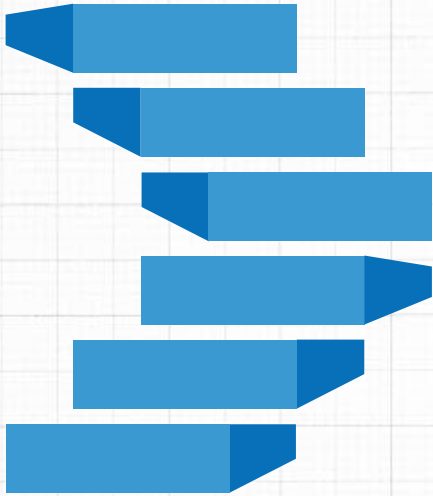


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CULTIVATION

STARTUP & EXPANSION GUIDE

New growers and those looking to expand their operations can use these insights to ramp up operations.



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CULTIVATION STARTUP & EXPANSION GUIDE: WHAT YOU NEED TO KNOW

Competition in the cannabis industry is fierce, and dedicating time, resources and money toward a new cultivation business or facility does not guarantee an applicant will win a license. It is more important than ever that companies looking to launch or expand in new markets set themselves apart. Reliable capital and a well-rounded team of experts that includes people with backgrounds in commercial cultivation (ideally cannabis), engineering, architecture and the law are key. Yet building a cannabis business goes beyond financial and human capital and even beyond the facility itself.

Each state, and even each municipality, has its own labyrinth of regulations that companies must navigate and follow closely, and officials that review license applications are looking for more than sound business acumen—they often want a commitment to their communities and to know that the company will provide an educational, philanthropic role, in addition to bringing jobs and increased tax revenues.

This guide provides an overview of the many steps essential to starting or expanding a cultivation business. In the following pages, you'll find tips on: what to consider when evaluating nascent markets; how to create a winning license application; how to write standard operating procedures to get your team up and running as quickly as possible and ensure consistency and long-term success; how to decide whether to build new or retrofit an existing facility, whether you're growing in greenhouses or indoors; and key considerations for operating your cultivation facility.

While this special report offers a strong foundation for your new or expanding venture, many other factors are essential to your success. Look for more best practices on everything from extraction to lighting, nutrients to drying and curing cannabis, building a winning team, and much more in our archives on [CannabisBusinessTimes.com](https://www.CannabisBusinessTimes.com).

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Top Tips For Winning a Cannabis Cultivation License

The state-legal cannabis landscape has changed drastically during the past decade. Once upon a time, experts recommended hiring someone with relevant commercial horticulture experience as the cultivation lead as part of the application process. Today, it's more important than ever to employ someone with direct cannabis experience on your growing team. Establishing real connections with local officials and partners also is emphasized more so than in the past as a way to set yourself apart.

While many aspects of applying for a license have shifted, much has remained the same. As more states come online,

entrepreneurs in emerging markets have the advantage of the advice from the people and states that came before. Here, experts weigh in on some of the top tips for applying for, and winning, a license.

DIANE CZARKOWSKI, FOUNDING PARTNER OF CANNA ADVISORS

Allow plenty of time to complete the application, even if the official window is only 30 to 60 days, and stick to the deadlines.

Diane Czarkowski, founding partner of Canna Advisors, says she cannot stress enough to her clients the amount of time the application process will take. The most underestimated

time sink: formatting, printing and assembling the application. It may sound like a simple process compared to actually writing and completing all the required documentation, but producing the physical application is quite a chore. Application instructions can be very explicit, specifying certain fonts, spacing, and binding restrictions, and states usually want several copies—some of them redacted of all identifying information. On the application deadline, at the government building where the applications must be submitted, you'll find several other applicant groups scrambling to finish.

OMAR FIGUEROA, ATTORNEY, LAW OFFICES OF OMAR FIGUEROA

If possible, reside where you plan to operate and establish relationships with local and state officials.

