TOWER FARMS

Designing a Tower Farm

Welcome to the exciting new world of *VERTICAL AEROPONIC GROWING!*

YOUR AUTHORIZED COMMERCIAL REPRESENTATIVE (ACR):

_____

PHONE:

_____

EMAIL:

_____

TOWER FARMS

SUPPLY ORDERS: Sales@TowerFarms.com

www.TowerFarms.com

TOWER FARMS

Dear Future Tower Farmer,

Congratulations on your interest in Tower Farms. This is a critical time to grow food and positively impact your community. Choosing Tower Farms is an important decision and we are here to ensure your success.

The first step of designing your Tower Farm is to determine why, what, where, and how you are going to reach your goals. The following guidelines, with the help of your Authorized Commercial Representative (ACR), will get you started with the technical and business decisions.

We will support you through the design, installation, and operation of your farm including growing strategies to maximize your production and increase your impact.

Let's start growing!

Your Tower Farms Team

Make a difference while you make a living!

Harness

vertical aeroponic farming

technology to help all of humanity.

Nearly 24 million Americans live in food deserts, or areas with limited access to fresh fruits and vegetables.[1]

And because most traditionally-grown produce travels up to 2,500 miles before it reaches a plate, the rest of us must often settle for food that is lacking in both flavor and nutrition.[2]

But with your help, we can change that.

Tower Farms growing systems are designed to flourish in nearly any environment and are uniquely suited for urban areas. And that means you can farm within the community you feed to solve the problems of local food availability and quality.

Because real food shouldn't be a luxury enjoyed by few. It should be available to us all.

Vertical Aeroponics: the soil-free growing technology that powers Tower Farms.

1. United States Department of Agriculture (June 2009)
2. University of California, Davis (August 2014)

Getting Started

What This Document Provides

This set of guidelines is a powerful reference tool for you as your Tower Farm is established and continues to grow. You will find helpful information about designing your Tower Farm, considerations as you build and grow your business, and even assistance for growing you business.

How to Use This Guide

Please use this guide as a reference for questions, planning, and ideas.

We provide QR codes so that you can reach accompanying videos and outside resources in each section..

To use a QR code, try this:

1. Open your smartphone's camera application.
2. Aim the camera at the the QR code.
3. A link will appear on your screen (no need to take a photo).
4. Tap the link and it will take you to a website or video.

The Video Collection

You will find QR Codes to complementary videos throughout these guidelines. This is the perfect opportunity to try out the QR code to find a resource. Here is a QR code and link to welcome you:

Welcome to Tower Farms

(Electronically, you can also click on the box as a direct link!)

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Your Support Team

In order to make your Tower Farm development a success, we want to be clear about what you can expect from our support team!

Your Authorized Commercial Representative (ACR)

- Help conceptualize the Tower Farm
- Provide a quote for the Tower Farm
- Consult on facility plans
- Provide resources for Tower Farm operation, including financial forecasting documents
- Help establish production plan for basic crops
- Support after the sale for six months from the time farm assembly begins

Tower Farm Support Team

Our corporate support team is available for the following:

- Assists with developing your Tower Farm
- Develops CAD drawings for electrical and plumbing needs for a nominal fee
- Provides a final invoice and collects payment
- Hand packs your Tower Farm as per specifications
- Schedules delivery and provides a tracking number with instructions for receiving the shipment
- Helps troubleshoot any Tower Farm related challenges

Other Professionals

- Financial Institution
- Insurance Advisor
- Accountant/CPA
- Attorney
- Web Designer
- Marketing Professional
- Social Media Manager
- Construction Professional
- Utility Company
- City/County Planning and Zoning
- Agriculture Extension Office (University, State)
- United States Department of Agriculture (USDA)
  - Farm Services Agency (FSA)
  - Natural Resources Conservation Service (NRCS)
  - Rural Development Office
- Small Business Administration (SBA)
- Chambers of Commerce
- Local Community Groups
- Additional professionals you may want to consult for your specific needs

Facility Planning
for Crop Production

Vertical aeroponic production numbers are most dramatically impacted by lack of light and/or temperature extremes.

Basics for optimal aeroponic growing conditions:

- Good, unobstructed, year round, full sun or adequate grow light system
- 55 to 65 F night temperature (depending on crop)
- 70 to 80 F day temperature (depending on crop)
- 60-70% humidity
- Abundant air circulation
- Oversized cooling system
- Keep greenhouse glazing clean so the sun is not obstructed
- Good horticulture practices
- Quality pest management
- Towers at standard spacing
- Use of Tower Farm Mineral Blend
- Maintain the proper nutrient dosing and pH levels
- Healthy seedling transplants 14 to 28 days old
- Quality commercial grade seed

Crops

Tower Farms grow a wide-ranging variety of crops:

- Typical: Lettuce, greens, herbs (generally most marketable and profitable).
- Specialty: tomatoes, cucumbers, squash.
- Other: flowers and much more.

Seeding

- Seed is planted in rockwool cubes for approximately 7-14 days.
- Seedlings can be separated into spacer trays for an additional 7-21 days.
- Seedlings are planted in the Tower.

Harvesting

When planting a healthy seedling in the towers:

- Petite living produce (roots on) is harvested at approximately 14 days.
- Mature living produce is harvested at approximately 14-28 days.
- Fresh cut produce can be harvested 2-3 times approximately every 7-14 days.

Facility Considerations

From the very beginning, the decisions you make for your farm create the foundation for the growth and ease of your business.

No matter the type of facility you choose to house your Tower Farm, there are many decisions to be made. Please take the following points under consideration:

Tower Farm Growing Environments

- Outside: Year-round
- Outside: Seasonally (closed in winter)
- Controlled Environment Agriculture (CEA) : Greenhouse
- CEA: Indoors with lighting

Key Facility Factors

- Land Topography
- Climate
- Facility Size
- Accessibility/Universal Design
- Biological Security (prevention of pests entering your facilities)
- Post harvest care workspace, walk-in cooler, etc.
- Office and storage space
- Agritourism, events, and tours

Make Sure to Check

- Permitting and zoning requirements at your location
- Any restrictions there may be at the location, in the city, or in the county/province
- Any neighborhood covenants, conditions, or restrictions (CCRs)
- Environmental considerations (particularly water discharge and plant waste)
- Distance requirements between your buildings and surrounding properties

Greenhouse Guidelines

Key Greenhouse Specifications:

- Tower Farm Greenhouse structures ALWAYS run north to south.
- Commercial Tower Farm rows ALWAYS run north to south.
- Full sun exposure and/or supplemental lighting is required for year-round production.
- LED Lighting is the most cost effective for supplemental lighting.
- Oversized fans and evaporative cooling pads.
- Cooling pad with motorized vents on north wall and two-stage exhaust fans on south wall.
- Thrips screen covering all exterior openings to minimize insect intrusion.
- Seedling propagation always on north end near cooling pad for pest prevention.
- Always submit a water sample for hydroponic analysis (see "Water Quality & Testing").

