

# 10 ESSENTIAL VERTICAL FARMING TOOLS

for the Ultimate Grow Room

*Elevate . Cultivate . Grow .*™

 **PIPP**®  
HORTICULTURE

Today cultivators are implementing and utilizing vertical farming systems and grow room equipment more than ever to maximize production capacity and maintain a competitive edge. For the foreseeable future, vertical farming and the associated technologies will continue to revolutionize and shape the production of cannabis and other high-value crops. For something so revolutionary, it's quite simple. Vertical growing provides many advantages when done successfully.

**The benefits of vertical farming include maximizing your production capacity within a fixed grow space, increased margins as production increases, and the ability to increase production with limited downtime rapidly.**

Using this previously unused vertical grow space is one of the easiest ways to improve total production capacity. However, effectively utilizing the majority of your space requires some upfront investment, strategic planning, researching options, and budgeting properly for grow room equipment expenditures can be the difference between success and failure. Like any large investment, you need to plan what you're buying, why you're buying it, when to buy it, and how it will yield a return on your investment (ROI).

In this E-Book, we'll look at sourcing the right equipment and systems that will effectively integrate to create an optimum controlled growing environment that is efficient, productive, and free of costly miscalculations and constraints.



# Why you need to select the right **GROW ROOM EQUIPMENT**

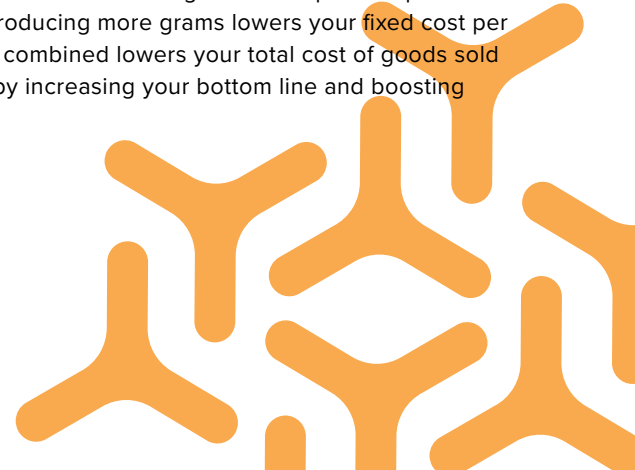
If you're going to flourish in the competitive cannabis industry, you'll need to maximize crop yield and quality. Every square and cubic inch of canopy matter, and ensuring that every inch of plant canopy is operating with minimal downtime while receiving optimal inputs is vital to maximizing production capacity. To do this, you'll need expertise and proper planning to calculate and integrate systems to achieve maximum results. "Saving a buck", taking shortcuts, and miscalculations can easily bottleneck or shut down operations altogether.

Investing in the right equipment is the closest thing to crop insurance that you can buy. Putting this type of care into your facility and equipment selection translates into a better product, and overall, more efficient and profitable operation.

## **HOW THE RIGHT VERTICAL FARMING EQUIPMENT CAN BOOST YOUR ROI**

In an increasingly competitive industry, maximizing your ROI is the key to long term success. Vertical farming is one of the best paths to achieve this, beginning with choosing the right vertical farming equipment. Making the right decisions and investing intelligently in your operation boosts your ROI in several ways.

First, it allows you to fit more plants into your grow space, increasing the quantity of your overall crop yield. Second, automated servicing across multiple layers of plants can reduce your labor costs resulting in a lower per-unit production cost. Finally, producing more grams lowers your fixed cost per unit. All of this combined lowers your total cost of goods sold (COGS), thereby increasing your bottom line and boosting your ROI.





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VERTICAL FARMING  
EQUIPMENT NECESSITIES

# 1. VERTICAL GROW RACKS

The backbone of vertical farming is a mobile **vertical grow rack system**. Pipp Horticulture's vertical grow racks help you utilize unused cubic feet by stacking multiple layers of cannabis and other high-value plants. Using vertical grow racks can offer flexibility and cost savings as you design and scale-up production by reducing the overall building square footage, deferring or eliminating expensive relocation costs due to capacity constraints, and offering flexible tiered expansion without expensive construction and permitting processes.

So, what should you look for when choosing your rack system? Strength and durability in a high-humidity environment. Your grow racks are the skeleton of your operation. The bones provide structure and accommodate all your cannabis plants and equipment, including fans, lights, trays, and irrigation. Your racking and mobile carriage should be constructed with high strength steel and must have a high capacity to ensure as many plants as possible can fit and grow on each row.

You want a UV-stable, anti-microbial, and fungal resistant finish that is simple to keep clean and sanitized while giving your cultivation space a professional appearance. Finally, you'll want to feel confident in the craftsmanship and the ability to last a long time through consistent usage in a damp and corrosive environment.



