for granted. Few realize just how recent these comforts are and think living without them would be like returning to the Dark Ages. Maybe it would—if they consider the time of their great-grandparents the Dark Ages. In tough times and situations it might help to keep some things in perspective. Horribly primitive as it might seem to some youngsters, humans haven't always kept comfortably warm or cool by poking one finger at a digital thermostat.

No doubt humans have always enjoyed solar heat; even a snake enjoys basking on a sun-warmed rock. Civilization started later, with the discovery of fire. The fuel was wood.

By the 1400s, wood was becoming scarce in Europe, and coal became the common heating fuel. North America had plenty of firewood for its first hundred years, but by 1885 Americans also were burning more coal than wood. As there was no electricity for fans or pumps, the coal furnaces of that time used natural convection, the heat rising from the basement to the rooms above. Coal was kept by the ton in room-size bins in the basement and shoveled into the furnaces (usually by the woman of the house, according to antique engineering books dealing with the subject). The first coal furnace to use an electric fan to move heated air was installed in 1935, which of course was in the depths of the Depression, when not many new-fangled furnaces were installed.

Off the Beaten Path

Of the 0.2 percent of homes in the United States still heated with coal or coke, 37 percent are in Pennsylvania. Solar heats 0.3 percent of American homes.

Very soon after, gas and oil replaced coal as fuel. No one mourned the passing of the coal bin and its dust, shoveling coal into the furnace, or removing and hauling out the clinkers that remained. Today, hardly a generation later, 60 percent of our homes are heated with gas, and another 9 percent use oil, with heat pumps employed in many of the rest. All use electricity for pumps and fans.

Air Conditioning

Air conditioning (AC) has a much shorter history because it had to wait for the electric motor to be invented. The electric fan was invented in 1886, shortly after Thomas Edison opened the first electricity generating plant, in London. Most people didn't have electricity until years later. The Tennessee

Valley Authority (TVA), Rural Electrification Administration (REA), and Boulder (now Hoover) Dam all went online in the 1930s.

By the mid-1930s, most cities and towns were electrified, but 9 out of 10 farms were not. Farmers milked cows by hand, by lantern light; spring water cooled the milk as there were no electric conveniences in the house. Then the Rural Electrification Act was passed in 1936, and by 1953, less than 20 years later, only 1 farm out of 10 was without electricity.

The first air conditioner was built to control humidity in a printing plant. For many years, AC was concentrated in industrial and commercial settings, such as movie theaters. (I clearly remember when the theater in my hometown got air conditioning, sometime in the 1940s. What a marvel that was for us kids on hot summer Saturdays.) Not until the 1950s did residential air conditioning become widely available.

Off the Beaten Path

The government-subsidized REA, conceived to electrify family farms, had several unintended consequences. One was that it destroyed a fledgling wind electric generation industry, which didn't regain its former stature until the 1970s.

Now what does all this history have to do with natural, self-sufficient living? Well, life used to follow seasonal cycles, and it wasn't that long ago. Electric lights changed night into day; central heating made winter into summer; and air conditioning, summer into spring or fall. They changed the way we live. We had night baseball games. (The first night game was played in 1880, long before most homes had electricity.) So why not have night bowling and shopping? They changed *where* we live. Some sociologists contend that without air conditioning, places like Las Vegas, Phoenix, Houston, and Atlanta would be little more than villages. (Picture the effects of that on water supplies.)

All three innovations have changed the way we design our factories, schools, offices, and homes. No one sat on the porch in summer anymore,

so we can eliminate it. Scratch the coal bin; add picture windows and sliding doors. There's no need for windows to open, or any windows at all, for that matter.

That's where we stand today, while looking at escalating fuel costs, dwindling fossil fuel reserves, environmental degradation, and global climate change.

Now we can talk about green shelter for self-sufficient living. As we do, please bear in mind how recently most of our energy came from wood or coal. If self-sufficiency means going back to that, we wouldn't have to go back very far. But of much greater interest, when conditions are right, things can happen fast—very fast.

ZEBs: Zero Energy Buildings

Considering how long it took to switch from wood to coal, how quickly we switched from coal to petroleum, and how many other technologies have been introduced in the brief period since then, it's safe to assume we "ain't seen nothin' yet." If *Moore's Law* applies to all technology and the environmental incentives translate into economic incentives, changes in the next few years will dwarf those of the past few years, significant as they have been.

def•i•ni•tion

In 1965, Gordon Moore, a co-founder of Intel, stated that the number of transistors on a chip will double about every two years. Known as Moore's Law, the observation has held up for half a century and is expected to continue for at least another decade. However, similar observations might be applied to other emerging technologies, such as solar, thermoelectric, or something yet unnamed even if the growth rate is less spectacular. For example, while only 14 percent of the photons that strike a photovoltaic cell are converted to electricity, this is

four times as much as it was only five years ago. Further improvements are expected to come faster. At some point, solar-generated electricity can be expected to make the kind of technical and social transformations oil, and electricity itself, made only a few years ago.

Few people would willingly go back to even the very recent past, but they obviously could, if they had to.

There is, however, a move to avoid anything so drastic as being uncomfortable. That's why off-grid solutions became popular and the Independent Home a catch-phrase. But now we have something even better; it's called Zero-Energy Building, or ZEB.

While there are a number of nuances, variables, definitions, and differing opinions involved, ZEB is basically a building that generates all the power it uses, employing renewable sources such as sun and wind or biomass. The building might actually produce more than it uses, sending the extra into the grid. Some purists take it further and include the emissions generated in the construction of the building. These we can reduce by using recycled or reclaimed and local materials.

Many people will be surprised to learn that basic ZEBs have already been built, more are being built, and they're getting better and cheaper all the time. What's more, the United States Department of Energy Office of Energy Efficiency and Renewable

Energy is behind the effort. As early as 2007, the California Energy Commission recommended requiring net-zero-energy performance in residential buildings by 2020. Without mentioning ZEB, Sweden has set a goal of being oil-free by 2020—and without building more nuclear power plants.

Off the Beaten Path

When most people think about solar power, they're thinking about photovoltaic panels, which produce electricity, not heat.

Solar water heating has been used in sunny southern locations for many years, and solar space heating is becoming more common. These are *active* solar systems. *Passive* solar is as simple as having windows on the south side to capture the sun's rays and warmth.

The environmental motivation is clear: reduce carbon emissions as well as dependence on fossil fuel.

Just as central heating and air conditioning played a role in building design, both residential and commercial, the new energy parameters are changing the way architects and designers think. Some have developed sophisticated 3D computer programs to work out things the owner-built home pioneers have been doing by the seat of their pants. Included is the structure's orientation relative to the position of the sun on both a daily and seasonal basis. The depth of overhangs can determine how much sun enters the building at various times. The placement of windows and doors, consideration of prevailing winds, and amounts and types of insulation are all important and nothing new. Neither is making use of daylight indoors, a Frank Lloyd Wright favorite that went out of style some time ago but is making a comeback. Where possible, principles of earth-sheltered building are used, as well as thermal mass.

The main difference in a ZEB is that the designers get really, really serious about energy-saving features. They use high-efficiency heating, cooling, lighting, laundry, and other equipment. Extra insulation and super-efficient windows are standard. But then they might go on to use heat recovery units on wastewater and refrigerator waste heat to heat water. In offices, heat from computers, other machines, and even human bodies is made part of the system.

If you're interested in building something like this or just curious, do a web search on these words: heat recovery ventilation, hot water heat recycling, absorption chiller units, thermal mass, misc. electric loads, standby power, and super-insulated. That's only a sample. The point is, every one of these technologies is available today and off-the-shelf, not custom-made.

A ZEB generates its own electrical and heating energy. Most often, solar cells and wind turbines provide electricity, and biofuels and solar collectors,

usually in tandem with seasonal thermal stores, provide space heating. In the good old pioneer days, maybe 40 years ago, we thought a 55-gallon drum painted black was a swell thermal store. Now you're more likely to encounter a PCM (phase change material) or LHS (latent heat storage) unit. According to Wikipedia, the most commonly used PCMs are salt hydrates, fatty acids and esters, and various paraffins "such as octadecane." By this point it would seem that a ZEH(ouse) is more than a DIY project for most of us.

Off the Beaten Path

One woman who lives off the grid said that whenever the batteries get low, she plans a picnic on the patio. That never fails to kick up a wind that gets the windmill spinning again!

However, the energy used in *any* house depends in large part on the occupants. Homes using alternative or renewable energy use far less than the average home on the grid. They usually have to because of the limitation of battery storage capacity. Watching their batteries—and often, the weather that affects their power production—makes homeowners more aware of energy use and waste. But that awareness is probably why they're off the grid in the first place.

Here's something even more interesting and pertinent. Studies of identical homes have found that some people use *twice* as much energy and water as others! It's often because of very simple things: the energy savers use more conservative thermostat settings for air conditioning and space and water heating; they turn off lights that aren't being used and use less illumination; they use fewer and more efficient appliances and other electric devices. *You can save energy by the way you live, without investing in new technology at all.* And just as with saving money in the previous chapter—and in fact, with most things throughout this book—it's 90 percent mindset. Attitude counts.

People who think alike often band together. Some people interested in zero energy housing live in zero energy neighborhoods, including a development in the United Kingdom and several in California and China. Some use district heating, shared wind turbines, community chilled water, etc. Among the advantages is the elimination of electrical transmission and distribution losses, which normally exceed seven percent.

Dongtan, Eco-City

There have been several intriguing plans for entire zero energy eco-cities, such as Dongtan, near Shanghai, China. This ambitious plan called for a city “which will be sustainable not just environmentally, but also socially, economically, and culturally,” according to the British designers and master planners. It was designed to be as carbon-neutral as possible, producing its own energy from wind, solar, and biofuel, and would have public transportation, using clean technologies, and a network of cycle and footpaths. Two-thirds of the site was set aside for green corridors of public space and organic farming. It was to have a population of 50,000 in time for the Expo 2010 in Shanghai, and 500,000 by 2040.

Through a series of misadventures, the project was delayed and by the end of 2008, apparently dead. Some cynics claim it was nothing but propaganda from the beginning, but a lot of critical thinking went into it. If nothing else, it should be an inspiration. (See *Wired* magazine article: www.wired.com/wired/archive/15.05/feat_popup.html.)

Beddington Zero Energy Development

A live dog is much fiercer than a dead lion. Beddington Zero Energy Development (BedZED) near Wellington, England, is a much less ambitious project than Dongtan, but it's completed, inhabited, and operational. The 99 homes were built between 2000 and 2002, largely from recycled, reclaimed, environmentally accredited, and local materials. There is also workspace for about 100 people.

The zero energy goal is met partly by solar panels and tree waste (wood chips) burned in a downdraft gasifier. The gasifier wasn't being used because of technical problems, although the developer noted that the technology was successful at other sites. (Apparently the "technical" problem was the installing company's financial situation, not a mechanical glitch.)

A "living machine" system of recycling wastewater was also installed but not in operation, although these, too, are becoming common and successful. Most of the rainwater is collected, and appliances are water-efficient.

Transportation is available through a car-sharing operation. Electricity is provided in parking spaces for electric cars, which have priority over gas and diesel. There are 10,000 square feet of green roof and a wind-powered ventilation system. The site is built to the same density as London's Soho, but in BedZED everyone has a garden.

By 2003, BedZED space heating requirements were 88 percent less than the United Kingdom average. Electrical power used was 25 percent less than the average. Water consumption was halved, and car mileage was reduced by 65 percent.

Canada's R-2000

Back in the New World, the emphasis is more concentrated on individual dwellings. However, Canada's R-2000 has been a worldwide model. Natural Resources Canada and the Canadian residential construction industry developed R-2000 to promote the use of cost-effective, energy-efficient building practices and technologies. One notable success so far is that heat recovery ventilators are now a \$50 million a year industry in Canada. Before R-2000, they were unheard of.

The first R-2000 home was built in Saskatchewan in the early 1980s. The name came from the R-value of insulation and the year 2000, which at that time seemed far enough away to appear futuristic.

Off the Beaten Path

According to the Census Bureau, almost 7 out of 10 homes in western states do not use any energy for heating. They don't even have the equipment.

As the name implies, the focus is on energy efficiency. The standard covers requirements for ventilation, airtightness, insulation, choice of materials, etc. The requirements are about 40 percent above the regular building codes, but R-2000 is strictly voluntary. People buy R-2000 homes because of their energy efficiency and overall quality. A house that uses 30 percent less energy than a normal new house is very attractive when oil hits \$140 a barrel.

Florida Solar

In Canada, about 80 percent of the energy used in homes heats space and water. In Florida, the number is 40 percent, and most of that is electricity. But Florida also gets about 85 percent of its possible sunshine; that is, it's only cloudy 15 percent of the time, which makes it a great place for solar.

The Florida Solar Energy Center is the largest and most active state-supported renewable energy and energy efficiency research institute in the United States. An institute of the University of Central Florida, the 20-acre Cocoa campus is also involved in education, testing, and certification. The 150-member staff is charged with researching and developing energy technologies and works with industry, nonprofit organizations, private sponsors, and national laboratories.