Economy Tower Farm Greenhouse

Structure

- Polycarbonate panels are an option on sidewalls and top.
- Recommend double polyethylene film covering with polycarbonate end walls.
- Light diffusing or thermal polyethylene film recommended.
- Minimum 10′ sidewall height to accommodate height of commercial Tower Gardens.

Climate Control

- Individual or simple digital controller thermostats.
- When outside temperatures are lower than 45°F (7°C), recommend fan-forced, vented propane or natural gas heater.
- When outside temperatures are higher than 80°F (27°C), recommend 50% Aluminet over traditional shade cloth for shade.

Flooring

- Groundcover flooring over fine gravel base.
- If budget allows, concrete with drainage is best.

Greenhouse Guidelines

High-End Tower Farm Greenhouse

Structure

- Gutter-connect greenhouse with minimum 16′ sidewall height.
- Polycarbonate on end walls, sidewalls and top.
- Ventilation (in conjunction with Climate Control):
    - Roof vent for additional heat bleed-off.
    - Gable fan and motorized louver is less expensive but also less effective.
    - Do not exceed 120′ in length between fan wall and cooling wall.

Climate Control

- High-end controller – PC-based with alarms, weather station and climate sensors.
- Outdoor temperatures lower than 45°F (7°C) require heating. Options can include: fan-forced, vented propane or natural gas heater, radiant in-floor heating, infrared heating, or other.
- Optional for desert climate, fogging system for Stage 2 cooling can increase greenhouse length. Requires RO water.

Flooring

- Concrete floor
- For cold climates, in-floor heating operating from high efficiency boiler.
- White epoxy coating is easier to clean and has better light diffusion.
- Engineered drawings can be provide for electrical and plumbing stub up locations.
- Floor slope ½" per 12′ for level Tower operation.

Large Greenhouse Design Details

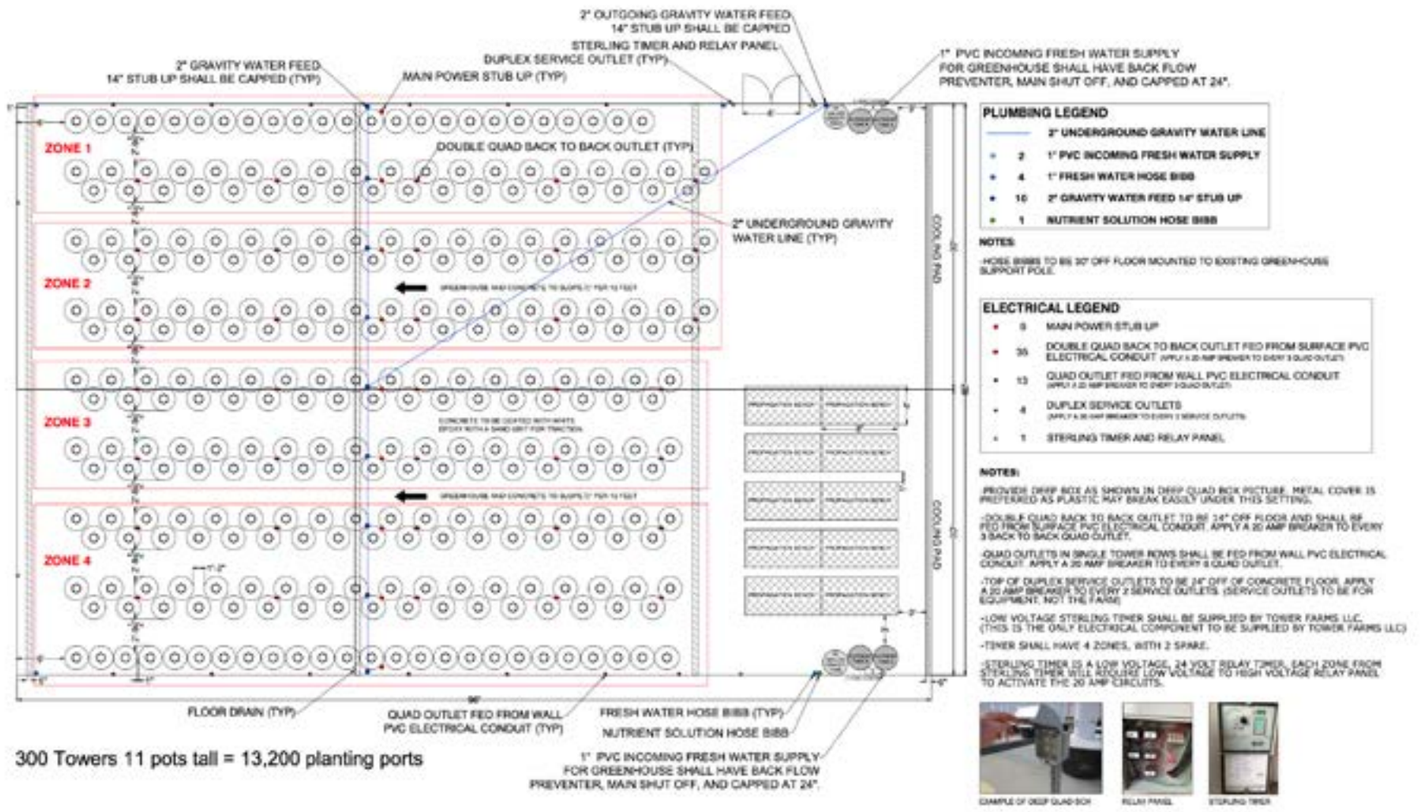
Farm Layout Examples

The following is an example of how commercial towers, electrical, irrigation, flush valves, and pathways can align. For a nominal fee, Tower Farms can develop specific CAD drawings for farm layout, electrical and plumbing needs.

The standard calculation for facility size is 20 sq ft per tower to accommodate for the towers, pathways, utilities, and seedling areas. For example, the average facility size for 100 towers is 2000 sq ft.