"Start volunteering in the local community. You will be received much differently after you live somewhere a few months. I have a client who did that, and pretty soon he was rubbing elbows with the mayor because they were both volunteering at a soup kitchen. Eventually, they saw each other at a cannabis meeting and recognized each other. It was organic. My client didn't scheme to make this happen."

**DEREK SIGMAN, DIRECTOR OF
LICENSING FOR SIVA**

Provide realistic sales projections and ensure you have enough capital.

“You want to make sure that your projections are actually based on assumptions that are realistic and defensible. ... The state knows when you’re inflating your overall revenues to try to demonstrate a high amount of tax revenue.”

The amount of cash an applicant needs on hand will largely depend on the area in which he or she plans to locate, he adds, and operating expenses also need to be considered.

“Real estate is always going to be one of your biggest up-front expenses, and when you start looking at how much capital you actually need ... and how much you need to demonstrate in the application, you want to be able to at least show that you have ... 20% [more capital] than what your anticipated operating costs are. When states start looking at groups for preliminary approvals for awarding a license, they are going to be wanting groups that are going to be able to enter the market quickly.”

**DINA ROLLMAN, SVP, GOVERNMENT
& REGULATORY AFFAIRS,
GREEN THUMB INDUSTRIES (GTI)**

Emphasize the educational role your company will play.

“[If you are applying in a medical market,] it is a good idea to stress that you intend to educate potential patients and doctors about cannabis as a tool for managing different medical conditions. It shows that you see your role not just as a business owner operating a for-profit business, but that you’re also taking on the responsibility of providing education to the community. Whether or not they become customers, you’re doing something positive to increase education and awareness for the benefit of people’s health and wellness.”

**PETER MARCUS, COMMUNICATIONS
DIRECTOR, TERRAPIN CARE STATION;
COLORADO, MICHIGAN, PENNSYLVANIA**

Carefully evaluate how you can make a difference wherever you locate.

“We applied in Pennsylvania along with about 179 other companies for 12 grower-processor licenses. What was interesting about Pennsylvania (and what we’re

starting to see in other states that are creating application processes) is not just a requirement that you prove things you need to be a secure and responsible cannabis company—your security, floor plans, growing standards, pesticide use, financials and all of that—they also want you to show your worth to the state and to the communities in those states.

“Pennsylvania wanted us to show market diversification, employee diversification and community engagement. We’re located in Clinton County, a rural part of the state that has been left behind economically. Veterans are a major part of [its] population. The median income is \$19,000 per year.

“This is a town that hadn’t had an influx of new jobs in a long time. We were bringing 45 new jobs, and we asked ourselves what part of the population we could affect the most. With such a high veteran population, we decided to hire veterans as 30 percent of our workforce. We held a job fair and placed a focus on veterans at the fair. We committed \$25,000 to refurbishing a veterans’ memorial in Lock Haven, Pa.

“When you’re looking at new applications in new states and cities, you are going to see those applications focus on community engagement. Folks who are thinking about getting into the industry or want to apply for a new license should definitely make community impact a priority.”

**VAN MCCONNOR, CANNABIS
SEED BREEDER, GOVAN SEEDS;
FORMERLY WITH CLEAR RIVER LLC**

Put together a well-rounded team of experts.

“You want someone who knows how to get permits and knows how to get the facility built. Also, hire a strong attorney who knows the state regulations and can help you interpret them correctly. You should have your attorney review your application, as well, like any legal document. Applying for a competitive license is essentially preparing a document focused on the law and the regulations promulgated in the legislature and the controlling agency, such as the Department of Agriculture, Marijuana Enforcement Division, etc.”

**AVIS BULBULYAN,
FOUNDER AND CEO, SIVA**

Vet all your operators, vendors and business partners.