In the south, Florida included, solar water heating was popular in the 1920s, when natural gas became available and dominant. Now the tide appears to be turning again. When the state offered rebates on solar systems installed in 2008-2009, the entire \$5 million fund was gone by the end of the first year.



Lore of the Land

Set your air conditioning thermostat to 78°F, Florida advises its residents. For every degree setting below 78°F, you spend up to 8 percent more in energy costs.

Heat Pumps and Geothermal

According to the United States Environmental Protection Agency (EPA), the most energy-efficient and environmentally sensitive of all space conditioning systems is geothermal heating/cooling. Also known as ground source heat pumps (GSHP), these systems use the virtually constant temperature beneath the earth's surface—about 55°F—to heat and cool a building.

That 55°F heat is transferred to water or another liquid stored in a ground loop. The heat pump can then wring 100°F out of it. Even more magical, the same machine and process can cool the house in summer. Here's how it works.

The heat pump contains a refrigerant, such as Freon. The refrigerant, which is cold and liquid, absorbs heat from the 55°F water (or other liquid) from the ground source through a heat exchanger. (Yes, "heat," from 55°F water; remember, absolute zero is -459.67°F or -273.15°C.) As the heat is absorbed, the liquid refrigerant evaporates into a gas, which goes into a compressor. The compressed gaseous refrigerant can reach 180°F. Then a

refrigerant-to-air heat exchanger takes the heat from the refrigerant and blows it into the house at about 100°F. The now-cooled refrigerant returns to its liquid state, and the process is repeated. For cooling, the process is reversed.

We have experience with one of these. Not only does it use the ductwork the previous, oil-burning furnace used, but we can also use a wood-burning furnace with the same ducts. The water comes directly from the well, which avoids the considerable cost of the more common closed loop system, and returns to the water table. (Minnesotans can return it directly to the well, but that's illegal in Wisconsin.) For us, the biggest negative is the amount of electricity the system uses.

A closed loop consists of polyethylene pipe containing water or an antifreeze solution, buried in the ground. It can be laid out vertically, in holes drilled like a well, or horizontally in three- to six-foot-deep trenches. Although ground source heat pumps do use electricity, the amount is supposedly insignificant compared to the heat recovered from the clean and renewable source. They don't require a flue; there's no chance of carbon monoxide poisoning; and because there is no combustion, there's less chance of a fire.

One downside is the initial cost. Expect to pay as much as 30 percent more than you would for a more conventional heating and cooling system.

But the word "conventional" is relative and can change rapidly, as we've seen. While there are only about 150,000 GSHPs installed now, the Geothermal Heat Pump Consortium wants to change that. Consisting of the EPA, DOE, 240 electric utilities, and 20 heat pump manufacturers—oh, and \$100,000,000 to spend on rebates and other incentives—it might have a chance.

It hasn't been that long since even the most up-to-date homes were heated with what was basically an enclosed campfire, such as warmed the first cave dwellers. Innovations of just the past few years have been astounding, and this is undoubtedly just the beginning.

Off the Beaten Path

The Solar America Initiative is a United States Department of Energy effort to accelerate the development of solar energy technologies. The goal is to make photovoltaics competitive with conventional electricity by 2015.

But there's no need to wait or to start from scratch. Fred Krupp, president of the Environmental Defense Fund, recently said that of the 130 million homes in America, 75 percent could be made more energy-efficient with a very quick payback. Add to that the energy-saving *attitudes* displayed by owners of off-the-grid homes, and you can increase your energy independence without adding a single solar panel or windmill.

The Least You Need to Know

- Wood and coal were the only sources of fuel until very recently.
- Zero Energy Buildings (ZEBs) are already operational, with many more on the way.
- The United States government has joined private industry in promoting ground source heat pumps.
- Some people use half as much energy as others living in identical houses because of attitude!

Chapter 24

Your Water Footprint

In This Chapter

- Global, national problems
- Backyard problems and solutions
- Household water: the low-flush toilet
- Some potential solutions

“Carbon footprint” has become an everyday concept, and “water footprint” is catching up to it. The United Nations has identified water shortages as one of the two most serious problems facing the world today. The other is global warming, and the two are interrelated.

It’s a huge problem and a huge topic, and every informed person, self-sufficient or not, should know a few of the facts.

Times Change

It goes without saying that the old-time books on self-sufficient living didn’t mention “carbon footprints.” Pollution had a very different meaning in those days, and conservation was seldom mentioned before the Dust Bowl, Aldo Leopold, and a few others brought it to the fore.

And water?

Those venerable old books talked about getting water from a spring, digging a well and, later, driving and drilling wells, and constructing a cistern. They told how to get water out of a well or cistern and, if you were fortunate, into the house without carrying a bucket. Ah, for the good old days.



Off the Beaten Path

“Here’s a good example of how availability increases consumption and waste.

“When water has to be carried from a well, average consumption is eight gallons per person per day. When a pump is put at the kitchen sink, consumption increases to 10 gallons per person per day. Put in a faucet and that figure goes up to 12 gallons. Introduce hot water in the kitchen, and you’ll use 18 gallons a day. But put in a complete plumbing system under pressure, and consumption increases to 30 gallons a day. Too often, a high standard of living is confused with foolish waste.”

That’s from my book *Country Living, A Guide for City People*, published in 1973. Today the per capita daily consumption in the average American home is more than 100 gallons.

But those days are gone forever. Today, we might start a discussion of water by noting that yesterday, thousands of kids died from drinking contaminated water. We know this because, according to the United Nations, thousands die *every* day from contaminated water. More than a billion people lack access to safe drinking water. One reason is that 2.5 billion lack access to sanitation facilities, such as latrines and sewers. Every year, more than five million of them die because of water-related diseases. And food crops lost to drought are almost immeasurable.

These concerns have little to do with you or me, but we have problems of our own. If we live in California or Georgia or any other place where water shortages are news-worthy, we might say, “I feel your pain.” If our city bans watering lawns or washing cars, we feel water-deprived. For some people, not taking a daily shower would be worse than going naked, and yet, one flush of a toilet uses as much water as the average person in the underdeveloped world uses for the entire day’s cooking, washing, cleaning, and drinking.

Yes, as we learned in grade school, water does cover two-thirds of Earth’s surface. But 97.5 percent of that is salty, and 66 percent of the rest is ice. Of the remainder, about 20 percent is in largely uninhabited areas. When water

falls as rain, most of it falls at the wrong time, in the wrong place, or in the wrong amount.

At the end, about 0.08 percent of Earth's water is available for human use. Putting that into a graphic, picture all the water in the world in a gallon jug. Our share of that is a bit more than a tablespoon. Now we can talk about how to be self-sufficient, on a tablespoon of water.

The Water Crisis

Clearly, there is a water crisis. It has been brewing for some time, and water experts expect it to become much worse. The World Water Council forecasts that by 2020 the water shortfall will be 17 percent. By 2009, more than two million residents of Mexico City and 13 other jurisdictions in the area had no municipal water for three days a month because of shortages. Some California farmers found they could make more money selling their water rights than growing crops; others were simply cut off.

One reason is the increase in population. This is especially obvious in arid sunbelt cities. The climate might be lovely, but there isn't enough water to support all the people who want to live in such idyllic places. But it's not necessary to look at desert areas: most cities with growing populations face water problems.

Everyone wants a higher standard of living, and that involves water. For those living in abject poverty, that might be a cup of clean drinking water and enough irrigation water to grow a bowl of rice or some beans. At the other end of the scale it could be someone living in the desert with a green lawn but envious of a neighbor with a swimming pool. Between the two extremes, it might just involve improving the diet to keep pace with an increase in prosperity, eating beef instead of beans. The beef requires much more water.

The industrial use of water is also tremendous. Very little associated with a high standard of living is not in some way associated with water.

Our standard of living is one reason Americans have the highest rate of water consumption in the world. In fact, it's twice the global average and

more than three times the Chinese average. The average American uses an astounding 1,189.3 gallons of water every day.

Most people are incredulous. 1,189.3 gallons! But I only drink eight glasses of water a day! I flush a toilet a few times and take a shower and wash the dishes and do the laundry ... but even so, 1,000+ gallons is ridiculous.

Welcome to the concept of the water footprint.

The water we actually use, at home, amounts to just over 100 gallons a day, which is bad enough when you think of others getting by on less than three, which is polluted besides. Or that even Americans used only 30, a generation or so ago. Now we can add to that *virtual* water, the amount used to produce food and other products.

Off the Beaten Path

Professor John Allan, from King's College of the University of London and the School of Oriental and African Studies, developed the concept of virtual water in 1993. "People do not only consume water when they drink it or take a shower," the Stockholm International Water Institute explained. "Behind that morning cup of coffee there are 140 liters (37 gallons) of water that was consumed to grow, produce, package, and ship the beans." The Institute awarded Allan the Stockholm Water Prize in 2008, saying his calculation method has changed the nature of trade policy and research. The idea is now embedded in the production of foods and industrial products.

It's been bandied about for some time that if you eat one pound of beef, you've used 2,500 gallons of water. Some people say that's the water the animal drank—plus the water it took to grow all the feed it ate. Vegetarians love this, and for some American beef, it could very well be true. If the hay and grain were irrigated, the water used was significant.

The people who spend time figuring out such things tell us it takes about 50 gallons of water to produce one egg, 19 gallons for an apple, and 343 for a

one-pound loaf of wheat bread. There are about 50 gallons of virtual water in a can of cola, and more than 600 in a hamburger. And that's still not all. Nonfood items also use water. It takes 24 gallons of water to make a pound of plastic. A cotton shirt, 765 gallons. And a pair of leather shoes, more than 2,000 gallons (mostly because of those darn cows, again). The virtual water involved in most industrial products is hard to pinpoint, researchers admit. But putting it all together, 1,000 gallons a day seems like a pretty conservative estimate.

Off the Beaten Path

Does it really pay to shower with a friend or use water from the dishpan to water the petunias (you do wash dishes in a dishpan, don't you? With biodegradable soap?), or to "let it mellow?" Those tricks are going to save a drop in the bucket, compared to that 1,000 gallon a day figure.

Of course it pays. Every drop counts, and you have to start somewhere. But the bigger point is to start thinking about where your virtual water comes from and change your consumption habits. The real conservation lies in attitude.

Even more significant than population increase and a rising standard of living is the inefficient use of water. Irrigation is a prime example.

Irrigation, in fact, accounts for most of the water in that beef. Beef produced on irrigated hay and grain does use a tremendous amount of water. Grass-fed beef, produced on marginal land in a region humid enough to not require irrigation, shouldn't fall into the same classification, but few sources take that into account. They do note that pork and chicken have smaller water footprints because they're generally located in regions where less irrigation is required. Goat meat is comparable to chicken, or about a fourth of the figure for beef, partly because goats mature more rapidly.

Most irrigation is very inefficient. A great deal of the water soaks into the ground without doing the crop much good. Vast amounts evaporate.

Watering lawns and golf courses is arguably the greatest waste of all, even without considering the environmental effects of mowing all that lush green grass. Subsoil drip irrigation is the most efficient way to water vegetable crops.

The inefficiency of the modern flush toilet is legendary and needs no amplification. Low-flush and dual-flush commodes, the new norm, will no doubt be improved upon.

Other water-using home appliances have also seen recent improvements, with more undoubtedly to come. It will be some time, however, before these are in general use. Until then, inefficient water use will continue to be rampant—at least among those without a water-conserving mindset.

Off the Beaten Path

A faucet leaking one drop a second wastes 2,700 gallons a year.

Planetary Water Self-Sufficiency

Earlier we saw a picture of Spaceship Earth, a small, lovely planet, all alone in the vast sea of space. All the water we'll ever have is on this small globe. When we've sucked the aquifers dry and turned the surface water to filth, there is nowhere to send out for more. The only option is to take care of what we already have. The planet must be self-sufficient because we have nowhere else to turn.

Seen in this context, yes, it does matter to a peasant in Africa when a suburbanite in Los Angeles or Minneapolis overwaters a lawn and sprays half on the driveway and sidewalk.

Water is not the infinite resource we've taken it to be. It's constantly recycled, but that doesn't mean today's polluted lakes and streams will be available for our use tomorrow. And it most definitely doesn't mean that water taken from underground will be replenished with the next rain shower. Agriculture, industry, and municipalities have been and are

increasingly tapping these subterranean groundwater supplies. Some aquifers are so depleted they won't be replenished in several human lifetimes.

The New Oil

Water supplies can be, and have been, compared to oil in the ground. Some economists have called water "the new oil," in that countries and areas with ample amounts will have great advantages over those that have shortages. But we could also compare the finiteness of both. Oil wells, entire oil fields, run dry, and the rigs move elsewhere. Water reservoirs and wells run dry, too, but the solution isn't as simple.

It seems to be the human way or at least the greedy and unthinking human way. When the surface water is used up or too foul to use, we drill a well. When the well runs dry, we drill a deeper one. Of course, that one will run dry, too, simply because we take out more than nature is putting in. So then we talk about building aqueducts, maybe from the arid west all the way to Lake Superior. As if that's going to be any different.