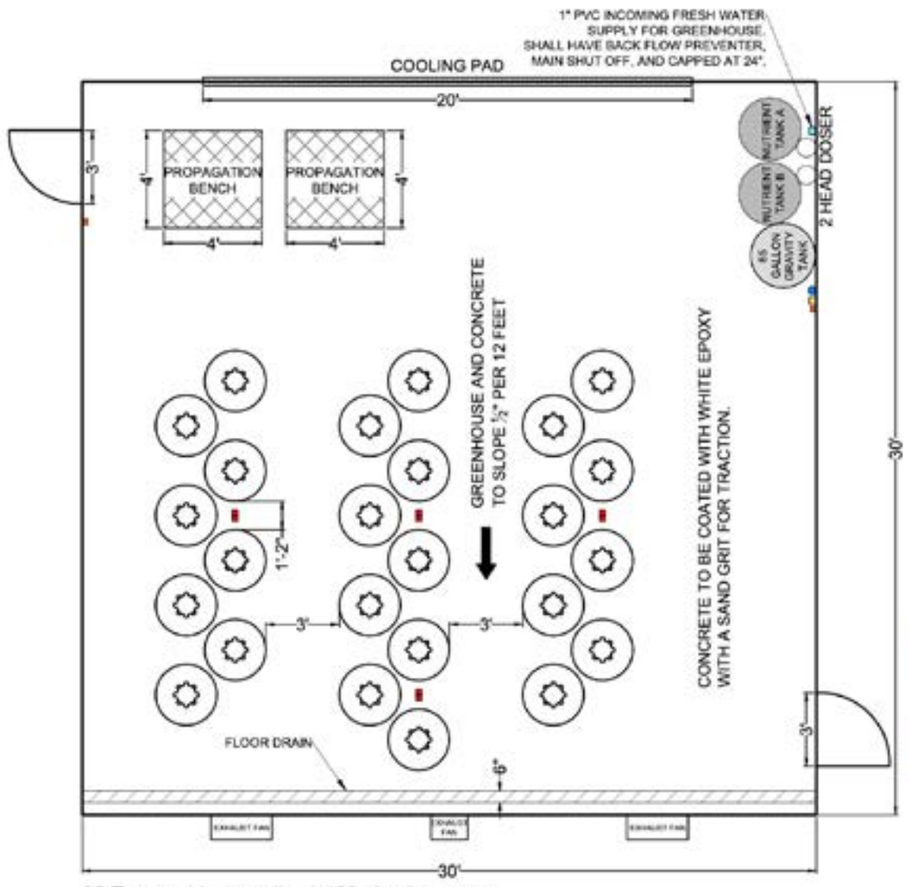
The Nutrient Dosing System, including the nutrient dosing injection system, nutrient tanks, and gravity tank, should be installed close to the seedling tables and irrigation lines.

Sample Greenhouse Farm with 300 Towers



300 Towers 11 pots tall = 13,200 planting ports

Sample Greenhouse Farm with 25 Towers



25 Towers 11 pots tall = 1,100 planting ports

PLUMBING LEGEND

1	1" PVC FRESH WATER SUPPLY
1	FRESH WATER HOSE BIBB

NOTES:

-HOSE BIBBS TO BE 30" OFF FLOOR MOUNTED TO EXISTING GREENHOUSE SUPPORT POLE.

ELECTRICAL LEGEND

4	DOUBLE QUAD BACK TO BACK OUTLET FED FROM SURFACE PVC ELECTRICALCONDUIT (APPLY A 20 AMP BREAKER TO EVERY 3 QUAD OUTLET)
3	DUPLEX SERVICE OUTLETS (APPLY A 20 AMP BREAKER TO EVERY 2 SERVICE OUTLETS)
1	TIMER AND RELAY PANEL

NOTES:

-PROVIDE DEEP BOX WITH METAL CAP FOR DOUBLE QUAD OUTLET. BOTTOM OF OUTLET SHALL BE 12" OFF FLOOR.

-TOP OF DUPLEX SERVICE OUTLETS TO BE 24" OFF OF CONCRETE FLOOR. APPLY A 20 AMP BREAKER TO EVERY 2 SERVICE OUTLETS. (SERVICE OUTLETS TO BE FOR EQUIPMENT, NOT THE FARM)

EXAMPLE OF DEEP QUAD BOX

Tower Specifications

Tower Farms are a tested and proven technology used in a variety of climates and locations around the world. There are two tower options: standard or high-density towers. Standard towers are used to produce most crops while high-density towers are used for petite or baby greens and some herbs. Your ACR will help you determine which option best fits your needs.

Each commercial tower is equipped with a submersible pump based on the height of the tower. Timers are required to determine when the pump delivers nutrients from the reservoir to the plants.

Standard Towers

Number of Pots	Plant Ports	Height in Inches	Height in Meters
7	28 plants	5'7" (67")	1.7 m
9	36 plants	6'10" (82")	2.1 m
11	44 plants	8'1" (97")	2.5 m
13	52 plants	9'4" (112")	2.8 m

Standard grow pots are 7.5in/19cm high, 8.6in/22cm in diameter and feature four plant ports per grow pot.

High-Density Towers

The High-Density (HD) Tower allows Tower Farms to maximize their vertical space by increasing the number of plants per tower. This tower is used for petite or baby greens and other small crops.

HD plant ports have a shelf for holding the seedlings in place, so net pots or grow clips are not needed. For HD towers the first grow pot on the reservoir lid is a standard grow pot to give plants more space. For example, a 13-pot tower will have 1 standard pot (4 plant ports) and 12 high-density pots (8 plant ports each).

Number of Pots	Plant Ports	Height in Inches	Height in Meters
13	100	5'7" (67")	1.7 m
17	132	6'10" (82")	2.1 m
21	164	8'1" (97")	2.5 m
25	196	9'4" (112")	2.8 m

HD grow pots are 3.75in/9.5cm high, 8.6in/22cm in diameter and feature eight plant ports per grow pot.

Grow Clips vs. Net Pots

Commercial Towers have two types of Plant Ports (each port holds one plant):

1. **Standard Ports** (four plant ports per grow pot) are round and require a grow clip or net pot to hold the seedling.
2. **High-Density Ports** (eight plant ports per grow pot) are square and have a shelf in the port to hold the seedling.

Using Net Pots

A net pot fits into each grow port with the large lip of the net pot resting on the outside rim of each grow port.

Use your fingers to firmly push down on the bottom of the net pot until the lip snaps into place.

NOTE: If the net pot is not pushed all the way in, the rockwool cube may not receive water and the plant will not receive moisture.

Using Grow Clips

Just like net pots, grow clips hold plants in place while allowing their roots to grow freely inside the Tower Garden. The difference is that grow clips (and the plants they hold) can be removed with less effort.

Grow clips are made from the same high-quality, USDA-approved, UV-stabilized, food-grade plastic as Tower Garden.

To plant, place the grow clip in the empty plant port, then place the seedling firmly on the grow clip peg.

To harvest, grasp the grow clip by the handle and gently pull the plant from the plant port.