“A lot of groups fall apart because someone has something to hide, like a felony record for arrest of a grower, for example. ... You are spending a couple hundred thousand on an application. You might as well spend a few thousand on a private investigator to do a background check on your partners. The state will likely do background checks on each team member, even vendors. So when you bring on new partners, or hire vendors or consultants that have a direct interest in your operation, or if you’re paying them six figures, you want to make sure ... that your partner’s background is not going to hurt your chances of winning.”

**JAY CZARKOWSKI, FOUNDING
PARTNER, CANNA ADVISORS**

Be ready to pay for team members, if that helps you win the license.

“You want to be able to recruit PhD-level horticulturists or PhD-level chemists. Those are the kind of team members you want that are experienced and work well on an application. Some of those folks may require a stipend to join.

“When it comes to building that winning team, the better-prepared applicants will start early. ... A winning team needs to propose high-level professionals on their applications. This can be a tricky situation as these applicants cannot yet commit to paying for a full-time position, since they don’t know if they will win a license. At the same time, these high-level professionals may currently be employed [elsewhere]. We typically handle this by recruiting the best people, but making that employment contingent on a license being awarded. And for the time and effort this person helps out pre-license, we’ll pay them for their time and willingness to go on an application.” ●

This article was adapted from “Applying for a MJ Business License? 10 Things to Know,” “15 Tips for Creating a Winning Cannabis Business License Application,” “11 Tips for Winning a Marijuana Cultivation License,” and “9 Tips for Creating a Winning Cannabis Business License Application in New Markets,” published in previous issues of *Cannabis Business Times*.

BY RINO FERRARESE & THOMAS SCHULTZ

How To Evaluate New Markets

A model to help you gauge emerging opportunities, minimize risk and increase your chances of success.

What's your model?" is a question that acknowledges that different conclusions most often depend on different assumptions. For example, an investment in a commercial cannabis cultivation, processing and/or dispensary facility might be a reasonable or an unreasonable decision, depending on the predictions that we insert in our model. Needless to say, evaluating the viability of launching or expanding into a new market can be challenging.

The model that we use to evaluate a potential investment/expansion into any jurisdiction includes many variables (i.e., population base or regulatory support), to each of which we assign values.

Let's use this scenario as a jumping-off point: Say that we are prepared to invest:

- \$250,000 in a competitive application to get a cultivation license (an investment we will lose if the application is unsuccessful),
- another \$10 million in a build-out of that facility (if the application is successful),
- an additional \$250,000 if a separate application is required for a dispensary,
- and another \$250,000 for a dispensary build-out.

Can all this be done for less? Yes. For more? Of course. The estimates all depend on our assumptions, and the actual costs will depend on the less than perfectly predictable reality.

We all want to evaluate any investment using good information. In this scenario, good information would be accurate estimates and quotes. The history of our industry, however, has shown that good information is hard to come by.

ESTIMATING COSTS

For example, consider the search for a location. Making a logical choice of location(s)—one where you would ideally like your business to be located for various business reasons—would seem to be a reasonable place to start. Nevertheless, many jurisdictions and many locations even within legal jurisdictions are off limits. Generally speaking, we focus on sites most likely to get license approval without considering the logical aspects of that location, such as how much will it cost both to get through construction and to create a positive cash flow at that location.

As you might expect, assuming that we have found a location where a local jurisdiction will accept our enterprise and where all state requirements are met, cost estimates begin with land, building(s) and equipment (all local building, fire and other codes still apply). Our budgets also include estimates for the cost of conforming to all relevant state regulations, including required security and other concerns. The possible location(s) in which we might find ourselves will have a lot to do with what our business will look like and how it will operate.

Once we settle on a location, we will want to control our "burn rate"—that is, the rate at which we burn through cash before our business creates a positive cash flow (usually in the tens of thousands per month). We will not want our operation to be too small for its market, but we especially will not want it to be too large.

Some people have gotten through this process for far less than \$10 million, but others have spent far more. The money spent on the application will be true risk capital; again, unless the app is successful, that investment will be gone. The money for the build-out will be different in that we will not have spent it without a license in hand. Additional considerations will define whether we might reasonably expect to get a return on our investment in the foreseeable future.

