Basement Gardening

Growing 24/7, 365 Days a Year In a 4' X 7' Space

Todd Ware

A complete guide
to building
an uber-productive
hydroponics system
in your basement

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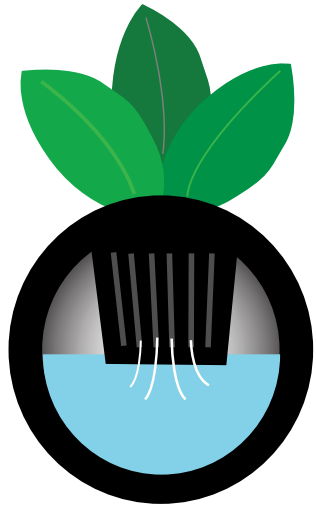

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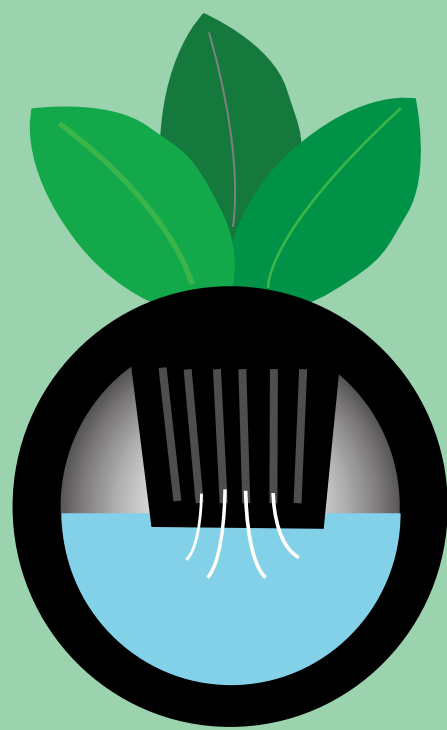
~~who~~ YOU Can Build A Hydroponic System!



Chapter 1

~~Who~~ YOU Can Build A Hydroponic System!

Anyone with space in their basement or heated garage space can benefit from building a hydroponic system like the one in this book. The system described in this book is called a DFT system. DFT stands for *Deep Flow Technique* and is optimal for growing salad greens, herbs and even strawberries. If you live in a location where growing outdoors 12 months a year is not possible and you have minimal space, you can build a very productive and cost effective DFT hydroponic system. With a little bit of handiwork, some direction from this book and your ability to build things with some basic tools will help make your hydroponic system build project easy. Anyone with a little initiative can build the system described in this book. We assume that if you have purchased this book you have already started looking into hydroponic growing and you want to build your own system instead of buying a very expensive much smaller system that will not last very long.

During the time of the COVID-19 pandemic we all realized that it is getting more and more difficult to get certain types of food, safe and nutritious vegetables and salad greens. The supply chain for salad vegetables and greens has become more and more expensive and unreliable. Most of it is shipped across the country and by the time it gets to your home it can be contaminated in many ways. Everyone is looking for a way to grow food at home and make it safer to eat lettuce and salad greens by growing it yourself at home. This book gives you a solution that solves that problem during a food supply crisis or anytime in the future. There will always be viruses, e-coli scares and pesticides used to grow the food in the stores. You can control what you grow, how you grow it and what goes into the food you grow with a system like the one in this book.

There has been a lot of work in the vertical farming industry to develop large scale vertical farms that are based in cities and food deserts. Watching companies building large factory based growing solutions to feed millions of people is commendable and we continue to support this effort and hope it is successful. These large vertical farms seem to have no problems getting initial donations to build them and many people want vertical farming to thrive and be profitable. Sustaining a profitable business model to support the cost of running them has been a problem. In a discussion with a representative of one of the largest providers of vertically grown salad greens in the US we discussed the work that Snap Fresh Farm is doing with hydroponics and the system represented in this book. The first question the representative had for us was, “is it sustainable and are you making a profit?”. It was obvious that they were struggling with profitability and I hope they will be in business in the next 5 years. We do hope large vertical farms achieve that and millions will be fed by the produce they deliver. It has been a struggle for many of the large start up vertical farms.