Off the Beaten Path

In a 2007 report, the United Nations Climate Panel said the world faces serious additional strains on water supplies due to global warming. It predicted that by 2020, 250 million people in Africa would face even more serious water shortages than at present and the melting of Hima layan glaciers could disrupt water supplies for millions of Asians.

By then the lakes and streams and wetlands that were an integral part of the aquifer have dried up. The ecology changes. Empty aquifers collapse, causing land subsidence. Living prairies become deserts.

We've been treating everything like this, for generations now. We keep withdrawing more from the bank than we have in savings. When the checks bounce, we use a credit card. When one card is maxed out, we get another.

What Are the Solutions?

And what can we do about it? As we might expect, different groups offer different solutions.

The mechanics think desalinating sea water and purifying wastewater are good bets. The engineers like piping water from the Great Lakes to needy areas, and dragging icebergs to the Arab nations would be workable. There is the concept of virtual water, with the suggestion that we factor its cost into trade and commerce. And of course, the conservationists have their rain barrels and brown lawns.

Each of these has some good points. Considering the nature and scope of the problem, we'll probably use parts of several or even all of them. But for most of us in the here and now, the logical place to start is with conservation. And the mechanics, engineers, and other types of tinkerers have already made that much easier than it was only a few years ago.

United States federal law mandated low-flow toilets in 1994, and they've been regulated in Canada on a region-by-region basis. They save water but also wear and tear on water treatment plants. Because toilets can account for as much as 40 percent of the water used in a typical household, the aggregate water savings can extend the life of treatment plants, cutting maintenance costs and letting them serve larger populations.

Conservationists hailed the development, but not everyone was enchanted. Opposition mounted as stories of double-flushing ("How does that save water?") and clogging became widespread. (Plumbers complained that nobody knew how to use a plunger anymore.) In cities close to Canada, such as Detroit, there was a black market for high-flow toilets from across the border.

Off the Beaten Path

In the 1950s, toilets used five and even seven gallons per flush (gpf). That was gradually reduced, with 3.5 gallons being the norm by 1994. The new standard, however, is 1.6 gallons. By 2008 we also had dual flush commodes, giving users a choice between 1.6 gallons or 0.8 gallons.

In 1999, Congressman Joe Knollenberg, a Michigan Republican, sponsored a bill to repeal the 1994 law. The bill received wide support from disgruntled homeowners, as well as those who simply wanted the government out of their bathrooms. Some averred the newer designs that boosted the flush with pressurized water and vacuum pressure frightened babies and young children. The bill failed, was reintroduced in 2001, and failed again.

Today the issue has died, mostly because the toilets have greatly improved. Some water districts have even offered rebates on ultra low-flow commodes. The Southwest Florida Water Management District started a rebate program in August 2001, and by June 2008, 94,921 high-flow toilets were replaced, saving an estimated 2.5 million gallons of potable water a day. The program was extended “by popular demand” in 2008. A news release stated that “The program’s extension will help further decrease Pinellas County’s already low per capita water use rate of 89 gallons per person per day.”

According to the American Waterworks Association, toilets use an average of 20.1 gallons of water per person per day in a home with no water-conserving fixtures, nearly 30 percent of the total average home use. According to the Federal Energy Management Program, replacing a 3.5 gpf toilet with a 1.6 gpf model will reduce one person’s annual water use from 27,300 gallons to 12,500 gallons.

While opposition to the low-flow toilets has abated, some conservationists are looking ahead. They want a *no-flow* or waterless toilet, such as a composting model that would be widely acceptable. (You can make your own. *The Humanure Handbook: A Guide to Composting Human Manure* by Joseph Jenkins, Chelsea Green Publishing, is a good place to start. www.jenkinspublishing.com/humanure.html)

In the laundry, there is little argument. Front loading, or horizontal axis, washing machines have been used for years in Europe and in crowded spaces where washers and dryers are stacked. According to the EPA, horizontal axis machines use about 40 percent less water and 50 percent less energy than top loading washers, are easier on clothing, and can accommodate larger items. Formerly considered a niche market because of their cost, they're now not much more expensive than conventional models.

Reclaiming Wasted Water

No matter how much water we save through conservation, we're still going to use a great deal. So what happens to it when we're through with it can be an important factor in overall water usage.

Most people don't even think about this concept. In the city, it all goes down the sewer pipes to the municipal wastewater treatment plant. And in the country, the equivalent is usually the septic system. It's out of sight, out of mind.

Black water is water from toilets with solid material such as feces and paper, which requires extensive treatment before the water portion can safely be returned to the hydrosphere.

Grey water, on the other hand, has barely been used and, in some cases, hasn't been used at all. This might include letting the water run while you brush your teeth, until hot water reaches the shower, or until cold water flows into a glass. Grey water comes from washing hands, clothes, and dishes.

This obviously isn't potable water because it does contain particulates and microorganisms, including pathogens. But they are generally of such insignificance, compared to those in black water, that this water is reusable for certain applications. Salvaging grey water can range from the very simple to the uneconomically complex.

We might call the simplest the bucket method. Wash dishes in a dishpan using biodegradable soap, then empty the water on some thirsty flowers. Or collect the cold preshower water in a bucket and use it to flush the toilet. (Pour it into the bowl, not the tank: it takes less.) Some people kick it up a

notch by disconnecting the drainpipe from the sink and placing a bucket beneath the sink.

Others take it much further. They run a hose from the washing machine to the outside for irrigation. Or they redo the plumbing, diverting grey water from the sewer or septic to landscape plants, sometimes first passing it through filters.

While there are exceptions, the consensus among those who know is that it usually isn't worth going to a great deal of trouble and expense. In most cases, the thought is to use the water for irrigating vegetables, but this isn't a good idea for those who believe in the germ theory of disease. For similar reasons, we shouldn't use it on lawns, so that leaves trees and ornamentals.

Because of the health and environmental risks, many jurisdictions have either banned grey water use or demand such intensive treatment that both the economic and ecological savings are wiped out. This doesn't deter some people. There are certainly many bootleg systems in place, although skeptics wonder how many are actually in use; they're built and abandoned when they don't work.

One interesting innovation, the GardenResQ grey-water system, is manufactured in Australia and also used in South Africa. Rainfall is inconsistent there; water supplies have been dwindling; and harsh restrictions were put in place in 2006. Yet gardens are everywhere and use an estimated 50 percent of the potable domestic water supply. To reduce that usage of clean water, water from the shower is piped to the GardenResQ, filtered, and delivered to the plants.

But note that even the people who manufacture and sell this device specifically engineered to filter grey water warn that humans and animals should not contact the irrigation water. Furthermore, "It is not recommended that grey water from the kitchen be utilized for irrigation. This includes kitchen sink water as well as water from an automatic dishwasher. Kitchen water often contains animal and vegetable matter which could affect your garden soil negatively. Chemicals used in your dishwasher are also very alkaline and, this too, could have negative effects on the garden."

We should also note that many drugs and chemicals are now passing through water treatment plants and into rivers and streams—and fish.

There's another promising wastewater treatment system, using biological filtration. We'll examine this a little later.

Garden Water

There are easier ways to save water in the garden than using grey water. One that's becoming widespread, and not only in arid areas, is xeriscaping. (*Xeros* is Greek for dry.) In its simplest form, it's nothing more than landscaping with plants that don't require a lot of water. Lawns are out; native plants are in. You probably have many suitable exotic (non-native) landscaping plants that are drought-tolerant, depending on where you live. There's no set or single design or method involved in water-conserving landscapes; the main requirement is to be aware of the possibilities.



Watch Your Step

Would you believe it? In some places rain barrels are *illegal*! The rain falling on your roof belongs to the government, not to you. The state gives it away to a variety of interests, including oil companies and ski resorts. Many cities are encouraging rain harvesting, and some even mandate it in new developments. But in Utah, Colorado, and parts of Washington, it really is against the law.

In any kind of garden, mulch will conserve water, and if it's organic, it will also improve the soil over time.

Drip irrigation, ideally buried under mulch, is definitely the best way to apply water to plants. It nearly eliminates evaporation, directs the water to where it will do the most good, and the water soaks in.

Raised beds drain very well, and therefore are very good when conditions are too wet. If you have the opposite problem, you might consider sunken beds.

Rain Gardens

Too much water can be even worse than too little. In cities and suburbs, roads, parking lots, sidewalks, roofs, and patios, with little vegetated ground to soak up a heavy rain, cover much of the area. The resulting flooding of streets and basements often lead to various forms of drainage ditches to carry the water away faster, but as so often happens, this kind of band-aid fix only makes matters worse elsewhere. Storm drains become clogged, and eventually the water, laden with chemicals from lawns and leaking cars, adds more pollution to a river or lake.

The newest solution is the rain garden. These often look like ordinary wildflower gardens or landscaped areas, but they're designed to collect runoff, mainly from roofs or parking lots. They fill with a few inches of water that slowly seeps into the ground, instead of running off. A lawn absorbs more water than a paved parking lot, but a well-designed rain garden absorbs 30 percent more than an equal area of turf.

Rain that runs off into surface water is lost; rain that soaks into the ground recharges aquifers. Rain gardens generally attract butterflies and beneficial insects. And most of them are attractive, too, enhancing the community beyond the merely practical benefits.

You might expect to find a rain garden in a low spot where water ponds already, but ponding indicates poor infiltration. When you want to encourage the water to soak in, the low spot in your yard is not a good place for a rain garden.

Locate the garden far enough from the house so water won't seep into the basement, at least 10 feet. Do not site it over a septic system, under a tree, nor in the shade. For a complete description of how to construct one, go to www.dnr.state.wi.us/org/water/wm/dsfm/shore/documents/rgmanual.pdf.

Water-Saving Tips

You can find tips on saving water everywhere today. During a dry spell, newspapers release a flood of them, and of course, there are hundreds more on the web. Most are just common sense: repair leaks; take shorter showers; don't kill a bug and flush it down the toilet.

Some might not be quite as intuitive, but are widely known. Check toilets for leaks by putting a few drops of food coloring into the tank. If it leaks into the bowl in 30 minutes or so, replace defective parts.

Check for hidden leaks by reading your water meter, not using any water for two hours, then checking it again. If there's a discrepancy, you have a leak. If you have your own well, listen for the pump. If it kicks in when no one is using any water, you have a leak.

If you have a conventional high-flush toilet, put an inch or so of sand or pebbles into a half-gallon plastic jug, fill it with water, and screw the lid on tightly. Put the jug into the tank, making sure it doesn't interfere with any working parts, and you'll be saving water with every flush.

Insulating hot water pipes saves water because you don't have to let the water run as long to get hot water to the faucet. Instead of an in-sink garbage disposal, start a compost bin.

There's little doubt that water will be the oil of the future. It will affect the way we live, maybe even where we live and what we eat, as well as economics and politics. If global warming changes climate and rainfall patterns, the future of water will be even more interesting and unpredictable.

The Least You Need to Know

- Five million people a year die from water-related diseases.

- Some people live on a gallon of water a day; others use more than 1,190 gallons.
- If all Earth's water were in a one-gallon jug, a little more than a tablespoonful would be available for human use.
- It takes 24 gallons of water to make one pound of plastic.
- You can save much water through commonsense conservation.

Chapter 25

The Conservation of Energy

In This Chapter

- The role of energy
- Know your energy slaves
- Preparing to go off the grid
- Use it sparingly and wisely

The law of conservation of energy states that energy cannot be created or destroyed. It can change form (heat, light, kinetic, potential), but the total of all the energy in a system remains constant.

So then what's all the fuss about conserving energy? And if it can't be destroyed, why should we worry about saving it—or running out of it? And what do we need energy for, anyway?

Before we run out to get a windmill and some solar panels, let's take a rational look at energy.

Oil Addiction Came Quickly

Primitive humans, like all birds and animals, produced their own energy with food, which gets its energy from the sun, as fuel. Then humans discovered fire, which converted wood into energy that they then used to cook their food, keep warm, and provide light.

For a long time, people and a few certain domesticated animals did all the work. Then someone discovered that wind could move a boat with a sail. Later, Hero of Alexandria was credited with inventing the first steam-powered device, the aeolipile, but it would be another two millennia before steam would power the Industrial Revolution.

That revolution began a mere 300 years ago with steam engines pumping water from coalmines and later driving railway locomotives, ships, road vehicles, and agricultural as well as industrial machines. Steam and coal maintain their supremacy as the main generators of electricity, but the real progress—and damage—we can attribute to oil. And this all happened in just the last 150 years.

Off the Beaten Path

Steam produces most of our electricity (you probably use a steam-powered computer), and most of this steam is generated by coal, a major contributor to global warming. But since the 1970s a movement called Advanced Steam Technology or Modern Steam has been updating the technology. Large automakers were reportedly investigating steam engines during the oil crisis of the 1970s, and a German company developed the ZEE (Zero Emissions Engine) which makes use of nonflaming ceramic heat cells. In Germany and Australia, work is being done on small-scale stationary steam plants (one said to be the size of a PC tower) to provide electricity and heat for homes and villages. Using wood as fuel, these could theoretically be carbon neutral. Companies involved include Pritchard Power, Enginon, Amovis, Powertherm, and Spilling.