NOTE: Grow clips are designed for leafy greens and herbs. They are not recommended for flowering plants with large root systems, such as tomatoes and squash. For these plants, you should use net pots instead.

To save time planting, cleaning, and harvesting, most Tower Farms prefer grow clips.

Propagation Setup

An important part of your Tower Farm is seeding and growing healthy seedlings for your farm.

Key factors to consider when designing your seeding area include:

Location
This can be in the growing space close to the towers and the Nutrient Dosing System. It can also be in a separate seedling growing room. Closely controlling your environmental factors and Integrated Pest Management techniques will give you the healthiest crops for your Tower Farm.

Style
Seedlings can be grown in a variety of systems including benches with mist or spray irrigation, flood benches, or seedling carts. Choose the best option for your farm.

Temperature
Seeds have specific temperature requirements for optimal germination. Temperatures for germination and growing vary based on the crop.

Humidity
Seeds need significant moisture to break dormancy and germinate. However, excessive water can also lead to fungal diseases. Maintaining a proper balance of available water is important.

Light
The most critical factor to ensure success is to give your newly germinated seeds a high light environment.

Air Circulation
If you are using a closed growing space, shelving or a chamber for growing seedlings, air circulation is your best defense against weak seedlings and fungal diseases.

Nutrients
Seeds do not need nutrients to germinate but will need nutrients after the first 4-7 days. The Tower Farm system allows you to set up your seedling irrigation with nutrient water for optimal growth.

Propagation Table Examples

Simple Bench with Hand Watering

(Photo: Chapala Gardens rooftop farm)

Small DIY Flood Bench

(Photo: Nature's Aquatics)

Mist/Spray Irrigation with Heating Pads

(Photo: True Garden)

Stacked Propagation Bench

(Photo: Johnny's Selected Seeds)

Supplemental Lighting

Greenhouse and outdoor farms are impacted during winter or extended periods of cloudy weather, causing increased production times and weaker seedlings. Supplemental lighting fills the lack of sunlight hours and minimizes the impact on your production yields.

Supplemental lighting is required for consistent year-round production yields.

Without supplemental lighting, year-round production yields will vary.

In your CEA facility, you can manipulate temperature, humidity, light, and other factors to produce the healthiest, most nutrient-dense crops. Plants use light in three different ways:

Light Intensity: Vegetables have varying light requirements, but generally, they require a high light intensity for optimal growth.
Light Photoperiod: The duration of light exposure is important. Most vegetable crops require 12 to 16 hours of light per day for optimal growth. Some crops may benefit from extended photoperiods to promote flowering and fruiting.
Light Quality: The light spectrum emitted by the supplemental lighting affects plant growth and development.

Supplemental lighting helps to provide the necessary light intensity, duration, and spectrum for optimal plant growth and development.

Consult with industrial professionals to tailor the lighting strategy to specific crop requirements and growing conditions. Your ACR can recommend companies to assist with your Tower Farm's lighting needs.

Water Sources

Water is one of the key ingredients to your Tower Farm's success. Good quality water is essential to the success of your farm and potable water is the standard starting point. The most common farm-accessible water sources are well water and municipal water.

Let's look at some of the pros and cons of well water versus municipal water:

Well Water (Ground)

PROS	CONS
• No monthly water bill regardless of how much you use (but overuse may drain a well) • No chemical additives like chlorine and fluoride • It may taste fresher and has nutritional benefits (subject to water quality) • Outside climate factors like natural disasters do not influence supply	• The initial cost of well installment • Water quality and testing are well owners' responsibility • Requires electricity for pump (use solar or generator power) • It may contain naturally occurring minerals that stain the water

Municipal Water (City)

PROS	CONS
• Governing authority is responsible for water purity, quantity, and delivery • Accessible for most city and suburban residents • Banks and mortgage companies consider city water a better option when negotiating mortgages	• It contains chemicals like chlorine, fluoride, & others and is stored in tanks • Shared with thousands, and a third party manages the supply • Costs of water is rising • Possible considerable scale contamination (natural disasters or equipment failure)

We generally do not recommend rainwater collection as a viable water source option. This is due to regulations, viability, and complexity of rainwater collection and treatment.

Water Quality & Testing

While Tower Farms use 98% less water to grow crops, filtration systems are often needed to ensure your growing success.

Many Tower Farms need a water filtration system. Hardness, acidity, chemicals, salinity, and more can affect the quality of your water and, consequently the quality of your plants' health. The extent of your water filtration will depend on your Tower Farm's water analysis.

A water analysis is critical to understand how to manage nutrients during the design phase of your farm and for daily operations.

Steps to collect a water sample:

1. Take samples from an active system that is free of stagnant water and representative of the water used for your Tower Farm.
2. Use a clean plastic water bottle and collect 16 ounces. Be sure that it is thoroughly washed and cleaned before filling. Tightly cap the bottle and pack it securely in a shipping box.
3. Mail water early in the week so the sample arrives in a timely manner.
4. Visit the lab website for the submission form and mailing address.

Recommended company: Macro Micro International Labs, LLC, Athens, GA. (mmilabs.net). Tower Farms is not affiliated with this company and does not receive compensation for recommending their services. Please refer to this section's Resources for MMI Labs' forms.

Send a copy of your water analysis results to your ACR for further recommendations.

Water Quality & Testing (Continued)

Based on your water analysis, Tower Farms may recommend a Reverse Osmosis (RO) filtration system to solve your water quality challenges. A water quality specialist is needed to design the appropriate water filtration system for your farm.

In an RO system, pre-treatment is an essential step to improve the efficiency and lifespan of the system by removing various contaminants and protecting the RO membrane. This is to ensure the feed water entering the RO system meets required standards to reduce the risk of membrane fouling or damage.

Common pre-treatment methods used in an RO filtration system:

Pre-treatment Type	Description
Sediment Filtration	The first line of defense to remove larger particles like sand, silt, rust, and sediment from the water. Prevents clogs and abrasion in the membrane to extend the life of the system.
Carbon Filtration	Activated carbon filters are used to remove chlorine, chloramines, and organic compounds that can damage the RO membrane or reduce its effectiveness. Carbon filters also help in improving the taste and odor of the water.
Water Softening	Reduces water hardness to prevent scale buildup on RO membrane.
pH Adjustment	Some systems require a specific pH range for optimal performance. If the feed water is outside of that range, acidity or alkalinity can be adjusted.
Anti-scalant Injection	Added to inhibit mineral scale deposit formation on the RO membrane, reduce maintenance needs.