Everyone wants them to succeed but doing that is difficult until a better solution for providing electricity and cheaper overhead for these companies can be figured out.

The growing solution represented in this book is only profitable if you feel that the benefits of paying for the electricity, time to build it, ongoing maintenance and knowing that you will be able to feed your family continuously, no matter how expensive salad greens and herbs get, makes the system worth it. If you connect this system to a solar powered solution you may be able to eliminate the cost for electricity but that will be for you to determine if you want to include that cost to make it work. Hydroponics can be a hobby for you but this solution is more than a hobby. It will require an initial and ongoing investment but it will be invaluable as you see the volume of produce you can provide from the system. Initially my family would joke that the lettuce they were eating was the most expensive lettuce we could ever buy. Over time they realized that the system is providing us what no store or local farm can give us. Peace of mind and excellent quality.

During the panic of the COVID-19 pandemic all of the family members realized immediately how valuable the system was and how it was benefiting us and our friends.
We gave away many heads of lettuce, chard, kale and other vegetables we grew in the system during that time to the friends around us. Our neighbors wanted to know how it was all grown during the winter and during the times when it was not possible to get it due to the pandemic and e-coli scares. We gave them tours of the system in our basement and educated them on how hydroponic growing is done. They used words like amazing, incredible and cool when they saw the system. They also wondered if they could create the same system for their homes. We told them anyone who wanted to build it could easily do that with an investment in materials, time and ongoing love for growing plants in your home. They asked us if we had a book or directions to build the system we had. It was at that time that we realized that we needed to write a book on how to build the system. Here is the resulting book and an illustrated list of directions showing you how to build your hydroponic system. This book and Snap Fresh Farm do not promise that this system will be profitable. The system you build from reading this book will be run at a cost to you but it will also provide for you and your family if you build it and sustain it.

The recent pandemic and the future of how our climates will be changing how farming will survive, indicates that individuals need to create their own sustainable means of producing food 365 days a year and have it available continuously in your refrigerator. That became painfully obvious in the last couple years and it may not be getting any better in the future. If the big industrial vertical farms can't figure out profitability then this system in your home will become a big need. Build it now while you can get all the parts and the cost is reasonable.

There are many "hydroponic/aeroponic" systems that are being sold on-line on social media advertisements. They have wonderful pictures of huge tomatoes, cucumbers, broccoli, lettuce and strawberries growing in a very small system in a nicely staged kitchen.

These systems are, get rich quick systems. The only one benefiting or getting rich from them, is the one selling them. They show veggies growing on a system that can't possibly support the growth of the plants purported to have been grown in the pictures.
A smart person realizes that many of the plants shown are most likely bought in a store and placed on the system for the advertisement. If you grow hydroponic tomatoes and cucumbers you know immediately that what they are showing in the pictures may not have really grown on the advertised system. You will learn that the lighting advertised in the systems is not sufficient to grow a mature tomato plant. Some of the systems are only about 2 square feet on a table top but they advertise vegetables that are two times the size of the very system they are growing them.

They make it look like you will be able to feed your whole family with the veggies from the system. In reality it takes at least 30 to 40 days to grow a full head of romaine lettuce hydroponically. The systems advertised would only grow a very small amount in that time. Maybe you would grow one small underdeveloped head of lettuce. What they are selling will not deliver what they say and you might get one decent salad for your family out of their system every month. This should be false advertising and you may spend anywhere from $500 to $2,000 for a slick looking system that will not deliver what you need or actually grow what they are showing on their advertisements. The System you can build from reading this book will deliver what your family would need for regular daily salads, stir fry meals, romaine lettuce, bok choy, Swiss chard, year round strawberries, an endless supply of mint or lemon balm tea, herbs like basil, cilantro, oregano and any other greens that will grow hydroponically.