Whether the first well was actually drilled in West Virginia, Ohio, or Pennsylvania, as various boosters claim, Edwin Drake's 1859 Titusville, Pennsylvania, effort generally gets the credit. At first the main product was kerosene, used for lighting and then steam engines. Gasoline was a bothersome byproduct until it found a use in internal combustion engines. They weren't mass-produced until Ransome Eli Olds invented the assembly line in 1901, and the first cars Olds made were steam-powered. Henry Ford's famous assembly line didn't appear until around 1914. Some people

who were alive then are still with us today! So in less than one human lifetime, we have become “addicted to oil.”

Prepare to Kick the Habit

What did people do before they started using so much energy? If we don’t like what profligate energy use has done to our spaceship, what would it take to go back that short distance and start over on a different path?

Well, most of our homes and workplaces are heated and cooled with petroleum. Industrial agriculture is highly dependent on petroleum, with ammonia production for nitrogen fertilizer being the biggest consumer in that sector. Petrochemicals, including plastics, are important. However, nearly 70 percent of the oil we use in the United States is used in transportation.

This “addiction to oil” is not an ancient tradition or an unbreakable habit. And it obviously isn’t essential to life. Those centenarians being feted on the morning television shows all spent their early years without ammonia-based fertilizer or plastic and with very little dependence on internal combustion engines. We can easily replicate their lifestyle. The simplest way would be to join an Amish community or follow their example. We would travel little and by horse and buggy. We would not use electricity. And we would survive, maybe even happily. Both our carbon and our water footprints would be close to zero.

If this doesn’t appeal to you—maybe because of the attitude that it’s too harsh and too much work—then start adding to that bare bones lifestyle, slowly, and with an eye on the bottom line, which is not money but the depletion of Earth’s resources. You can make this very personal by looking around your home or by mentally going through your average day to determine what you use fossil energy for. Which tasks could you eliminate? Which ones could be accomplished with reduced energy or in another way? And how much energy does each one use?

These are essential exercises for anyone going off-grid. You have to know how much power you use, or would like to use, in order to properly size your solar or wind system. Once you get these numbers and match them up

with the alternative energy equipment required—and get a price estimate on such a system—it gets a whole lot easier to find ways to conserve energy. You'll become much more interested in efficient appliances; you'll decide there are many you can use more sparingly and some you can do without.

Off the Beaten Path

Inhabitants of off-grid homes must know how much power each tool draws and plan their use of electricity accordingly. For example, they might not be able to use the washing machine, vacuum cleaner, and table saw at the same time.

A nation can, and should, do the same on a grander scale, and of course look at the true total cost, not just the money.

The point is, you don't have to become Amish, and you don't have to spend thousands or tens of thousands of dollars on an alternative energy system to begin saving energy. All you have to do is run through the exercises and then live as if you had made the more drastic changes. If you are not already niggardly with your energy usage, you might be able to cut your costs and your carbon footprint by half or more. And you'll be reducing your dependence on your energy slaves.

Meet Your Energy Slaves

Buckminster Fuller coined the term “energy slaves” in 1944 and refined the numbers and math involved for years afterward. It can get pretty serious and mathematical, and different people come up with different numbers. But what we're interested in here is the general idea that an energy slave is work performed for a human, by a nonhuman, using nonrenewable energy. It's using millennia-old fossilized sunlight instead of your own muscles to brush your teeth or open a can of soup.

Off the Beaten Path

A professional alternative energy technician and consultant I know has a personal lifetime goal of installing enough solar panels to eliminate a nuclear power plant. He often grumbles about the stupidity of “using an atom bomb to toast a slice of bread.”

On average, every person in the world has 38 energy slaves. Some have less than one. In the United States it might be 100 or 200, depending on whose figures you believe. Either one is awesome.

This morning, instead of walking down to the spring or well for a bucket of water, I sent my slave, the well pump, simply by turning on the faucet. Instead of having an outcast or untouchable empty the privy, as they do in some places, I summoned my slave by flushing the toilet. Instead of gathering wood and starting a fire to cook an egg, I turned on the gas stove. Few of us would be eager to part with our slaves, our modern conveniences, altogether. When I needed that water this morning, it just happened to be -22°F outside; let the slave do it! But is there a rational way to benefit from them with minimal damage or fallout?

To reduce our dependence on slaves, let's ask ourselves four questions:

- What jobs are slaves doing for us?
- Does this job really have to be done?
- If so, how else can we do it?
- If there's no way out, how can we reduce the energy used, or what renewable energy source could we employ?

Somebody said the average American home has more than 50 motors, but he didn't say what they're used for. I couldn't think of nearly that many, at first. When I realized that the garage, garden, and shop tools had to be included, the total soared, and by golly, it came awfully close.

The 100-year-olds had none of those motors in their youth, and the Amish still don't. This tells us that those slaves aren't doing anything that wasn't done by hand a brief time ago and is still being done by hand today.

Self-sufficient living doesn't require a solar-powered home. It requires people who are willing to think and to act on their convictions. You can start doing that today without moving or spending a dime.

Transportation

We devote nearly 70 percent of our petroleum consumption to transportation of people and goods. And I could devote 70 percent of this book to what's wrong with that and how to fix it. (Come to think of it, maybe I have.)

Here's what's wrong with it. The automobile led to rampant population dispersal and desecration of the countryside; it enabled fast food, franchises, and the homogenization of America, and ultimately, the world; it is responsible for using prodigious amounts of resources that include not only the materials, workers, and money used to build cars but also land and material for roads, parking lots, and garages. That's in addition to emissions and the effects on the social fabric of the nation, including the automobile's major role in the industrial economy. We have squandered, wasted, burnt up, misused, dissipated, thrown away, poured down the drain, and lost awesome and unconscionable amounts of resources, just to get from one place to another. In the process, we have created an unsustainable economic system, a consumer society that consumes our lives.

And here's how to fix it. Grow your own food, or eat locally, and eliminate the trucks and planes that haul most food an average of 1,500 miles from where it is produced. Work at home or nearby, ideally within walking or biking distance, which would also eliminate the 4.2 billion hours a year Americans spend sitting in traffic jams. Consider the true cost of auto transportation, perhaps starting with eliminating highway and other subsidies; this might reduce frivolous use of the machines. (I was once the flabbergasted houseguest of a man who, out of the blue, said he had to run to town—to put gas in the car!)

Off the Beaten Path

To get an idea of the grip automobiles have on the economy, just scan the Yellow Pages. You'll find air conditioning, body shops, customizing, dealers (new and used) and detailing, electric service, leasing, oil and lube services, mufflers, parts, radiators, repairs, restoration, seat covers and tops, tires, towing, windshield repair ... and we didn't even mention insurance, car washes

Is any of this going to happen? Maybe ... when white blackbirds fly backward. Or when Peak Oil sends the price skyrocketing on a more permanent basis than it did in the summer of 2008, or when the environment becomes so degraded that even the most adamant naysayers are silenced, if only by their own choking and the death of the planet.

Or when enough crew members of the spaceship determine to work together toward self-sufficiency and sustainability to put down the mutiny.

More efficient engines and alternative fuels for transport might solve some of the problems, but they are not the answer. They merely shift the focus of the industrial economy, which is at the heart of the matter. A far better solution would be to update our thinking. It is not necessary or desirable or maybe even allowable for everybody to want to be someplace else. Like Thoreau, we can travel much—in Concord. Then it might not be sensible or economical for every adult to be the proud owner of a 3,000-pound heap of resources. The world has many needs today, but the world does not need more cars.

Off the Beaten Path

Amtrak's fastest train averages 80 mph. France's TGV covers the 250 miles between Paris and Lyon at an average of 133 mph. Japanese Shinkansen trains average 180 mph and carry more passengers than any other rail system in the world.

A French train set a world record in 2007, at 357.2 mph, and a Japanese magnetically levitated train holds the overall record at

361 mph. Think of that the next time you're in an airport, standing in your stocking feet.

Free the Slaves, Employ Servants

If we have energy slaves we simply cannot do without (without jeopardizing our hallowed standard of living, that is), can we at least soften the blow? Might there be energy servants, perhaps?

This might be one way to look at high-efficiency machines, tools, and appliances. It is now possible to buy and use many that sip, rather than guzzle, energy. Washers and dryers, freezers and refrigerators, light bulbs and more, use far less power than they did just a few years ago. And improvements keep coming apace.

We can also take another look at conservation. In our housing, we should inspect insulation, caulking, and weather-stripping. Another classic is “dialing down” the thermostat. Closing drapes or curtains to keep heat in during winter and the sun out in summer is another. You can find many more on the web, often on sites sponsored by energy companies.

All lights should be off when not in use. But then, this applies to many other electrical gadgets as well, often with what's known as phantom loads. Some devices draw electric power even when they're turned off. Televisions and anything with a remote are examples. They have a “sleep” mode so that, being faithful servants, they're ready to spring into life at your command. Turning them off and really meaning it requires pulling the plug.



Lore of the Land

To flush out the phantoms in your house, turn off everything you can think of, record your electric meter reading, then go for a walk or work in the garden. In two hours, check the meter again. The electricity used is your phantom load. Multiply that times 84. That's the electricity your phantoms consume in a week. Multiply by 52 weeks to see what they use in a year. Off-grid homes can't afford phantom loads—can you?

Moving Ahead, in a New Direction

Alternative sources of energy, as currently considered, are predicated on the same old Industrial Revolution and Industrial Economy models. They would merely replace petroleum with solar generated electricity, perhaps, or hydrogen. This is putting a band-aid on a limb that, to save the patient, requires amputation.

If we're headed in this direction anyway, we might as well learn from the pioneers—not the early homesteaders, but the early adapters in the field of alternative energy. Their first step is not putting up a solar panel but determining their energy use and how to reduce it.

Direct Use of the Sun's Energy

Passive solar collects and utilizes the sun's energy without any mechanical devices, using natural heat transfer mechanisms. This can be as simple as building a house that faces south (in the northern hemisphere), with windows to admit the sun.

Active solar can be thermal, collecting heat (for air or water) and moving it mechanically. But most of today's solar panels are photovoltaic; instead of heat, they produce electricity.

Photovoltaic (PV) cells are made of semiconductors, silicon being the most common. Semiconductors absorb light energy, although only a small portion of what's available, at this point, which makes them "inefficient." That frees electrons within the semiconductor. Due to electric fields within the PV cell, those electrons are forced to flow in one direction, which establishes an electrical current, usually about 0.05 volt. This can be drawn off and used. Since five hundredths of a volt won't do much, cells are connected together to form solar panels or modules. Panels are further connected to become a solar array. These larger groups of PV cells can produce about 10 to 12 watts per square foot, with research and improvements continuing.

Bright sunshine produces roughly 93 watts on every square foot of Earth's surface. We can currently collect 10 to 12 of them. That's the promise, and attraction, of solar energy.

On the other hand, oil production has, in all likelihood, peaked and is in terminal decline. M. King Hubbert devised the peak theory and the bell curve chart named after him in 1956, correctly predicting that U.S. oil production would peak between 1965 and 1970. World production probably peaked in 2006 or 2007. See www.hubbertpeak.com.

Alternate Alternatives

A small fan sitting atop our woodstove often fascinates winter visitors. It spins, spreading warm air, with no visible means of propulsion. It's thermoelectric.

Thermoelectric devices have a cold side and a hot side. Electrons move from the hot end to the cold end, producing positive and negative electrodes and an electrical voltage. They use very little of the heat available, but for a use like a woodstove fan, that's not a problem. They've been tested in the far north to provide lighting during the long, cold winter nights. No batteries are involved, and the energy source is virtually free. Recent breakthroughs by chemists at Northwestern University in Evanston, Illinois, have doubled the output with more efficient materials, and researchers believe quadrupling is possible.

Who knows what else is out there or in the minds and notebooks of people tinkering in industry, academia, or on their own? The right incentives and encouragement will bring them out. But most of all, it's important to avoid the kinds of disincentives and discouragement that have been so evident during the Oil Age, the kind that come from The Establishment, trying to maintain the status quo. That time is coming.

The Least You Need to Know

- The profligate use of energy is a very recent phenomenon in human history.
- Steam power is by no means dead or outdated; it probably runs your computer!
- Each American employs 100 to 200 energy slaves.
- Roughly 70 percent of the energy we use in the United States is expended on transporting goods and people.

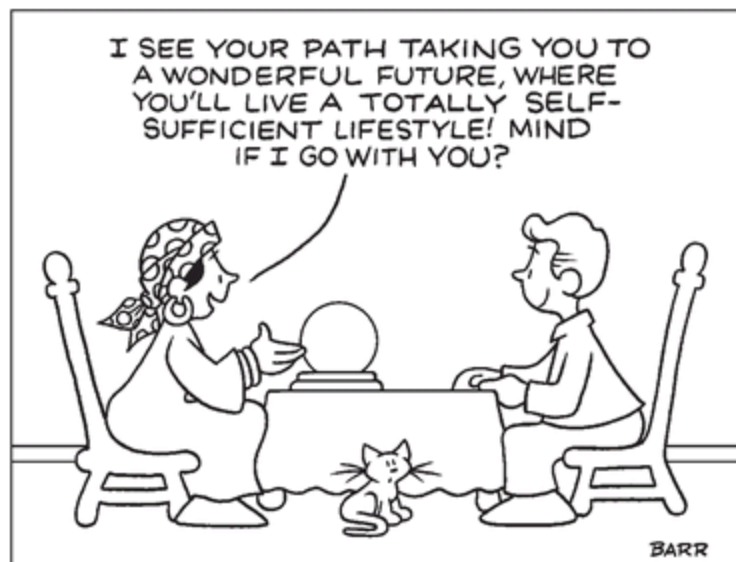
Part 6

A Plan for the Future

It's been said that life is what happens while you're getting ready to live. The future sneaks up on you. But as we've seen over and over again in the past few hundred pages, the future we now face has been anything but sneaky, to those who were paying attention. And now it is crashing down on us like a tsunami, no doubt inundating those who were *not* paying attention and didn't see it coming. They are justifiably terrified of the unknown.