Treatment Considerations:

- A water filtration specialist will determine your treatment considerations.
- Pre-treatment steps will vary depending on your water analysis.
- It is important to analyze the feed water's composition and conduct regular monitoring to ensure effective pretreatment and optimal operation of the RO filtration system.
- An RO filtration system creates wastewater. Make a plan to use or dispose of this water.
- A well-designed water system for your Tower Farm will ensure this wastewater is used for cleaning, cooling, and other facility needs.

Business Design

YOU'RE A FARMER AND AN ENTREPRENUER.

Whether you are a seasoned business owner or brand new to entreprenuership, the questions you ask yourself while designing your Tower Farm will be the same.

In this section, questions are asked to help you shape the idea of what you want your Tower Farm, your team, and yourself to achieve - what problem are you solving and what your short- and long-term goals are. Creating a Tower Farm is fun and it is also work.

Having a strategy will keep you focused and help through any challenging times that might arise.

As you design your Tower Farm and business, you create a story. It's the story you envision for the future, the story you are pursuing, the story you will bring to fruition. When you feel like you're getting off-track, this story is what you return to in order to bring your goals back into focus.

A realistic view of the problem you are wanting to solve (or at least make a dent in) is very important. Identifying that accurately without rose-colored glasses or a frantic mindset will make your business model relevant and accessible to more people.

The aim is to approach the problem you wish to solve with your business from the middle of the road, with practicality and adaptability.

The Business Plan Foundation

Making the decision to start a Tower Farm is an exciting step. Now that the spark of inspiration has ignited, there are some decisions to make in order to shape your Tower Farm's future.

In this section, we look at your Tower Farm business goals, the growing environment, the community surrounding your Tower Farm, production considerations, and financing. This is an invaluable tool for your business' growth and longevity.

Every business, no matter the size or function, benefits from having a plan. After going through this section and answering the questions, you'll have most of the information you need for a complete business plan. This helps with securing funding, expressing your vision to interested parties, and can also assist you in the future as your Tower Farm is established and growing.

We're giving you space in this section to write down your answers to the questions. From there, you may take what you've written and compile it into your own formal business plan.

The goal of the Business Plan Worksheet questions is to design the Tower Farm of your dreams. We are providing questions to consider as you build your unique business plan. The Tower Farms website also has a crop yield and profit calculator and a farm financial forecast template to assist in your planning.

You can find many options for business planning services with local-to-you business coaches, mentors, small business incubators or non-profits in your area, and online. While your ACR does not provide business planning services, they will provide a financial forecasting worksheet. It's always wise to look for reviews or find recommedations from people you trust.

Business Structure & Ownership

There are different business structures that might fit your needs. The main types of business registrations in the United States are:

- Sole Proprietorship
- Limited Liability Company (LLC)
- Limited Liability Partnership (LLP)
- Partnership
- Non-Profit Organization
- B-Corporation
- C-Corporation
- S-Corporation

There may be other business structures in your county, state, or province that better suit your farm's needs. Speaking to a tax acccountant and business attorney would be a great place to start in order to register your business in the best way possible. If you haven't registered a business before (and even if you have), they can help you complete and send all the appropriate forms and funds to make it official.

Registering your business is important for legal liability, even if it's only a single person owning and running the show. If you're going to put this kind of effort and planning into creating your farm, it's worth protecting. The same rule applies with insurance!

Tower Farms highly recommends you protect your investment, effort, and assets with proper legal and financial guidance. It's a relatively small expense up front that can give great peace of mind down the raod.

What business structure best fits your Tower Farm?
Who is/are the owner(s)? If there are multiple owners, what percentage of ownership does each person/entity have? Make sure to create an operating agreement for the parties involved.

Business Plan Worksheet

Summary of Your Tower Farm

Problem and Solution

What business are you really in? Growing vegetables or feeding a local community? Being a commercial farmer or creating a consistent and sustainable food source for your customers? Examples: local food, sustainability, providing food to a certain segment of the population, growing a certain kind of food (chemical-free), or providing a service to a community through growing food.
What is the "problem" your business is solving? It could be local food scarcity, lack of produce variety in the local market, gaps in job opportunities, lack of opportunities for underserved portions of the community, and more.
What is your solution to the problem?
What does your customer need now and in the next five years?

Goals

What would make you feel successful?

What does success look like to you for this business (both qualitative and quantitative)?

What are your overall goals for the Tower Farm (to be your livelihood, to support a school or community organization, as a hobby, or something else)?

What milestones/goals are you projecting for the foreseeable future? You could measure this in sales, expansion/growth, or other quantitative ways over time.

Mission Statement

In simplistic terms, a mission statement focuses on the present: why your business exists, its purpose and objectives. **What**, by **When**, because **Why**.

What is your mission statement?
(It's perfectly ok to have more than one and to evolve with time.)

Vision Statement

Similarly, but taking the statement further, a vision statement focuses on the future: what you want your community or world to look like because of your efforts.

What is your vision statement?

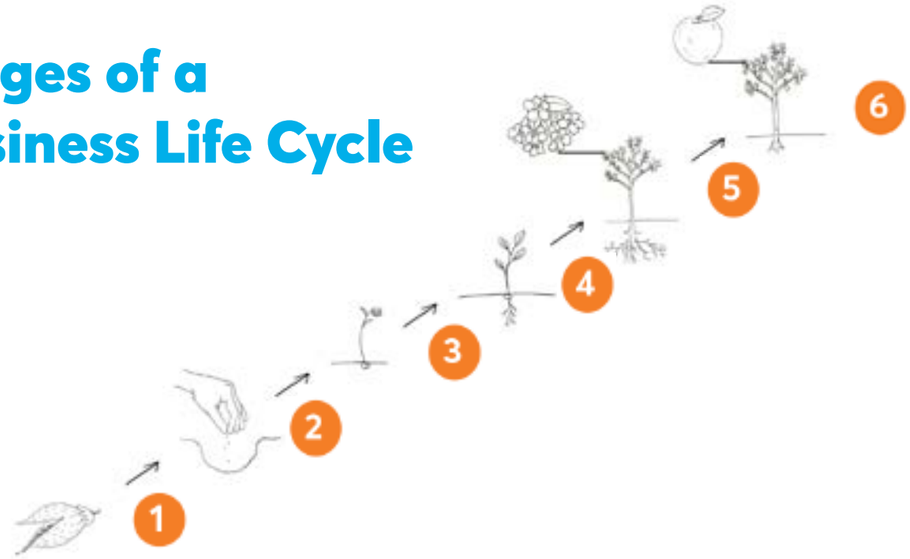
Location and Facilities

Will your Tower Farm be inside a building,, in a greenhouse, or outside?
How much space do you have or do you plan to get for farming?
How is this land zoned?
Are you allowed to operate a business like this on this piece of land?
If in an urban building or location, is the city understanding and supportive of the creation of an urban farm here? If so, what changes do you need to request to the zoning in order to operate a Tower Farm and who do you need to contact to do that?
Are there restrictions you need to be aware of? For example, distance and/or buffers from neighboring buildings or property lines, sound or light restrictions that might affect your winter growing, etc.?
What business approvals, licenses, or paperwork do you need to run your Tower Farm? (For example, business licenses within a city, federal and/or state tax IDs, and considerations to set up an LLC or other business structure. We recommend consulting a trusted attorney about your business structure and liability protection.