Buyer Beware

Before you spend $800 to $2,000 for a system you see advertised online, that will not work after a couple months, think of the benefits of building a system yourself. In the systems you see advertised you won't be able to easily replace the parts if they break and you will be very frustrated with the results of very small plants and high costs for the seed pods they require you to buy. This book shows you how to build a much better solution. A system that can be built from readily attainable parts that you buy in a hardware store and on-line hydroponic stores.

The companies marketing these systems advertise that their system will be set up in your kitchen or living space. What they don' tell you is that their system has nutrient water in it that will eventually leak in your kitchen or wherever you put it. The kitchen is not the ideal place for a true hydroponic system. You will need to clean and wash the system regularly, change the nutrient solution and make sure it runs cleanly to really get good growth from the system. You will also notice with the systems advertised, that they tell you to buy the seeds and growing solution specific to their system. When they are charging you $5.00 per seed pod for each plant and $40.00 for a small bottle of nutrient solution you will quickly realize they are really ripping you off. Their systems are overpriced and so are the plants

and nutrients that they think you have to buy from them. Those systems are not sustainable and will end up frustrating a person who is really serious about growing your own produce.

If you are really interested in growing real food in a true hydroponic system, at a large enough volume for your family 24/7/365, then you will want to save your money and build your own system like one in this book. Don't buy a system that will not last and you cannot buy replacement parts cheaply from your local hardware store. This book saves you the grief of wasting a lot of money and not getting what you really want from a true hydroponic system. This book gives you a plan to build a system that can feed your family year round with most varieties of lettuce, kale, chard, pak choy, parsley, herbs and other plants you will need for an awesome salad. The system in this book is a system that is sustainable, efficient, cost effective and reliable. This is a system that has been developed for over 5 years and has been created in multiple steps to make it the best solution. We did the work of experimenting with different methods of creating the system and rebuilding parts of it to make it the best system possible. We are saving you about 5 years of trying to figure out what works and what doesn't. I hope that is worth the money alone for what you will pay for this book. You can build the system easily and replace every part of it from your hardware or on-line hydroponics store if anything breaks. You can build more than one of these systems and expand on the system as you want. The system can also be built as large or small as you need. You don't need to have 10 tubes in your system, you can have 4, 5, 6 or any number that you can put on a shelf that won't be too much for the shelf or tip over due to weight or the capacity of the shelf you buy. Space is not much of a concern building the system in this book. The system takes up about a 4 foot by 7 foot space and 7 feet in height. The two main concerns are noted below, electricity and water.

Ensure you read all the safety statements you see in each chapter before planning and building your system.

SAFETY - Note To reader: Electrical Safety

This system you build will be a combination of electrical elements and water. In combination they can be very dangerous and can result in electrocution or death if not set up correctly and safely. **Ensure that you consult with an electrician before you build the system to ensure that you plan your system build correctly for safe operation and to local code from the guidance of a licensed electrician.** This book is not liable to the builder or reader creating the system and does not ensure how you have built your system is safe. Consult with your local licensed electrician when planning the wiring of the electrical parts of your system. The water pump, air pump, lighting fixtures and electrical outlets in your system need to be configured to ensure you have placed them in your system safely. You will want to always keep any electrical connections above all running water in the pipes and lighting attached to the PVC extensions at the top of the system to minimize any contact with the lighting fixtures and water.

One requirement for this system is having a source of water nearby and a way of easily removing and replacing the water from the system as needed. A basement with a concrete floor and a way to flush your water reservoir is optimal. If you have any concerns about flushing hydroponic solution into your septic system call your local Municipal Water Treatment Facility first before dumping the used nutrient water down your drain or out a basement drain. They will be able to tell you about the regulations, locations and facilities where they can safely dispose of your excess water and nutrient solution legally and safely. Each locality has different rules, regulations and laws for waste disposal that you will need to check and be responsible for before you go ahead with building this hydroponic system.