In Shakespeare's *The Tempest*, Antonio says, "What's past is prologue," which has been roughly translated as "What we just saw was setting us up for the really important and exciting stuff that's just around the corner; you ain't seen nothin' yet!"

We, the crew of Spaceship Earth, are in the tempest now, and the past is prologue. It's the stuff our greatness will be built on. The old-style self-sufficient living is impossible. The new self-sufficient living awaits.



Chapter 26

Looking Back, Moving Forward

In This Chapter

- The crowded island
- Cities and the environment
- Science for the people
- The new entrepreneurs

Imagine, for a moment, that you and one other person are entirely self-sufficient in a Garden of Eden on a small island. You have plenty of food, fresh water, ample amounts of firewood, and life is good. Even better, you've been gifted beyond mere island subsistence. You have discovered a treasure trove and acquired all kinds of wonderful artifacts that have made an easy life even cushier: metal cooking pots, fishhooks, an axe, and other valuable tools.

But a short time later, you are no longer two—you are eight. You need more water, more fish, more coconuts, and more firewood; you need four times as much of everything. The treasure is no longer enough for everybody, and that obviously can't be stretched. Change is imperative.

The Population Equation

In 1900, roughly 1.6 billion people inhabited Spaceship Earth; in 2008, 6.7 billion; by 2040, 9 billion. For every two people in 1900, there are more than eight today. In a few years it will be more than 11. As if that human population weren't enough, consider such concepts as carbon and water footprints and energy slaves, and the population that burdens the Earth has increased a hundredfold or more.

The spaceship, our island in the universe, cannot support those numbers. While some people might advocate reducing the human population, either gradually with 17 α -ethinylestradiol or very quickly with nuclear fission, a much easier, more sensible, and certainly much nicer approach would be to first eliminate the slaves. Not only the energy slaves that perform actual work but also the pleasure slaves that merely entertain or massage us, and which many people who live simple lives do without: the copper wiring and plumbing that go into our extravagant homes, the water that irrigates our lush lawns, the foods we eat that are produced in an unsustainable manner, the hundreds of horses that carry us down to the corner store for a six-pack of beer or a pack of cigarettes.

After that, we could possibly regain some of our sybaritic excesses—if we're still so inclined and can do so in a sustainable manner.

This is the new face of self-sufficient living. It's not an option; it's a mandate. But is that so bad? We've seen enough to suggest that maybe, just maybe, a new outlook, a new Establishment, might actually be kind of neat—even fun.

For example, about half of all the people in the world live in cities today, and we expect that proportion to increase. Cities can be sustainable, too, with the proper ideas and attitudes. More than that, cities have the potential to be far more pleasant and exciting places to live than they are today. And new entrepreneurs are making it happen. But because every new development is based at least in part on what has gone before, looking back can give us a glimpse of the future.

Off the Beaten Path

I could easily say that the future started around 1970 when the first Earth Day was celebrated, the Environmental Protection Agency (EPA) was created, and Arcosanti, an experiment in urban ecological architecture, started to take shape. *The Whole Earth Catalog* was in its second year; *Countryside* was launched in late 1969; and *Mother Earth News* appeared in January 1970, indicating the widespread and growing interest in self-sufficient

living and sustainability. It was also the year a group of scientists began work at the New Alchemy Institute. Clearly, something was afoot.

Architecture Plus Ecology

Arcosanti is a planned community of the future, paradoxically rising like an ancient ruin in the high desert 65 miles north of Phoenix, Arizona. It's an arcology: architecture wedded to ecology. Architect Paolo Soleri's concept statement explains that it's "a hyper-dense city designed to maximize human interaction; minimize the use of energy, raw materials and land; and reduce waste and environmental pollution and allow interaction with the surrounding natural environment."

Urban sprawl is wasteful of land and resources and usually ugly. It's dependent upon the automobile, which exacerbates the problems and adds pollution, congestion, and social isolation for good measure. As a three-dimensional pedestrian-oriented city, Arcosanti eliminates urban sprawl.

According to the Arcosanti website, in an arcology "the built and the living interact as organs would in a highly evolved being. Many systems work together, with efficient circulation of people and resources, multi-use buildings, and solar orientation for lighting, heating, and cooling." The plan includes greenhouses for private and public use, doubling as solar collectors for winter heat. There is a café and a bakery, woodworking and ceramics shops, an art gallery, a swimming pool, an amphitheater, and a foundry.

Any resemblance to Frank Lloyd Wright's Broadacre City might not be coincidental. Paolo Soleri worked with Wright in both Wisconsin and Arizona after getting his advanced degree in architecture in his native Italy in 1946. He returned to Italy in 1950 and was commissioned to build a large ceramics factory. Becoming familiar with ceramics led to his involvement with ceramic and bronze windbells and siltcast construction.

The city he later planned and developed became well-known for siltcast construction, which involves casting walls on the ground so they take on the color and texture of the earth when raised into place. Arcosanti is also

famed for the windbells made in its foundry, which provide one of its main sources of income.

Soleri settled in Arizona in 1956 and made a lifelong commitment to urban planning. He and his wife established the Cosanti Foundation, whose singular project is Arcosanti, begun in 1970.

In 1976 *Newsweek* declared, “As urban architecture, Arcosanti is probably the most important experiment undertaken in our lifetime.” Later, *The New York Times* stated: “With its radical conservation techniques and brilliantly scrunched-together layout,

Arcosanti was intended to reinvent not just the city, but also man’s relationship to the planet: picture a ’60s vision of a Mars colony, but with a cutting-edge, eco-friendly design.” Arcosanti reportedly inspired George Lucas when he made the *Star Wars* films.

The Foundry Apse at Arcosanti, a model city of the future north of Phoenix, Arizona. For information on tours, workshops, seminars, overnight accommodations, and music events: [www. arcosanti.org](http://www.arcosanti.org). (Photo by Yuki Yanagimoto.)



The 25-acre city is designed for 5,000 residents. That's an astounding 200 per acre or the equivalent of 32,000 per square mile (about half the population density of Manhattan) with no sense of crowding. Although 6,000 have participated in its construction, the permanent population varies between 60 and 80, with a constant ebb and flow of students and visitors. After 40 years, the city is less than 5 percent completed, which some see as a failure. Others see the glass as half full.

A recent visitor said it's amazing that Arcosanti has been built at all, considering the obstacles, but that its lessons of density, energy conservation, and self-reliance are exactly what we need today. And in spite of being behind schedule, it's still going forward.

Biosphere II

But I can't say that for another experiment in the Arizona desert, one with far more financing and publicity, which is something else to think about. (Money is no cure-all.) Biosphere II was constructed between 1987 and 1991 at a cost of \$200 million. By June of 2006 the structure was no longer maintained, and a year later, the property and surrounding land, 1,650 acres, was sold to a residential developer for \$50 million. But that's getting ahead of the story.

Biosphere II is a 3.14-acre glass structure—that's the size of two and a half football fields—the largest closed system ever created. Biosphere I, as you might guess, is Planet Earth, upon which II was modeled. It was built by Space Biosphere Ventures to explore the vast web of interactions within life systems, particularly in regards to space colonization. That's significant. It was not designed to improve our stewardship of Spaceship Earth. It was conceived and funded to let us go off on our own.

Inside was a miniature replica of Earth's environment. There was a rain forest and an ocean, complete with coral reef. There were mangrove wetlands, savannah grasslands, and a fog desert. And there were facilities for human inhabitants and their support system, including gardens, goats, and chickens. Sealed against the outside world, scientists constantly monitored the ever-changing chemistry of the air, water, and soil.

On September 26, 1991, eight scientists sealed themselves into the compound for a highly publicized and sometimes controversial two-year experiment. (Did one *really* send out for pizza?) The humans survived for the planned two years but not without help from Biosphere I. Carbon-dioxide and nitrous-oxide increased to dangerous levels. Atmospheric oxygen dropped from 21 percent to 14 percent, and oxygen had to be pumped in.

In spite of that, after two years 19 of 25 vertebrate species and all the pollinators were extinct, while populations of weedy vines, ants, and cockroaches exploded. Apparently we humans don't understand the world as well as we sometimes think we do.

A second crew continued the experiment in 1994, but two years later the entire structure was in danger of being bulldozed, figuratively and literally. In June of 2007, the University of Arizona (UA) announced that it would be using the facility for at least the next three years, supported by grants and private gifts.

“UA will develop Biosphere II into a center for research, outreach, teaching, and life-long learning about Earth, its living systems, and its place in the universe,” said Joaquin Ruiz, dean of UA’s College of Science. “The facilities and resources at this new campus will be an inspiring place for researchers to gather and to tackle problems that science and society will face now and in the future.”

New Alchemy Institute

The New Alchemy Institute was seeded by two marine biologists, Drs. John Todd and William McLarney, while they were teaching at San Diego State University. In 1969, they contemplated the possibilities of cultivating fish and plants in a symbiotic relationship while using renewable energy, with a goal of eventually allowing humanity to blend into ecosystems instead of destroying them. The term “alchemy” popped up naturally, calling attention to a time when science, art, and philosophy were not separate, much less antagonistic as they had become then. Both left San Diego for the Woods Hole Oceanographic Institution in Massachusetts and soon after, New Alchemy.

Located on a leased 12-acre former dairy farm on Cape Cod, the institute declared that one of its major tasks was to create “ecologically derived human support systems—renewable energy, agriculture/aquaculture, housing and landscapes.” Their research emphasized minimal reliance on fossil fuels and accessibility to individuals and families or small groups.

Their manifesto proclaimed, “Our programs are geared to produce not riches, but rich and stable lives, independent of world fashion and the vagaries of international economics.”

To this end they investigated what even today would be a homesteader’s dream. They designed bio-shelters and built several of them, including the Cape Cod Ark and the Prince Edward Island Ark. A bio-shelter is essentially a solar greenhouse that is managed as a self-contained ecosystem (see Biosphere II). That is, the plants, animals, soil, and insects involved create closed loops of water, energy, materials, and life cycles that

copy nature. Through the rhythms of life, growth, death, and recycling, the system becomes self-sufficient.

They completed the first goal within a few years. That was an “ark,” a self-sufficient food-production system based on greenhouses, fishponds, solar heating, and wind power, all working together. Physically, it consists of three greenhouses, each with a pond, all built on a slope.

The lowest pond contains a variety of edible fish, including tilapia, which most of us had never heard of before. The windmill pumps water from this pond through a solar heater and then through a filter bed of crushed shells in the upper pond. The shells are encrusted with a form of bacteria that detoxifies the fish wastes and converts the ammonia in them to nitrites and nitrates. These are used to fertilize algae in another part of the pond.

The enriched water flows into the middle pond, where the microscopic plants (algae) feed tiny crustaceans called daphnids, or water fleas, because of their vertical jerky movement. Back at the bottom tank again, the water fleas and leftover algae feed the fish.

In its first year, the 8,000-gallon pond produced 100 pounds of fish. But that’s not all. Vegetables are grown in the warm greenhouses, even in winter. Naturally, they’re watered with the fertile fish water.

Granted, this isn’t nearly as ambitious as Biosphere II. But it worked, and—my favorite part—the entire cost of building and stocking the ark was not the \$200 million of Biosphere II but \$2,300. (And Arcosanti is supported mainly by selling wind bells.)

In a 1975 article, *Time* magazine noted that, “Even scientists sympathetic with the institute’s philosophy are highly skeptical that such techniques can make much of a dent in the world’s enormous food needs.”

But then, the stated purpose of the new alchemists was not to feed the world in one fell swoop. That was the approach of the chemicalized, industrial global business model they found fault with and endeavored to correct. As stated in one of their bulletins, “The strategies we research emphasize a minimal reliance on fossil fuels and operate on a scale accessible to individuals, families, and small groups. It is our belief that ecological and social transformations must take place at the lowest functional levels of society if humankind is to direct its course toward a greener, saner world.”

Meet the Establishment

Yes, highly skeptical people abound. They are, for the most part, The Establishment, the people who've decided how you should live. Call them the ruling class if you must, but most don't make or enforce any laws. Instead, they're the ones who've led you to believe you need a house with at least 2,400 square foot of space, filled with wonderful gadgets, and surrounded by a large green coddled and manicured lawn. They've also made you think you should eat and enjoy fast food several times a week and go to college even though you'd much rather be an artisan sheep milk cheese-maker. It is in large part an economic establishment, aided and abetted by those with a vested interest in the status quo as a means of self-preservation.