Description of Business

What kind of crops do you want to grow (include whether you will focus on one or two plants or grow a wide variety)?
Do you want to grow seasonally or year-round?
What is the purpose or inspiration for your Tower Farm?

Stages of a Business Life Cycle



	Stage	Description	Strengths	Challenges
1	Birth	Taking the Risk ~ Meeting Your Needs ~ Managing Self	Movitation and Excitement	
2	Seed	Surviving ~ Hiring ~ You Wear All the Hats ~ Focus ~ Challenge of Cash Flow		
3	Sprout	Business begins to Self-Cultivate ~ Delicate but with Great Potential ~ Fast Growing	Growth and Movement	
4	Seedling	Roots are Developed for Growth ~ Team is Coming Together ~ Accelerating Growth ~ Over Confidence and Conflict Are Possible		
5	Sapling	Future Anticipation ~ Commitment to Choices ~ Streamlining Focus ~ Redefine Goals & Success ~ Identity Review ~ Settling in		
6	Prime of Life	Fruits of the Labor ~ Meeting the Needs of Your Community Well ~ Operating with a Team ~ Clear Identity and Purpose ~ Sales/Profit Growth		

SWOT Analysis

What is a SWOT Analysis?

This analysis is a marketing technique to clearly and honestly look at the overall health of your Tower Farm business. It's an overview that allows you to capitalize on your business's strengths to reduce risk, as well as find opportunities to improve weaknesses in order to avoid threats.

SWOT	Meaning	Example
S	Strengths	Tower Farm/ACR Support
W	Weaknesses	Being new to farming or growing vertically
O	Opportunities	Food is essential and everyone is a potential customer
T	Threats	Pests, malfunctions, plant diseases

Why is a SWOT Analysis beneficial?

This analysis contains elements that are important pieces of a business plan, which you want prepared for your investors, bank, funders, and partners. You will look at both internal and external influences for the following:

- What your Tower Farm does successfully?
- Where is there room for improvement?
- What are your risks, assumptions, or even blindspots?

Exposing these oversights can bring valuable insight into current business operations and the ability to create powerful strategy and momentum.

Who should perform a SWOT Analysis?

- New Tower Farm: the analysis helps determine where to focus and identify action steps.
- Established Tower Farm: the analysis reviews the business plan, goals, and objectives.
- Purchased Existing Tower Farm: the analysis provides insight and potential restructuring.

Open input from team members helps with the accuracy and clarity of the overall analysis. Who will you include?

When would someone perform a SWOT Analysis?

- When you're creating a new business plan.
- For an existing Tower Farm, a SWOT Analysis every 3-5 years is recommended.
- When your Tower Farm experiences changes or challenges.
- When your Tower Farm experiences growth spurts or opportunities.
- When purchasing an existing Tower Farm.

How to perform a SWOT Analysis:

SWOT analysis involves making lists and so much more! As you write one list (e.g., Strengths), you'll naturally be prompted with ideas for the other three lists as well. When you compare the four areas, similarities and differences will become more apparent.

Questions to get you started:

Strengths

1. What do we do best?
2. What unique knowledge, talent, or resources do we have?
3. What advantages do we have?
4. What do other people say we do well?
5. What resources do we have available?
6. What is our greatest achievement?

Weaknesses

1. What could we improve?
2. What knowledge, talent, skills, or resources are we lacking?
3. What disadvantages do we have?
4. What do other people say we don't do well?
5. In what areas do we need more training?
6. What customer complaints have we had about our service?

Opportunities

1. How can we turn our strengths into opportunities?
2. How can we turn our weaknesses into opportunities?
3. Is there a need in our organization that no one is meeting?
4. What could we do today that isn't being done?
5. How is our field changing? How can we take advantage of those changes?
6. Who could we support? How could we support them?

Threats

1. What obstacles do we face?
2. Could any of our weaknesses prevent us from meeting our goals?
3. Who or what might cause us problems in the future? How?
4. Are there any standards, policies, or legislation changes that might negatively impact us?
5. Are we competing with others to provide service?
6. Are there changes in our field or in technology that could threaten our success?

Business Operations

Products & Services

Are there other secondary products or services you might offer?

System

How will you get your products to customers/clients? (Pick-up, Delivery, Markets)

Growth & Potential

As Stephen Covey, author of Seven Habits of Highly Effective People, wrote, "the main thing is to keep the main thing the main thing."

QUITE TRUE!

And it's also good to know how you want your future growth to look.

Ideas for growth and possibilities:

- Growing and Selling Vegetables, Herbs, Flowers, Seedlings
- Education Opportunities
- Volunteer Opportunities
- Selling Residential Tower Gardens
- Work Skill Training
- Community Supported Agriculture (CSA) Boxes (weekly, biweekly, monthly subscriptions)
- Products made from what your farm grows
- Agritourism
- Therapy Opportunities
- Events and Fundraisers

Marketing

Target Market

Who is your target market? Institutions, commercial, business-to-business, or business-to-customer?

What are your intended sales channels? Wholesale (Grocery stores, restaurants), Retail (Farmers Market, Direct from Farm, Community Supported Agriculture (CSA)), Online (Online Farmers Market services).

What will your marketing activities be? What kinds of advertising and marketing will you utilize, such as social media ads (e.g., LinkedIn, Instagram, Twitter) or partnering with other supportive businesses?

Customers

Who is your customer, really? Example: You may sell vegetables to a restaurant, but the real customer is the patron coming to enjoy the restaurant's food.

Your first customers are your employees. Choosing employees who are equally as passionate about your Tower Farm will help you shape your farm's story. Who shares your vision?

Competitive Advantage

What distribution channels can you use?

What technology could benefit you? How can Artificial Intelligence (AI) be used to benefit your Tower Farm?

Who is your competition? What are they doing that's similar, different, or related? What gaps are in the market that you can fill?

Branding

What will people think of when they do business with you? Who will they become through that interaction?

What will make your Tower Farm unique? What will stand out?

How will you add more value than anyone else for your customers?

What will your Tower Farm be great at?