SAFETY - Note To Reader: Leaks and Water Removal

With this system you will have periodic water leaks and you will need to remove the nutrient solution from the system on a regular basis. It will be a requirement to have a mop and pail available while you are doing nutrient solution changes and when the system spills nutrient solution from the tank or PVC piping. You could also experience all of the nutrient solution draining from the system (35 gallons) on your floor if something goes totally wrong with the pipes or leaks. It is wise to use this system near a sump pump or a floor drain in case this happens and not in an area where water will cause damage to flooring or furnishings.

The system you build can use the design and ideas in this book or you can introduce all of your own ideas from other sources available. To build this system you will need to be somewhat handy with basic tools such as a drill for hole cutting and a saw to cut PVC pipe as well as cutting wood for the pipe holders. The wooden holders, the growing pipes

SAFETY - Note To Reader: Electrical Safety

As a safety suggestion. Keep all of your electrical connections as high up and away from water in the system as possible. Zip ties are used excessively and redundantly in this system for all connections and hanging of the electrical wires for the lights, fans, pumps and timing equipment. Make sure you double up with the zip ties in case one breaks. You can't add too many zip ties when it comes to making sure your electrical wires don't hange down in any liquids. The PVC extenders added to the shelf on the top of the system are an excellent way of keeping your wires sorted and away from the water in the system. They also give you the ability to easily adjust the chains for your lighting.

rest in, are the most tool intensive part in the build and they are simple to build with a saw and 4 1/2 inch hole cutting bit. Otherwise the project is mostly a lot of hole cutting, pipe cutting and fitting of the pipes and parts. This book will bring you through the steps and required tools to build it but you can be as creative as you like and replace parts as you feel necessary to create the system you want. If you want to add more or longer grow pipes to the system make sure you take into account the additional weight of the pipes, the water weight and all other factors of whatever you add. Check to make sure the shelf you use for your system will support the full weight of the system and all other factors in whatever you build.

With all the correct parts the complete system can be built and running in a weekend. You may end up taking a few trips to your local hardware or hydroponics supply store but this book should reduce the amount as it will show you what you need from the start.
The build in this book took 5 years of tweaking, watching many on-line how-to videos and trying new ideas until it became clear what worked and what did not. This is the value of this book and the reason it has been written for you. This book gives you a basic design that works and a starting point for you to improve on the system as you go forward and learn more about hydroponics. Nothing in this book is extraordinary or inventive. This is a system based on what we have learned from seeing what others have tried to do and didn't take time to perfect.

Find your local hydroponics store nearby and becomes friends with the most knowledgeable person in the store. They will be very helpful in giving you tips on how to run your system and also keep you up to date on the newest lighting, nutrients, growing techniques and measurement gadgets available. You can also connect with on-line companies that can deliver the parts you will need for the build and other items that you can't find in your local store. The connections for the PVC parts and black pipe connectors are best bought from on-line or local hydroponics supply stores. It is best if you can go to the store to make sure your pipe and connector fitting sizes are correct as you are buying them.

Your system will become a hobby as well as a way of providing an excellent supply of nutritious and safe produce for your family. Initially it will take a bit of time to get the system running and balanced but once it is in place and running you will not need to spend more than a few minutes a day and a couple hours a week keeping it going and cleaning it. You will need to keep a supply of starter plants growing so you can keep replacing what you pick from the system.

You can build this system over time or immediately depending on your funds. To see how this system works as a fully functioning hydroponics system you can visit the Basement Gardening YouTube channel at: https://www.youtube.com/channel/UCZ5QDmT2hLIqVz-BlBv8oOWw and watch the videos of the build.

You can visit the YouTube channel for Basement Gardening using this QR code:

The system build will continue to become better over time even after this book has been published. The cost of the complete build at the time of publishing is estimated around $650.00 depending on where and what parts you purchase. This may produce the most expensive lettuce and produce you have ever purchased but that will become irrelevant knowing that what you grow in the system will be the best, safest and available 365 days a year in your own home.