John Todd of New Alchemy is now a professor at the University of Vermont, head of the NGO (nongovernment organization) Ocean Arks International, and founder of John Todd Ecological Design, Inc. (JTEDI). He has several stories about how The Establishment throttled science and change.

His forté is designing biological systems to clean wastewater, as described above but considerably refined since the days of New Alchemy. His eco-machines use all five kingdoms of life, from bacteria at one end to plants and animals on the other. And they work.

China asked his company to build one, called a Restorer, in the canal city of Phuzou. These are not canals for romantic gondolas; they're open sewers. Todd's company created a Restorer almost a kilometer long, and in less than a year, it was working. About nine months later, it became an officially approved technology for cleaning sewage-laden canals in China. He foresaw his company "cleaning up" in more than one way.

What the company didn't realize was that it was putting a very powerful group of people out of work. Phuzou alone has 55 miles of canals and workers who dredge them. The clean water put them out of business. Todd recently said the entire project is now on the shelf, and nobody knows what's going to happen.

Then there was the Tyson chicken-slaughtering plant in Berlin, Maryland, in the Chesapeake Bay watershed. Tyson was spending hundreds of

thousands of dollars and using state-of-the-art technologies and hundreds of horsepowers of energy and still wasn't in compliance with environmental regulations. JTEDI was called in to treat 1.25 million gallons per day of "high-strength waste" in a huge lagoon. And as in China, it worked.

Also as in China, the establishment reared up. In this case, Tyson got tired of the Maryland regulations, so they moved the whole operation to Mississippi. The moral: we have the technology; the problems lie elsewhere. But Dr. Todd has more.

He believes we must integrate ecology and economics. It's linking old skills—the old forms of self-sufficiency—with new skills, to get new economic forms. We can't rely on compliance because we don't have time. He maintains that a new generation must get to work as Earth stewards and for that there must be an economic engine connected with their activity. As a college professor with former students scattered around the globe, he can attest that young people get excited when they can see a connection between doing good and doing well.

The alternative, the more common attitude or mindset, is what social scientist Howard Kuntzler called "sleepwalking into the future." Most people have no idea what's going on, what's happening to the planet. Instead of leading people to believe the future is going to be like the present, we should make it clear that nobody knows; we have to be adaptable. For that we need literacy in what Todd calls first principles: food, shelter, transportation, and energy.

Fred Krupp, president of the Environmental Defense Fund, makes a similar case in his book *Earth: The Sequel*, when he states that what Earth needs now is "a second industrial revolution as sweeping as that effected a century ago by the likes of Thomas Edison, Henry Ford, and John D. Rockefeller." Krupp has great faith in political solutions, or at least participation, in "a huge opportunity for America" that will create new billionaires. But the engineers and entrepreneurs are going to get us out of this fix, he said. Advocates of self-sufficient living won't agree with all of this, but it's a clear indication that the old order is crumbling.

Tom Sazky founded Terracycle, a company that makes and sells Worm Poop. Not only is this a green company in that the product is manufactured by worms and from garbage, but it pays schools and nonprofits 5¢ for the recycled plastic bottles it uses as packaging. In a recent television

appearance, Sazky said his goal is not about money; it's about changing the world in the biggest way possible.

He's not alone. "Ecopreneurs" abound. These mostly young entrepreneurs with ideas and enthusiasm are looking at a triple bottom line: financial success, but also environmental and social responsibility. And still the skeptics abound.

The Myths of the Naysayers

"We can't all be subsistence farmers." Probably not, if you're thinking about 40 acres and a mule. But don't throw out the baby with the bath water. Remember, 40 to 50 percent of the fruits and vegetables consumed in the United States from 1942 to 1945 were produced in Victory Gardens. Note how much time and money Americans spend now on lawns and flowers, counting it as enjoyable recreation, mostly. What would it take to transfer that to vegetable gardening? What if the unemployed, and under-employed, were to grow even a small portion of their own food? Under the right circumstances and with enough motivation and education, vast swaths of lawn could be returned to food production, and untold numbers of urban and suburban dwellers could become at least partially self-sufficient in food. With cities like Broadacre and Arcosanti and technologies such as New Alchemy, of course we can all be subsistence farmers, if that's our wish! And we could do that in addition to other pursuits, such as science or the arts.

"Alternative energy is too expensive/not competitive." Yes, it's more expensive than the fossil fuels that are underpriced because they don't include a charge for environmental degradation. With a planet on the brink of collapse, is the expense of energy a major concern, or should we perhaps consider using less of it to avoid extinction?

"We must stimulate the economy" by trying to retain, or return to, the status quo: by building still more wasteful homes, building still more cars and roads to drive them on, and in general, avoiding change like the plague. The world does not need more cars, roads, or big houses. The world needs a return to sanity, including a sane economy based on human values and

sustainability. Constant growth is as impossible as self-sufficiency ... and much more dangerous to even attempt. The longer the old order is artificially “stimulated,” as it has been for decades, the harder it will be to recover after the inevitable collapse.

The Least You Need to Know

- There are more than four times as many people living today as there were in 1900, but with many more energy slaves who also use scarce resources.
- We ought to pay more attention to livable and sustainable cities because that’s where most people live.
- New ideas and technologies abound, many of them aimed at planetary self-sufficiency.
- It’s interesting that a very expensive project, centered on letting us escape the planet, failed, while other less expensive ones, aimed at allowing us to remain here in good health, enjoyed some success, even though stymied by The Establishment.

Chapter 27

Let Your Imagination Soar

In This Chapter

- Welcome to the dream, part II
- The ideal homestead
- Broad Acre City, updated
- Beware the active imagination

At the beginning of this book, as I was telling a little story about a self-sufficient homestead, we pushed the pause button. Now that we've looked at some possibilities, let's finish it. Please press "resume."

As I Was Saying ...

As I opened the door to the chicken coop, the hens rushed out like eager children leaving school after the final bell. The goats, Cleopatra and Nefertiti, saw me coming, and amidst the rustle and aroma of clean straw, stood with their front feet on the stock panel fence and baa-ed their welcome.

Swinging the milk pail, I continued up the path to the goat shed. I reached for the door handle, and just as I was going in, a voice startled me.

"Good morning, Jérôme."

An old man, watching me with an intent gaze, was sitting on a bale of hay as if he'd been waiting. "Uh, hello, do I know you?" I hoped my voice conveyed the implied question: Who the heck are you, and what the heck are you doing in my goat shed at this time of the morning?

As I noticed the strangeness of his smile—it had a thin, faraway quality—I was also struck by his eyes and his clothes. The eyes mirrored the smile: very pale blue, but thin and far away; misty, faded, and washed out. His full

beard was very white; his boots and jeans were well-worn; but the brown shirt, which was of an unusual cut, seemed new.

“No, I don’t believe so, yet. But apparently you know *about* me. And, of course, I know you.”

“Oh?”

“You’re Jérôme Bélanger, the author of *The Complete Idiot’s Guide to Self-Sufficient Living*.”

“Wha—It’s not even finished yet. What can you know about it? And most people call me JD. Or Jerry.”

“I’m here to help. You got several things wrong, you know, items I can correct. There is still time. Come, I’ll show you.”

He heaved himself up from the bale and turned sideways to pass me in the narrow passageway of the shed. “You can leave the milk bucket here; this won’t take long.” He went through the door I had just entered and motioned for me to follow.

Which I did, ready to protest that when the goats were to be milked, I did not intend to follow a trespassing stranger anywhere ...

What the ...? What’s going on? That’s not the path I had just come up! I mean, it *was*, but ... everything was different.

He turned and smiled again, but now he was transformed. His eyes were bluer and sharper; his skin didn’t seem so sallow, and the smile was bolder and from thicker lips.

“Come, Jérôme. Call me Henry, not Hank. Let me show you around the place. *Your* place, I believe?” His head was lowered, and he gazed up at me from under raised bushy eyebrows.

And indeed it was. Or it *was*, as in, it used to be, a long time ago, maybe. That was not the chicken house I built. That was not my fence. The old white pine that had stood near the house was missing, but the young *Pinus sylvestris* I planted to eventually replace it looked positively ancient.

And the house itself was gone. In its place was what appeared to be a greenhouse of some kind, with several other outbuilding-type structures—or were they sculpted landforms?—it was hard to tell.

Yes, it was definitely the same place; I was sure of it. I felt the scene begin to waver, or maybe it was me, but before everything started spinning, Henry was leading me by the elbow, supporting me as I stumbled down the path toward the buildings.

My senses were swimming as we approached what I instinctively knew was a bermed house, which could be described as Frank Lloyd Wright meets Mike Oehler. It wouldn't have surprised me in the least to see either a hobbit or Snow White and a couple of dwarfs emerge from the quaintly beautiful but elegantly simple and rustic wooden door. The cottage garden in front of the house was in full bloom, but incredibly more luxurious than it had been ... what, a few minutes ago? It had taken me years to get a decent stand of columbines; now, they grew in profusion. But so did the hollyhocks, dame's rocket, foxglove—everything was lush.

Henry waited patiently for a few moments; then, still steering me by the elbow, he silently urged me forward. He opened the door, which was even more massive than it had appeared from a distance, and we went in.

Although not apparent from the outside, the house was circular, the walls curving away from the door in a grand sweep and meeting, unseen, behind a circular wall in the center of what otherwise would have been one large room. It was definitely an Oehler PSP design. The wall posts were cedar, varnished to a high luster, while the shoring walls were a soft deep golden of, what, aspen? The ceiling beams were stained dark, giving the place a feeling of solid security.

As I was still too catatonic to explore on my own or even to ask intelligent questions, Henry led me around, pointing out features he thought would interest me and explaining those he knew would baffle me. Thinking about it later reminded me of the time we were buying a house and went through half a dozen prospects in one day, and then when we got home, tried to evaluate them all. Comparing bathrooms, all the houses blended together, and in exasperation Diane said, "Did that one even *have* a bathroom?"

This one did have a bathroom. Henry explained how urine was diverted from the composter to become a fertilizer component, and how the grey water from the sink and shower was routed to what must have been some kind of living machine water reclamation system before being used for crop irrigation. He pointed out the lighting. Although the room was enclosed and windowless, it was flooded with soft, natural light, through the clever use of mirrored tubes.

The kitchen was compact but obviously efficient. The Einstein refrigerator had been perfected, with modifications, Henry announced, but my daze was lifting and the range got my attention. This particular model, Henry

explained, was gas: methane, produced on-site. But some people preferred wood, which had become highly efficient and amazingly fast, thanks to developments in precharring and gasification. The microbial composter looked familiar; several countertop appliances did not. Henry dismissed them with a wave of his hand. “Oh, you know how that is. Somebody is always coming up with something new.”

Off the Beaten Path

In 1926, Albert Einstein and a former student invented a refrigerator with no moving parts, operating on only a small heat source. It used no electricity or Freon. The two men eventually secured 45 patents on 3 different models. Most of the key patents were bought by a Swedish company, Electrolux, to prevent its own refrigeration technology from competition.

In 2008, Oxford University electrical engineer Malcolm McCulloch, whose passion is green technology, started a three-year project to revive old and forgotten non-electric inventions that can contribute to better living. His team believes the Einstein refrigerator’s basic efficiency can be quadrupled.

We examined the laundry, with its horizontal axis low-water washer. Henry said the cities were more into sonic laundering. While dryers were very efficient, the old-fashioned solar dryers—clotheslines—were also popular. Apparently this world was not as rushed as mine, and many simple tasks were considered pleasures, not onerous chores. Water was heated by solar and heat reclamation units, and of course, treated by the eco-machine and recycled.

The office was intriguing. There was only one small bookshelf, holding a few reference volumes, but the computer was recognizable. What flummoxed me was a small bank of lights, screens, and buttons that monitored every aspect of the physical and mechanical aspects of the homestead, including many that were meaningless to me.

Battery conditions I was familiar with, or so I thought. Turned out the old chemical batteries had long been replaced by energy storage units that bore no resemblance to a battery of any kind. The most popular type was based on gravity.

Nutrient levels I could guess at, or so I thought. Actually, there were several of these, monitoring the condition of everything from the various composting devices to the hydroponic greenhouse solutions.

And for some, I hadn't a clue. What might CreRe stand for? Or PotSta? Somewhat impatiently, Henry explained that just about anything that could be counted, monitored, or kept track of in any way was computerized. Not only could you tell at a glance how much wheat or any other commodity you had on hand, but the computer also actually warned you when supplies reached certain preset levels. You never had to balance your checkbook (although there weren't really any checks, since everything was electronic). All credits and debits were automated, and again, you were kept informed of changes and tension points. Even such personal data as weight, pulse, and blood pressure could be recorded and monitored, if that was your choice.

As we left the house, blinking in the bright sunlight, my dazed condition turned to almost childlike excitement. I was anxious to see the greenhouse, the wind electric generators and solar panels, the insectuary?

"Yes," Henry chuckled. "People eat bugs now, even in America. Once it became a fad, there was no stopping it. Remember the first pizza you ever ate, when you were in high school? It tasted like cardboard, and you were sure you'd never eat another one! You thought it was a fad that wouldn't last. Bugs are like that. Most folks couldn't make it through the day without their gals."