What makes you personally stand out?

Management and Organization

Your Credentials and Experience

Consider and list your Skills, Experience, State of Mind, Standards and Habits that are beneficial to your business:

Team & Personnel Plan

What kind of staffing needs do you anticipate having? Your ACR can help you estimate this based off the size of your Tower Farm and overall needs. Key roles may include the owner, operations manager, farm manager, growers, and possibly even a bookkeeper or front office assistant.

Advisory Board

Who would you include on your Advisory Board? This may be informal, but these are the people whom you can call to ask questions when it comes to Tower Farms (your ACR), growing, business, money, entrepreneurship, community-building, and more.

Financial Plan, Projections, and Analysis

Expenses

What are your estimated expenses for start-up and operating? Remember to think about direct costs of start-up, day-to-day operations, and indirect costs (such as taxes, insurance, loan payments, utilities, payroll, etc).

Projected Revenue

What do you need to net each month to create profit?

Where can you do local market research for prices on products, interest from buyers, and gaps in what you may provide?

Capital Request

What financing options are available for your start-up needs: personal funding, farm loans, commercial/conventional lending, grants, small business loans, investors, or a combination of these?

Creating a Website

In this era of business development, a website is essential for customer connection. Even a "microsite," or landing page that provides your farm's name, a bit of information about you, your mission, and what you grow goes a long way to bring customers to you. Remember to include your location and a way to contact you.

While some farms opt for larger websites capable of online sales (eCommerce) and providing a lot of extra information, you can also have a powerful presence with a more simplistic website that shows off your beautiful towers and produce. You generally have three choices:

	**Hire a Professional:** If your needs are more complex or you feel less than tech-savvy, a web designer can be found at local agencies or as a freelancer (in-person or online). One way to find a web designer is by looking at websites you like and asking them who designed it: you might even find the name at the very bottom of the homepage. Consider looking into AI!
	**Do It Yourself:** Another option is to build a website yourself. Online website building platforms have come a long way over the years and allow for a more intuitive experience to build a site just as you want it.
	**Online Farmers Market:** There is a wide variety of online direct-to-consumer produce delivery services. In addition to helping with the logistics of orders, shipment, and sales, many of them also provide a simplistic landing page for the farms that supply products. It can be worth checking into if you'd rather not maintain a stand-alone online presence.

Consider your branding and desired style as you create your website so there are fewer changes going forward. Colors, your Tower Farm's story, and your mission go a long way in shaping the image of your Tower Farm and inspiring customers to seek out and feel connected to what you do.

Water Testing Form

Shipping details

USPS

Micro Macro International

PO BOX 7127

Athens Ga 30604

FedEX and UPS

Micro Macro International

1350 Ferncreek Dr

Bogart Ga 30622

Telephone ▪706.548.4557

info@mmilabs.com

www.mmilabs.com

MMI Lab ID #:

Samples Submitted By (Client Name)	Send Invoice To:	Send Copy of Results To:
Name:	Name:	Name:
Company:	Company:	Company:
Address:	Address:	Email:
City:	City: State:	Phone:
State: Zip:	Zip: PO#:	
Phone: Fax:-	Phone: Fax:	
Email:	Email:	

Analytical Results
Check the appropriate box

☐ **E-mail**

☐ **MMI Website- go to mmilabs.com click on analysis results**

User name:

Password:

Phone # with no spaces or dashes

	Sample type See mmilabs.com for Sample Identification	Description Include a description for identification purposes	Comments List any other descriptions including tests needed
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Resources

Water Testing Example

MICRO MACRO INTERNATIONAL
183 Paradise Blvd., Suite 108, Athens, GA 30607 USA
Phone: (706) 548-4557
Fax: (706) 548-4891
www.mmilabs.com

FERTILIZER ANALYSIS

Customer Name:
Address Line 1:
Address Line 2:

Lab ID: 220225-1
Received:
Completed:
Phone:
Fax:

Sample Description: City Water for Hydo/Aeroponic Irrigation

	--ppm-
Sulfate (SO4)	45.60
Chloride	13.15
MAJOR NUTRIENTS: *	**--ppm-**
Nitrate (NO3-N)	0.49
Ammonium (NH4-N)	0.16
Phosphorus (P)	0.14
Potassium (K)	2.46
Calcium (Ca)	86.31
Magnesium (Mg)	19.22
MINOR NUTRIENTS	**--ppm-**
Iron (Fe)	0.00
Manganese (Mn)	0.00
Boron (B)	0.05
Copper (Cu)	0.00
Zinc (Zn)	0.01
Molybdenum (Mo)	0.00
Sodium (Na)	16.52
Nickel (Ni)	0.01
Aluminum (Al)	0.00
Silicon (Si)	6.82
	--ppm-
pH	7.61
Conductivity (mmho/cm)	0.53

* Urea not determined

Conversions: To convert P to P205 multiply by 2.29
To convert K to K20 multiply by 1.20

This analysis is based upon the sample received and does not guarantee the uniformity of the lot sampled.

FAQs

Q. Does Tower Farm provide a business plan or budget?
Yes, your Authorized Commercial Rep (ACR) can provide a business planning template for you to use as you create a unique plan for your farm. The template provides data specific to the operation of a Tower Farm, as well as helps you budget for local variables in overhead, labor costs, local pricing, etc.

Q. How much electricity does the tower use?
The commercial pumps are rated at 45 watts per hour, and a normal timer setting is three minutes on and 12 minutes off, so that is 4.8 hours per day of run time. So, 58w x 4.8 hrs = 278 watts per day per tower multiplied by your local electricity rates.

Q. How much water does the tower use?
On average, one-half to one gallon of water per day per tower multiplied by your local water rates.

Q. How long does a set of nutrients last?
Each set of dry nutrients makes at least 10,000 gallons of finished solution at the full rate (example 1:200). The rate can be much lower (example 1:400) in warm season. The rate of use will vary by the size of your farm.

Q. How much does supplemental lighting cost?
Tower Farms doesn't sell grow lights for large scale production, but can refer you to our preferred lighting vendors for a quote. We can also recommend fixture specifications and layouts making it easy for you to source and price them.

Q. How much labor does it take to run a farm?
Our business plan template calculates this automatically for you. Generally, one full time worker can easily manage seeding, harvesting, and maintenance for 50 Towers. For larger farms, budget one full time worker for every 75-100 Towers, plus a manager and owner/operator.

Q. How much can I sell my produce for?
Pricing varies widely by market, so your local market research is critical during your planning stage. We suggest a blend of customer types (wholesale, restaurants, retail) to diversify and increase revenue sources. The Business Planning Template has pre-filled pricing to give you a starting point in planning.