# 2. MOBILE CARRIAGES

Just as crucial as choosing the right racks is selecting and correctly installing the complementary **mobile carriages**. If your grow racks are the skeleton of your grow space, the mobile carriages are the muscles, moving the bones around where they need to go.

This mobility is a critical function for optimizing your vertical farm's capacity and workflow. If you've ever been in a library or back-of-house retail stockroom, chances are you've seen mobile carriages in action. Pipp's mobile carriage offerings allow a user to effortlessly move huge racks or shelving units to maximize space and eliminate static aisles between each rack.

When choosing your mobile carriages, keep in mind that they must meet ADA compliance standards. Carriages should utilize in-track anti-tip features that provide worker safety and are often mandatory in states with seismic regulations.

You'll also want to ensure all components are corrosion and oxidation-resistant. A mechanical-assist drive system allows for the effortless movement of each rack. Selecting the right mobile carriages helps utilize every possible square and cubic inch of space and ensures reliable performance while avoiding operational failure and downtime caused by corrosion and breakdown of cheap components.



# 3. GROW TRAYS

Once you've built the framework or skeleton, it's time to fill it out with grow trays, the organs, metaphorically speaking. They give your cannabis plants a home and provide the foundation and/or mounting points for your lighting, air circulation, and plumbing. **Pipp's grow trays**, designed for durability, can be used for drip-to-drain irrigation. Pipp trays come with UV-stability, anti-microbial, and fungal-resistance properties and feature a built-in trough for easy drainage to ensure a clean, sanitary and productive vertical growing environment.



# 4. LIGHTING

Along with water and air, lights provide your cannabis plants the crucial input needed for cannabis to grow healthy, vigorously, and produce high concentrations of cannabinoids, terpenes, flavonoids, and other actives.

Vertical farming typically utilizes **LED lights** on each growing tier. While this upfront investment can be expensive, the reduced installation costs and continuous energy savings (when compared to HPS lighting) lower your production cost/gram. Most cultivation facilities recoup their upfront premium within several harvests.

When selecting your vertical farming lights, you'll want to ensure the light spectrum, intensity, and layout are adequate for your needs, typically between 750 and 1500 PPFD. Ideally, flex-wiring or "daisy chain" functionality will allow for reduced electrical work and installation costs. Additionally, you'll want your lights rated IP65 or IP66 for wet environments, easily dimmable, and capable of providing an even distribution of PPFD across the entire fixture.

Warranty and service should also be taken into consideration when making your final decision on lighting. With all these components, we recommend utilizing proven systems with verifiable installations and operational customers willing to provide positive testimonials. Working with reputable manufacturers provides assurance and support as you determine lighting, cooling, and other crucial calculations necessary to create the ideal growing environment.





# 5. AIR FLOW

Helping your plants thrive in a vertical growing environment requires ensuring that they get adequate amounts of clean air. Providing sufficient airflow is imperative to plant health and mitigating pests and pathogens throughout your facility. Vertical farming operations have unique air circulation needs. Due to obstructions and restrictions created by infrastructure and the multiple tiers of cultivation, micro-climates can form if the design and execution is not done correctly.

Adapting to these challenges is critical for ensuring adequate airflow and thorough fresh air exchanges. You must provide a system on each level of plants that's capable of supplying consistent conditioned air to the canopy and sub-canopy across the entire run, with minimal variation. Some airflow systems like **Vertical Air Solutions** provide additional capabilities, including air sanitation and Co2 enrichment.



# 6. HVACD

Your HVACD system is metaphorically like the lungs of a vertical growing system. It brings in the fresh air and expels used air through the ventilation system, keeping the air clean, moving, and well-regulated within the set temperature and humidity parameters to ensure your cannabis plants thrive. Keeping your HVACD **clean and sanitary** allows for regular, fresh-treated air exchange and prevents the growth of mildew, mold, bacteria, and other pathogens in the air.

When choosing your HVACD system, it's essential to determine the adequate cooling and heating loads specific to your production plan. In addition you must consider the irrigation rates and dehumidification need to remove excess transpiration.

Most cultivators elect for redundancy in HVACD equipment to ensure continuous operations if one or more systems are down for service or malfunctioning. Also, consider maintenance and servicing these systems, are parts and service personnel nearby and readily available. It is a standard best practice to keep a backup of spare parts prone to breaking and/or have extended lead times.



# 7. IRRIGATION AND FERTIGATION SYSTEMS

Similar to previously discussed vertical farming equipment components, irrigation and fertigation systems and corresponding controls require design, installation, and commissioning to provide coverage for current and future plant layouts and plant feeding strategies. Consistent water and nutrients are essential for cannabis plants. Proper irrigation and fertigation arrangement could be the difference between growing weak plants and **producing robust and cannabinoid-rich harvests** through various crop steering techniques.