"Gals?"

"Giant African land snails. Here, look at this. This is the solar still that provides most of the potable water." And he was off again, leading me past luxuriant gardens, sparkling ponds and splashing waterfalls, and a massive brick oven.

The current inhabitant of "my" place is a baker. He makes artisan breads, and bread only, twice a week. Other baked goods are made in the village. Everybody, Henry informs me, works at some income-producing craft, skill, or profession, the equivalent of two or three days a week. It's called

“bread labor,” which is a big joke for a baker. Almost all produce the bulk of their own food. They divide the rest of their time between intellectual or artistic pursuits and social or recreational activities.

“But you really must see the village,” Henry insisted.

We made the short trip in a four-wheeled pedicar. He steered; we both pedaled. Going up hills we were assisted by an electric motor and the energy that was captured when we went *down* hills. There was little other traffic on the narrow road, but the variety was amazing. There were other vehicles like ours, some with solar chargers on the roof, and a few bicycles (including one recumbent). I also saw fully motorized vehicles, including several trucks and a bus which I was told ran on compressed air, the air being compressed by wind power. Much to my surprise as it appeared over a small rise and drew closer, there came a horse, pulling a buggy; yes, it was carrying an Amish family, no different from my neighbors back home, wherever or whenever that was.

Off the Beaten Path

Technically, all piston-driven engines are air-powered. A car using air compressed externally, not by internal explosions, was unveiled in March, 2009.

We exchanged waves, as usual. I turned to watch them grow smaller with distance. “They never change,” Henry observed.

“Well, they don’t have those slow-moving vehicle signs on the back anymore,” I offered. We both chuckled as I resumed pedaling to maintain our pace, about the speed of a good horse and buggy—a nice pace for watching the world go by.

The Village

The village was a cluster of earth-sheltered homes scattered like tulip bulbs in a mass planting. You know how that works: to achieve a natural look, you simply toss out bulbs by the handful and plant them wherever they land. Some are close together, some are widely spaced, none of them line up, and you'd swear nature put them there. Every one had a garden, but they, too, looked as if nature had designed and planted them. Overall, it gave the impression of a well-kept park.

That included the very center of the settlement, called The Square although it was actually an oval. A large but low structure had so many alcoves, courtyards, promenades, porticos, atria, apses, and arbors it was difficult to tell whether it was one building or many. The walls were alive with growing plants; the roof was covered with solar panels.

This was the marketplace, the manufactory, the community center, the school, and the bus stop. There was the bakery, the butcher shop, and the shoe repair shop, as well as the stalls of the merchants from outside the village: the cheesemonger, purveyors of fruits and vegetables and grains, and, of course, the bread baker.

The community car rental agency was here, ready to serve anyone who needed to make a longer trip or to use a larger vehicle. Individual ownership was rare, being impractical, uneconomical, and unsustainable. For a quick trip to the city, with its larger and more varied shops and amusements and more sophisticated medical facilities, the bus was the first choice. High-speed railroads carried passengers and most of the freight between cities and from producers of raw materials to cities and manufacturing. The village was not on the rail line and relied on trucks and busses. I learned that inter-city and -village highways were considerably more advanced than the lane we had traveled.

Not that it mattered much. The village and its people were largely self-sufficient and had little need or use for goods from afar. It didn't take many truckloads of solar modules, computer chips, window glass, PVC pipe, or medications to replace or add to what was already in place.

The workshops were open to all and were often centers of merriment and camaraderie as well as education—and, of course, production. The woodworking shop buzzed with the sound of whirling blades amidst the aroma of wood shavings and sawdust; the sewing shop hummed as bobbins spun and machine feet fed cloth through clacking reciprocating needles; the

blacksmith shop held the distinctive smell of hot metal and the occasional clang of metal on metal. In season, the commercial-size cannery preserved the bounty of individual household and community gardens, as neighbors joined together to lighten the workload and enjoy the companionship.

The library (with actual paper books), the music rooms, and spaces devoted to pottery-making, sculpture, painting, weaving, and other arts and crafts ebbed and flowed as people came and went. In contrast, the café hosted a steady stream of patrons from the village and the countryside and the occasional outlander.

There was a small clinic, with two part-time doctors, which was connected with the hospital and more sophisticated medical facilities in the city. But there was no law office, real estate office, or bank. More shoppers were conducting business with local scrip than with the coin of the realm, and I noticed some business being conducted with barter.

Most villages, I was told, have a small manufactory, making necessities such as toothbrushes and canning jar lids for distribution within a hundred miles or so, depending on population density. Very seldom does any product, of any kind, travel much further. There were very few instances where economies of scale were such that national or global production was justified.

This was the new self-sufficiency, Henry said, and part of the new economic system. The previous system had evolved as a result of the Industrial Revolution; the new one arose from its ashes. It was still impossible for individuals or families to be self-sufficient. Henry estimated that smallholders in the countryside achieved maybe 60 percent, while villagers were closer to 50 and urbanites less than that. But localities, such as the village and its environs, were often 70 percent self-sufficient, while most regions were 80 and nations, 90. (I gathered that bioregions were more important than states, and communities or neighbors a more important unifying factor than such common bonds as the Green Bay Packers.)

This particular village has an unusually large business enterprise. It's located near the extensive marsh northwest of town, where it makes use of the ubiquitous cattail. The dry cattails are made into paper, at about half the cost of paper made from wood. They use the sugar stream that comes off the pulping process to produce ethanol, and what remains, to fire an electric generator. The laboratory is investigating many other uses for the plant,

including pharmaceuticals. Like everything else, the facility is independent and locally owned, and all employees work either a few hours a day or a few days a week. Obviously, there is more to life here than work.

I was astonished to learn that the next village down the road makes circuit boards, out of chicken feathers—based on research started in 2004!

The City

I harbor no love for cities but was tempted to visit one. According to Henry, as old buildings are demolished, they are replaced, not by new ones of similar design and construction but by ZEBs. The city is, in effect, very similar to the village, but with a much higher population density. That density is masked by the concentration of people in housing units—apartments and condominiums, rather than individual houses packed tightly together on postage stamp-size lots as in my time—and by green space. There is an amazing amount of privacy, and it's quiet. There are no private motor vehicles in the residential sections. Everything anybody needs is within walking distance. Most of the neighborhoods are distinctive and cohesive, much like small villages within the city. People know each other, and there is a sense of community. This is said to partially account for the scarcity of anti-social behavior.

There are community gardens blended with CSAs and organic farms, all connected with bike and walking paths and interspersed with parks and arboreta. Mass transit and shared vehicles are the norm, with rail and air transport available. All water is recycled through eco-machines.

It was once said that the countryside could survive without cities, but the city could not survive without the countryside. That is not quite as true anymore: the city has become self-sufficient, too, and less dependent on the raw materials of the rural districts. Of course, the post-industrial world doesn't rely nearly as much on material goods or the raw materials of the earth and energy required to produce, market, and distribute them. Whereas most people flocked to the cities for jobs in the old days, now many prefer to live there for cultural and social reasons.

But it's getting late, and Henry seems anxious to get back to the homestead. We pedal in unison, quiet, thoughtful. Finally, he said, "Well?"

"Umm. Isn't this awfully ... utopian? I mean, isn't it human nature to rape and plunder and accumulate and, well, I just can't see anything like this happening in the real world."

"The real world?" he huffed. "This *is* the real world. The *sane* world. It came about when the old establishment, the old economic system, failed. People rebelled against rebuilding something that hadn't worked. They wanted to be more self-sufficient, and they wanted to live in a sustainable world. And of course, they were concerned with survival, period. The advocates of simple living had to reach a critical mass to overcome the naysayers, but fortunately, they got there in time.

"The world you know is the one that isn't real. Its economy is artificial, manipulated, not based on real needs or resources or sustainability. People's lives are artificial, revolving around getting and spending with little time or regard for enjoying and real living.

"This one, on the other hand, is firmly rooted in reality. The reality is that there are plenty of resources for all, and that includes future generations, if they are used wisely and not squandered. The reality is that spending a human life to acquire material goods is a waste; to support an omnipotent economic system is insane.

"That economic system has destroyed families, neighborhoods, cities, and, eventually, countries. Yes, there was a housing bubble. But consider the effects of cheap—highly subsidized—transportation, from before the transcontinental railway to the latest auto bailouts. Way back in 1994 Komanoff Energy Associates estimated that the subsidies, for American roads alone, cost \$20 to \$25 billion a year. That doesn't include air, rail, or water transport. This is all justified as being a boon to the economic system. That seems to be putting the cart before the horse.

"This resulted in the dispersal of the population, to suburbia, exurbia, and beyond, with related increased costs of infrastructure. It made fast food possible and unavoidable, while providing yet another form of subsidy to agribusiness by making it easy to move their products long distances and by limiting small farms, which, by their nature, are more suited to local markets."

I pondered that, still skeptical. Human nature isn't going to change, and there are always going to be a few rotten apples in the barrel. Would a community be able to hold the renegades in line, using public disapproval rather than laws? Would a new economic system change anything, even if it could be implemented?

But then I wondered where all this was coming from. Half aloud, I murmured, "Am I dreaming or hallucinating, or are we in some kind of time warp? Are you a time traveler or a ghost ..."

"I'm nothing but a figment of your imagination." I was about to breathe a sigh of relief, but he quickly warned, "Don't relax too much. A powerful imagination can be far more dangerous than a ghost or a time traveler. Most revolutions have been fomented by active imaginations. Nothing is achieved without first imagining it."

"Once a photograph of the Earth, taken from outside, is available—once the sheer isolation of the Earth becomes known—a new idea as powerful as any in history will be let loose."—Sir Fred Hoyle, British Astronomer (NASA Photo)



We were back at the goat shed. I was still skeptical as I went in ... and discovered I still had the milk pail in my hand, and Cleopatra was still standing on the bottom rail of the gate, waiting expectantly.

Shaking my head, I looked out the door. There was the chicken coop, the house, and the old white pine. There was no sign of the old man.

The Very Least You Have to Know

- The Earth is yours: cherish it!

Appendix A

Glossary

aerobic decomposition Breaking down of organic material by microorganisms in the presence of oxygen; composting.

agri-industrial Highly technical, complexly organized, capital-intensive, vertically integrated farm production system.

agribusiness A large-scale farming business encompassing the production, processing, and distribution of agricultural products.

anaerobic decomposition The breakdown of organic materials by microorganisms in the absence of oxygen.

annual A plant that sprouts from a seed, produces flowers and fruit, and then dies, all in one season. See *biennial*, *perennial*.

appropriate technology Technology designed to be used and maintained by people of limited resources and technical expertise, usually to ease everyday tasks such as cooking and hauling water.

arcology Architecture + ecology.

BedZED Beddington Zero Energy Development, a 99-home development near Wellington, England, completed in 2002.

biennial A plant that grows without flowering the first year but survives for the next growing season when it produces fruit and seed, and then dies. See *annual*, *perennial*.

capital goods Durable goods, those not used up or consumed, employed in the production of other goods.

capital investment Money invested in a business venture (such as a homestead) with an expectation that it will produce income (anything of value, not necessarily money). **carbon footprint** The environmental impact of human activity, measured in terms of greenhouse gasses such as carbon dioxide. See *water footprint*.

C:N ratio The ratio of carbon to nitrogen, ideally 25:1 in a compost bin.

coir Coconut fiber used as a more environmentally friendly substitute for peat moss in gardening.

CSA Community Supported Agriculture, an agricultural system where, for an annual fee, one farmer provides a certain amount of food for members of the community; a socio-economic model of food production, sales, and distribution on a local level.

compost A mixture of decaying organic matter used as a soil amendment; humus.

discretionary income That portion of income remaining after paying basic expenses and prior commitments.

entomophagy The practice of eating insects.

fertile (soil) Soil containing nutrients plants need for growth, including N (nitrogen), P (phosphorus), and K (potassium), as well as minor nutrients needed in lesser amounts.

fertilizer Plant food, either natural (organic) or chemical (synthetic); see *fertile*.

flour Finely ground grain, usually wheat but also rye, triticale, buckwheat, etc.

flour, all-purpose Flour often made from hard red winter wheat, which has less protein and gluten than hard red spring wheat.

flour, bleached Wheat flour artificially aged, commonly with chlorine gas and benzoyl peroxide.

flour, bread Commonly made from hard red spring wheat, high in protein and gluten.

flour, pastry Usually made from low-protein soft white winter wheat.

friable (soil) Crumbly; a soil that you can crumble in your hand.

green living Any action resulting in a positive impact on the environment.

green manure A crop grown for its fertilizing and soil conditioning value, then incorporated into the soil, commonly clovers and grains such as rye, oats, and buckwheat.

hardening off Gradually exposing tender plants started inside a home or greenhouse to outdoor conditions.

heirloom An open-pollinated plant variety at least 50 years old.

homesteading A simple, usually pioneerlike lifestyle, whose practitioners strive to be as self-sufficient as possible, especially in food.

hybrid A cross between two dissimilar parents.

intensive gardening Any method of growing plants, usually vegetables, that produces a maximum harvest from a small plot.

keet A young guinea fowl.

maker Name applied to tinkerers who repair products and also make new items from old ones.

microclimate A small area where climate is modified by surroundings, such as a large body of water, south-facing slope, etc.

milk, homogenized Milk mechanically treated so the cream layer doesn't separate.

milk, pasteurized Milk heated to 165°F for 15 seconds or to 145°F for 30 minutes to kill harmful organisms.

milk, raw Milk as it comes from the animal, untreated in any way.

milk, standardized Milk with butterfat removed to bring it to a three, two, or one percent level.

monoculture A farming system in which vast areas are devoted to a single crop, such as corn, usually year-after-year.