Q. What size farm do I need for a profitable business?
Virtually any size Tower Farm can operate profitably if the direct and overhead costs are proportionately low. For example, many farms operate in a non-profit setting such as a school, outreach, or restaurant, they can often cover costs with any size farm. For an owner-operated farm, 100-250 towers or more can produce a viable business profit. Tower Farms are proven to produce in virtually every growing environment. Our goal is to help you create a successful commercial farm.

Q. What type of greenhouse do I need?
Your ACR can help you understand the best type structure for your farm and provide a set of guidelines by greenhouse type.

Q. How much does a greenhouse cost?
Greenhouse cost vary depending on size, location, and type. We do not sell greenhouses, so you are free to choose the supplier that best suits your needs. Because the Tower Garden technology is unique and greenhouse types and technology vary widely, we are glad to provide specifications to maximize the efficiency for your greenhouse type and climate. We can also provide basic greenhouse package budgets and make recommendations for greenhouse contractors.

Q: What other costs should I anticipate for the creation/construction of my farm?
This will depend greatly on your plans and needs. Your ACR can help you identify other costs and budgetary items to consider.

Q. What is my ROI?
ROI (return on investment) is a function of many choices you make in your specific business plan – your unique overhead costs, capital expense, revenues, etc. Our business planning template allows you to include those costs to help determine your ROI.

Final Note

For suggestions on vendors, products, and services Tower Farms recommends in conjunction with your Tower Farm, please consult with your ACR. They will have the most up-to-date resources to help you design and build your Tower Farm.

Glossary

Authorized Commercial Rep (ACR)	An ACR is assigned to (or chosen by) parties interested in setting up a commercial Tower Farm. The ACR is the primary point for contact and support from concept to operating a farm for commercial use.
Computer Aided Design (CAD) Drawings	As the design of a Tower Farm develops, for a nominal fee the Tower Farm support team can provide a CAD drawing for the farm including tower layout, electrical and plumbing needs.
Commercial Dosing System	The commercial dosing system includes two nutrient tanks, a gravity tank, and at least two dosing heads for regulating the amount of nutrients delivered to the commercial towers. No electricity is required to run the dosing system.
Controlled Environmental Agriculture (CEA)	Enclosed growing environment like a greenhouse where factors such as temperature, humidity, light, and nutrient levels are precisely controlled and optimized for plant growth.
Dosatron	Dosatron is a brand of water-powered dosing pump used to inject and regulate liquid nutrients into water systems. The commercial dosing system uses one Dosatron to mix nutrients from tank A and one Dosatron to mix nutrients from tank B with water to automatically fill the gravity tank as needed.
Dosing Manifold	The dosing manifold is the setup of Dosatrons fixed to a backing plate with inlet and outlet access piping and hoses.
Drain Valve	Also known as a ball valve, this is the valve at the end of each irrigation line that allows the flow to be open or closed when draining or cleaning the irrigation lines.
Electrical Box	A waterproof plastic box to contain the electrical cord connections between the main power cord and the pump cords.
Gravity Tank	The gravity tank is the container that stores the mixed nutrients for the commercial dosing system. The gravity tank uses gravity to automatically deliver nutrients to the towers so it must be elevated to create pressure.

Gravity Tank Manifold, 1-barb/2-barb	This manifold contains a screen filter and individual barbs for each zone of towers. There are between one and five barbs on the manifold to which the 1" poly irrigation line is attached.
Greenhouse	A greenhouse is a controlled environment structure designed to grow plants under cover to help regulate temperature, humidity, light and other environmental factors to create optimal conditions for plant growth.
Grow Clip	Like net pots, grow clips hold plants in place while allowing their roots to grow freely inside a tower. The difference is that grow clips (and the plants they hold) can be removed with less effort.
Grow Pot	A grow pot is each section of the tower. The standard grow pot holds four plants. The high-density grow pot holds eight plants. Grow pots are then stacked to the desired height (up to 13 pots).
Net Pot	Net pots hold rockwool cubes in a tower's grow ports.
Nutrients, Dry Mineral	The formulated minerals that come in buckets marked A1, A2, B1, and B2 that will be mixed with water.
Nutrient Tanks	Nutrient tanks are a part of the commercial dosing system and contain the concentrated nutrients. There are two nutrient tanks: one for "A" minerals and one for "B" minerals.
Plant Port	A plant port is the opening that holds an individual plant. Standard plant ports require the use of a net pot or grow clip to hold each plant. High-density plant ports do not.
Poly Line	1" poly irrigation line: transports the nutrient water from the gravity tank manifold between the rows of towers. This line is gravity fed and not under high pressure.
Poly Line Drain Valve	This drain valve is located at the end of each poly line to allow purging of the lines for cleaning as needed.
Propagation	Propagation is the process of planting crops for commercial towers. It is necessary to have an area of the farm for seeding and germinating trays of new plants.

Reverse Osmosis (RO) System	RO system is a water purification technology that removes impurities, contaminants, and particles from water by using a semi-permeable membrane. This process involves applying pressure to force water molecules through the membrane while blocking larger particles, ions, and molecules. As a result, the treated water on one side of the membrane is significantly cleaner and free from many dissolved solids and contaminants.
Supplemental Lighting	Supplemental lights provides the necessary light intensity, duration, and spectrum needed for optimal plant growth. When growing indoors or in a greenhouse with short winter days, supplemental lighting is required to grow healthy plants. There are different lighting options based on environmental needs.
Supply Tube	One quarter inch drip irrigation tubing with a valve on one end that attaches to the poly line and adapter on the other end to connect to the conical socket adapter on the outside of the reservoir.
Tower Farm	A Tower Farm is an agricultural system using our patented, vertical aeroponic tower technology and a commercial dosing system to grow plants (greens, vegetables, herbs) in a variety of environments. A Tower Farm can have from 10-100s of commercial towers.
Tower Farms Mineral Blend	The Tower Farm Mineral Blend is a proprietary mixture of essential mineral elements delivered by two separate solutions called "A" and "B". The commercial dosing system is responsible for carefully formulating the balance for optimum plant growth.
Tower Farms Support Team	The Tower Farm Support Team are members of Tower Farm corporate in Memphis, TN, who support the ACR during design and installation phases and support the farm after installation.
Tower Garden	A Tower Garden is a patented, vertical, aeroponic gardening system designed for growing plants, including vegetables, herbs, and some fruits, using a tower-like structure that can be set up indoors or outdoors.
Water Analysis & Filtration	Water analysis is required to evaluate the condition of the water source. A water filtration system may be necessary to adjust the hardness, acidity, chemicals, salinity, and other conditions for optimal plant health.

Notes