Several well-established companies are operating in this sector, providing irrigation and fertigation systems and controls to commercial farmers worldwide. Utilizing proven providers with cannabis experience will ensure proper functionality and integration. Automated irrigation systems are an excellent way to achieve efficiency, reduce water consumption, and reduce costly and grueling labor often associated with manual fertilizing and hand watering. Be sure to select irrigation and fertigation components that are compatible and integrate with your other grow controls, sensors, and monitors.



# 8. GROW SENSOR AND MONITORS

One of the most high-tech evolutions in cannabis growing is the proliferation of grow sensors and monitors and the robust data now available to growers to help make data-driven solutions. These tools offer both a macro and micro view of your entire grow operation, with in-depth analytics including air temperature, soil temperature, pH, humidity, VPD, lighting, and substrate moisture, among others.

Digitally analyzing your cultivation space allows expert growers to combine their earned expertise with insights located in a simple digital dashboard to optimize vertical cannabis growing conditions. When selecting these components, they must have open API and integrate with other systems and controls to provide real-time alerts and provide feedback to modulate other components that maintain set parameters.



# 9. MOBILE CARTS

With a solid infrastructure of vertical grow racks, mobile carriages, and grow trays in place, your vertical farm setup is starting to take shape. While space maximization and optimization have been our main focus throughout this article, we've yet to address one of the critical activities of all cannabis operations: harvesting and drying plants.

Now that you've optimized the cultivation areas, it's only right to extend these concepts into the processing and drying areas to maximize the space and create efficient workflow and processes. **Pipp's mobile drying carts** quickly move from flowering rooms to processing and drying areas, making for an efficient, gentle, and sanitary transition from harvest to drying. It's a smart idea to invest in a few other general mobile carts for storage and transportation to keep the team safe in the grow space, as accidents are more likely to occur when someone is carrying around large loads of gear or plants.

The ideal drying cart is designed and constructed for durability and flexibility to accommodate hanging plants or bucked cannabis to dry/cure/process harvested material. Carts should be adjustable and have various trays or hanging options like cantilever-style finger attachments allowing for custom configuration based on specific plant structure, process, and intended use. Additional features like nesting bases, security cages, and anti-microbial and fungal-resistance coatings are available.



# 10. ELEVATE™ PLATFORM SYSTEM

**The Elevate™ Platform System** is a robust yet lightweight, portable deck to allow cultivators to access the upper level of Pipp's Multi-Tier Mobile Grow Racks quickly, efficiently, and most importantly - safely. This patent-pending system was designed to integrate with Pipp's Bulk Rack Shelving Systems without any modification. The Elevate™ Platform System can be installed on new or existing Pipp mobile vertical grow racks.





# COMMON VERTICAL FARMING EQUIPMENT MISTAKES

Now that we've reviewed the main components of a vertical farming system, **let's address some of the most common vertical farming equipment mistakes.**

# Believing the investment is out of budget and seeking cheaper and inferior options.

Financial constraint is the most common reason for choosing a suboptimal solution. But don't let a lack of cash limit your options. Securing capital without traditional institutional lenders can make capitalizing a cannabis operation challenging. However, as the industry develops and becomes more mainstream, funding and leasing options for cultivation equipment are becoming more readily available with terms equivalent to those provided to other sectors. Working with Pipp's team to create a phasing plan for purchasing and installing growing equipment can help defer some capital expenditures to future expansion phases.







## **Undercutting the operation by miscalculating and skimping on equipment.**

By miscalculating or buying less output or capacity than required for optimal performance, you may overextend and wear out undersized equipment, severely impeding your operation from fully maximizing and capitalizing on the advantages of vertical farming. Upfront investment in adequate infrastructure supports operations that generate profit, providing funding for future expansion as demand increases.

## **Failure to design grow space for vertical farming.**

Vertical farming success hinges on strategic planning, calculations, and design. Getting the Pipp Team involved early in the design process can significantly augment your overall production capacity. While the equipment can dynamically move around your grow space, calculating ideal room sizes and configurations that maximize your canopy can increase production capacity up to 55%.

# HOW PIPP HORTICULTURE CAN HELP



We hope this piece was an informative and useful review of vertical farming and the various components that integrate to create an optimized cultivation facility. Though we covered much information, there is much more detail and nuance that sets up and operates a vertical farm. When you are ready to learn more and begin planning out a vertical grow, Pipp Horticulture can help you every step of the way with expert advice and industry-leading vertical farming equipment.

**We offer the best in vertical grow racks, mobile carriages, grow trays, mobile carts, and storage lockers to optimize your vertical cannabis growing operation. Contact the Pipp Horticulture team today for a **complimentary consultation** to maximize your facility's potential.**

If you've made it this far, your mind is probably surging with the possibilities inherent in vertical cannabis growing. Are you ready to make the switch? Pipp Horticulture is your partner in re-imagining your space, so **contact us today and take the first step up to a vertical farming future!**



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