Without this system our family would not have had salad greens that were safe to eat during the e-coli scare or the COVID-19 pandemic. We have added strawberries to our system and they are a great addition. Herbs like mint, basil, thyme and parsley grow incredibly fast in the system. Parsley will grow for months in the system and can be cut many times and regrow. If the plant is green and does not require fruiting or flowering and is not too large it will most likely grow in this system.

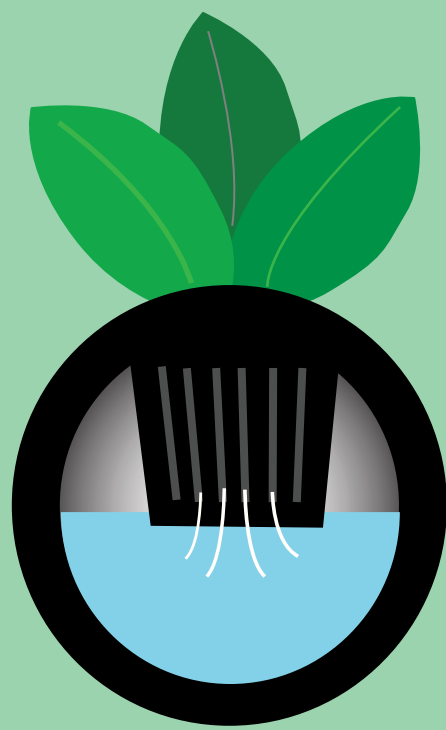
Plants like tomatoes, squash, cucumbers and other vegetables that require a lot of space are not the best fit for this system but can be grown hydroponically in another type system called Dutch bucket growing in a grow tent or in soil pots. They would require a different mix of nutrients and broader spectrum lighting than the typical salad green lettuce, chard, kale and plants that will grow in this system. You can see a complete list of plants in Chapter 6 that can be grown in the DFT system and those that won't grow well
in the system.

The system represented in this book is for the person who wants a system they can build and continue to maintain and grow plenty of produce to feed a family of 4-6 on a regular basis. The big difference between this system and the ones you will see advertised online is the volume of produce you can grow is continuous and enough for food to be available every day once you get it going. We hope you look forward to building your own system and look forward to hearing your stories of how your build progressed and how it is working for you. You can send your feedback to Todd at the following email address:

Contact us: todd@snapfreshfarm.com

CHAPTER 2

Visual Plans To Help Build Your System

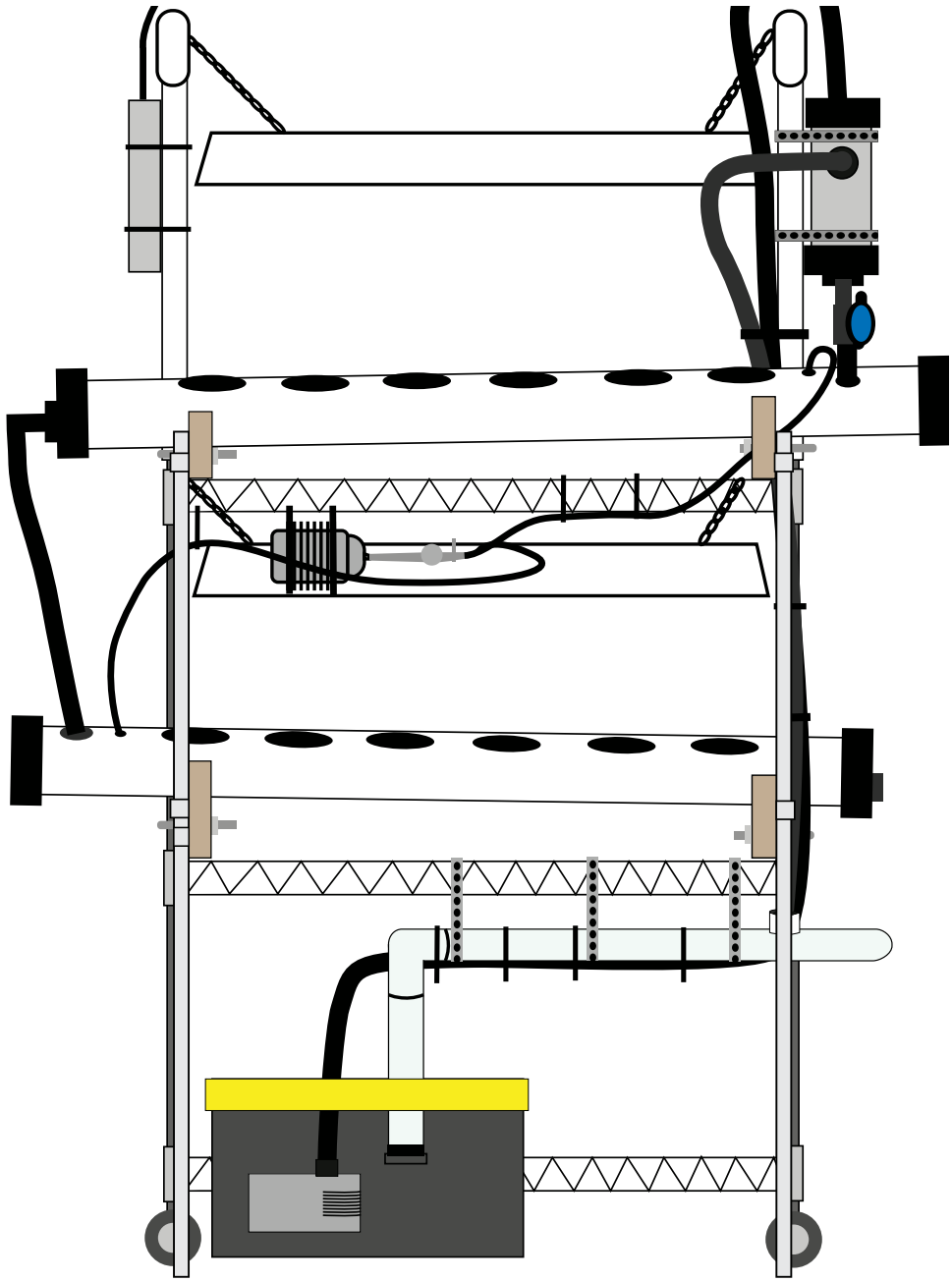


Chapter 2

Visual Plans To Help Build Your System

Side view - no annotation

This is what the system looks like from the side showing a direct view of the length of the system. The system is built on three shelves with the main pipes on the top two shelves.



More About The Author

Todd Ware is the owner of Snap Fresh Farm, a micro-farm in rural South-Eastern Pennsylvania. Todd grew up in suburban New Jersey where the nearest farm was many miles away. After moving to Pennsylvania in 1993 Todd and his family did some gardening in their back yard. They quickly realized that their back yard was not conducive to growing vegetables due to three black walnut trees that exuded the chemical juglone and killed everything they tried to grow. Todd started growing in buckets and experimented with Dutch bucket growing during the growing season. It was a great success but it did not allow the family to have produce 365 days a year.

In 2010 Todd began searching on-line for other methods of growing in doors. Hydroponics methods were very interesting and seemed like a good option to start experimenting with.
Todd started growing lettuce in the basement using a metal shelf and plastic bins with soil in them. That worked well but required a lot of soil over time. After switching from soil to nutrient solution in 2015 and using PVC grow pipes a new solution began to make sense. Todd switched from the plastic bins and put 10, 4 inch PVC pipes on a metal shelf and connected them to create a DFT solution with continues nutrient being pumped to each grow pipe. Aeration to the pipes was added and a larger 35 gallon nutrient bin was attached to produce a better balance of PH and nutrient mix.

The system represented in this book grows enough to feed the Ware family and some of the neighbors all year round. It has evolved over the last 5 years and continues to become more efficient and more productive. Todd would love to hear from you about your experiences in building your own hydroponic system.
You can contact Todd at: todd@snapfreshfarm.com