NPK Nitrogen, phosphorus, and potassium elements of a fertilizer, listed numerically on the label, e.g., 10-10-10.

open pollinated Plants with pollen transferred by natural means: insects, wind, birds, etc. See *hybrid* and *heirloom*.

organic foods, gardening, farming The products and process of sustainable food production: grown without synthetic fertilizers and pesticides.

peak oil The theoretical bell curve showing the peak of oil production and its rapid decrease afterward, said to have occurred in 2006-2007; the Hubbert Peak.

perennial A plant that normally lives more than two years; see *annual*, *biennial*.

pesticide Poison; herbicide kills weeds; insecticide kills insects; fungicide kills fungi; rodenticide kills rodents; suicide kills self.

phenology The study of the times of recurring natural events, such as the dates of the first springtime appearance of certain birds, insects, buds, or blooms.

photovoltaics Production of electricity from sunlight.

poult A young turkey.

pullet A young female chicken.

radical sustainability An ideology that recognizes the interconnections of ecological and social concerns.

RAFT Renewing America's Food Traditions, a consortium of plant and animal preservationists and cooks dedicated to continuing the propagation and use of unique species; includes American Livestock Breeds Conservancy, Seed Savers Exchange, Slow Food USA, Chefs Collaborative, and others.

rain garden A garden specifically designed to help excess precipitation soak into the earth instead of running into storm sewers and ditches; usually used in urban areas with large areas of impermeable surface such as roofs, roads, and parking lots.

self-reliance Depending on one's own resources; often interchangeable with self-sufficiency.

self-sufficient Capable of providing one's own necessities without dependence on others. **simple living** A way of life that embraces the plain and functional; voluntary simplicity.

slow-food movement An organization with wide-ranging goals aimed at neutralizing fast food and standardization: preserving local and regional cuisines, eating with the seasons, preserving heirloom varieties of food plants and animals, organic growing, etc.

square foot gardening A planting system based on any number of grids one foot square.

straight run Newly hatched chicks, unsexed, just as they come from the incubator.

sustainable Capable of being continued; see *unsustainable*.

unsustainable Guaranteed to disintegrate.

urban homesteading Simple self-reliant living in an urban setting, often with an emphasis on community.

voluntary simplicity Living a plain life, consciously and intentionally avoiding extravagance.

voluntary poverty Living on a purposely reduced income, usually based on a principle.

water footprint A measurement of water usage that includes all the water used in the production of goods; e.g., one pound of beef might represent 2,500 gallons of water, counting that used for irrigating hay and grain, meat processing, etc.; see *carbon footprint*.

working capital Cash available for day-to-day operations.

ZEB Zero Energy Building, a building that generates all the power it uses with renewable energy sources.

Zero Energy Home ZEH, a dwelling that generates all the power it uses with renewable energy sources.

Appendix B

For More Information

American Livestock Breeds Conservancy

Working to protect over 150 breeds of livestock and poultry from extinction. www.albc-usa.org

Appliance repair

www.bobvila.com/FixItClub

www.fixitclub.com

Bees

www.HoneyBeeQuiet.com

Butchering, poultry

www.extension.umn.edu/distribution/livestocksystems/DI0701.html

<http://themodernhomestead.us/article/Butchering-Ready.html>

Butchering, hogs

www.geocities.com/thurlane/hogkilling.html

www.ars.usda.gov/Main/docs.htm?docid=15403

Family finance

www.ocw.usu.edu/Family_Consumer_Human_Development/Family_Finance/familyfinance.jpg/view

Fast food

Pollan, Michael. *The Omnivore's Dilemma*. Penguin Press, 2006.

Schlosser, Eric. *Fast Food Nation*. Harper Perennial, 2002.

Foraging, plants

Marrone, Teresa. *Abundantly Wild: Collecting and Cooking Wild Edibles in the Upper Midwest*. Adventure Publications, 2004.

Thayer, Samuel. *The Forager's Harvest: A Guide to Identifying, Harvesting, and Preparing Edible Wild Plants*. Forager's Harvest Press, 2006. www.foragersharvest.com

www.mnsu.edu/emuseum/cultural/ethnoarchaeology/ethnobotany/index.shtml

Gardening Books (*See also* Seed Catalogs)

Ashworth, Suzanne. *Seed to Seed*. Seed Savers Exchange, 2002.

Bartholomew, Mel. *All New Square Foot Gardening*. Cool Springs Press, 2006.

Bradley, Fern Marshall, and Barbara W. Ellis (ed). *Encyclopedia of Organic Gardening*. Rodale Press, 2000.

Coleman, Eliot. *Four Season Harvest*. Chelsea Green Publishing Company, 1999.

———*The New Organic Grower*. Chelsea Green Publishing Company, 1995.

Gershuny, Grace, and Deborah L Martin (ed). *The Rodale Book of Composting*. Rodale Press, 1992.

Riotte, Louise. *Carrots Love Tomatoes*. Storey Publishing, 1998.

Garden Supplies

Gardens alive!, www.gardensalive.com

Geothermal Heat Pumps

Geothermal Heat Pump Consortium

1050 Connecticut Ave. NW, Suite 1000

Washington, DC 20036

www.geoexchange.org

International Ground Source Heat Pump Association

Oklahoma State University

374 Cordell South

Stillwater, OK 74078

www.igshpa.okstate.edu

United States Department of Energy—Geothermal Division

1000 Independence Ave. SW

Washington, DC 20585

www1.eere.energy.gov/geothermal

United States Environmental Protection Agency—Residential Efficiency Programs

Mail code 602j

401 M St. SW

Washington, DC 20460

www.energystar.gov

Hatcheries

www.feathersite.com/Poultry/BRKHatcheries.html This is a very extensive annotated list of hatcheries across the United States and Canada and beyond.

www.mcmurrayhatchery.com

www.mthealthy.com

www.ridgwayhatchery.com

Homesteading

Coyne, Kelly, and Erik Knutzen. *The Urban Homestead*. Process Media, 2008.

www.pathtofreedom.com/pathproject

www.selfsufficientish.com A British site (and book) aimed at urban homesteaders who don't think they can make a clean break but would like to get involved anyway.

www.urbanhomestead.org/journal

<http://themodernhomestead.us>

www.journeytoforever.org

www.soilandhealth.org

Housing

Johnson, Gregory Paul. *Put Your Life on a Diet: Lessons Learned Living in 140 Square Feet*. Cibbs Smith, 2008. www.resourcesforlife.com/g

Salomon, Shay, and Nigel Valdez. *Little House on a Small Planet*. The Lyons Press, 2006. www.littlehouseonasmallplanet.com

Susanka, Sarah, and Kira Obolensky. *The Not So Big House*. Taunton Press, 2008.

www.resourcesforlife.com/small-house-society

www.tumbleweedhouses.com

Insects, eating

www.creepycrawlycuisine.150m.com

Peak Oil

www.hubbertpeak.com

Lawns

Flores, Heather C. *Food Not Lawns: How to Turn Your Yard Into a Garden and Your Neighborhood Into a Community*. Chelsea Green Publishing Company, 2006.

Haeg, Fritz. *Edible Estates: Attack on the Front Lawn*. Metropolis Books, 2008.

Steinberg, Ted. *American Green: The Obsessive Quest for the Perfect Lawn*. W. W. Norton & Co., 2006.

Mormon food storage calculator

www.lds.about.com/library/bl/faq/blcalculator.htm

Phenology

www.usanpn.org

Poultry

Damerow, Gail. *Storey's Guide to Raising Chickens*. Storey Publishing, 1995.

Luttmann, Rick and Gail. *Chickens in Your Backyard*. Rodale, 1976.

Pangman, Judy. *Chicken Coops: 45 Building Plans for Housing Your Flock*. Storey Publishing, 2006.

Salatin, Joel. *Pastured Poultry Profit\$*. Polyface, Inc., 1996.

Rain barrel

www.ehow.com/how_4604915_make-rain-barrels.html

Root cellaring

Bubel, Mike and Nancy. *Root Cellaring: The Simple No-Processing Way to Store Fruits and Vegetables*. Storey Publishing, 1991.

Hobson, Phyllis. *Build Your Own Underground Root Cellar*. Storey Publishing, 1981.

Seed catalogs

Burpee (W. Atlee Burpee & Co.) www.burpee.com

Cook's Garden, The, www.cooksgarden.com

Dixondale Farms (Onions), www.dixondalefarms.com

Fedco Seeds, www.fedcoseeds.com

Johnny's Selected Seeds, www.johnnyseeds.com

J. W. Jung Seed Co., www.jungseed.com

Kitchen Garden Seeds (John Scheepers), www.kitchengardenseeds.com

Park Seed Co., www.parkseed.com

Pinetree Garden Seeds, www.superseeds.com

Southern Exposure Seed Exchange, www.southernexposure.com/index.html

Territorial Seed Company, www.territorialseed.com

Thompson & Morgan, www.tmseeds.com

Totally Tomatoes, www.totallytomato.com

Vermont Bean Seed Company, www.vermontbean.com

Seed Savers Exchange, www.seedsavers.org

Slow food

Slow food, www.slowfoodusa.org

Sustainable agriculture

www.sare.org/about Sustainable Agriculture Research and Education, supported by the USDA under cooperative agreements with the University of Maryland and the University of Vermont.

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Stoneview: How to Build an Eco-Friendly Little Guest House

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Storey's Guide to Raising Chickens

Storey's Guide to Raising Dairy Goats

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Storey's Guide to Raising Sheep

Storey's Guide to Raising Sheep: Breeds, Care, Facilities

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*Wind Energy Basics, Second Edition: A Guide to Home- and Community
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Wind Power: Renewable Energy for Home, Farm, and Business

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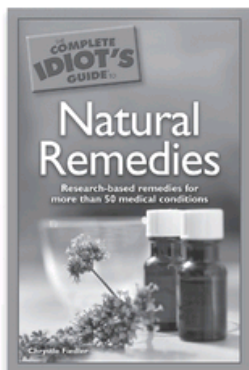
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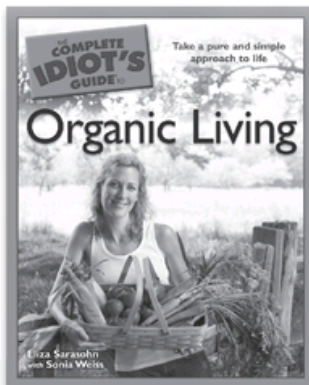
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Your guides to the good life.



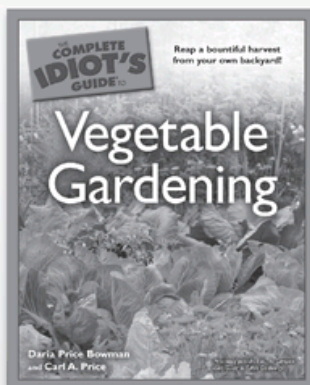
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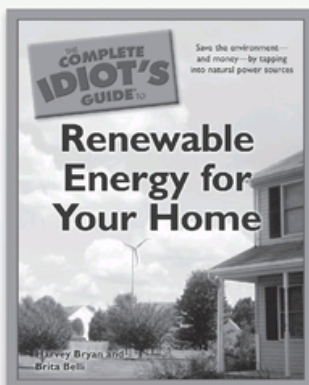
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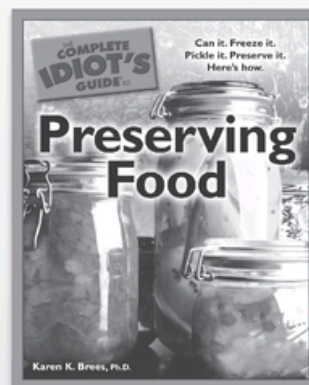
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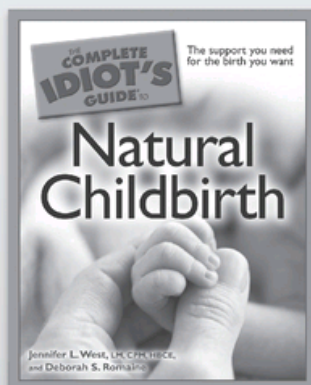
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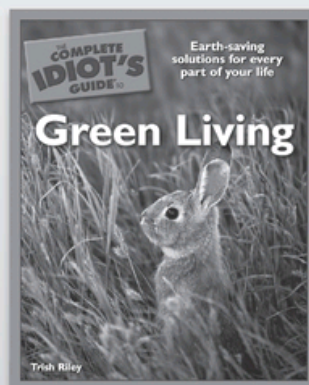
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