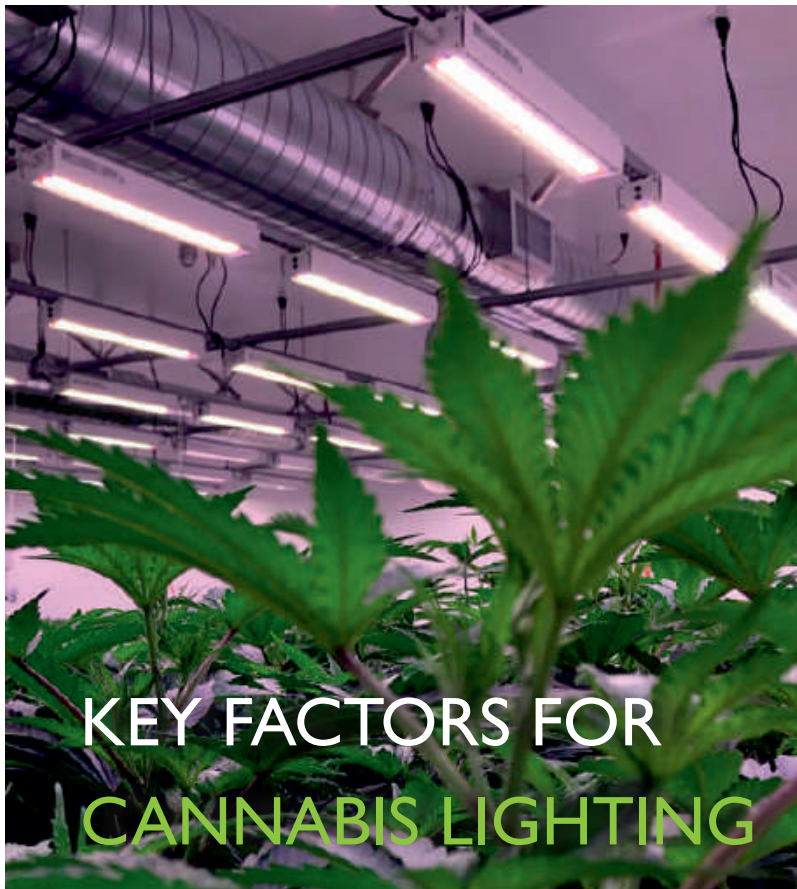
ASK YOURSELF THE TOUGHEST QUESTIONS

Assuming 2% of a state's population will eventually participate in the state's medical cannabis program, and projecting that 10% of the state's population will eventually participate in the state's adult-use marijuana program, how many consumers can we expect to serve with a cultivation facility and/or a dispensary facility? The answer, of course, will depend on how many of those businesses might be awarded licenses by the state. States with large populations might seem attractive, but if a state awards too many cultivation licenses, recent history suggests that the following will occur:

1. The state will have an oversupply of product;
2. wholesale and retail prices will collapse;
3. financial pressures will bring about substantial diversion of supply into the illicit market; and

10%

THE AUTHORS ESTIMATE THAT 10% OF A STATE'S POPULATION WILL EVENTUALLY PARTICIPATE IN THAT STATE'S **ADULT-USE CANNABIS PROGRAM.**



KEY FACTORS FOR CANNABIS LIGHTING

Controlled environment cultivation under supplemental or sole source lighting allows for a high quality and uniform yield by influencing many factors such as morphology and metabolic activity.

THE LIGHT ENVIRONMENT

Light is one of the most important environmental factors that impacts plant growth and development, as it exerts a wide range of effects on photosynthesis and plant photomorphogenesis. Light is essential for photosynthesis and provides energy for plants to convert CO₂ and water into sugars and oxygen. Elements of the light environment that affect plant growth and development, are light quality, intensity and duration. Understanding how these factors affect the growth of your crop can help influence many environmental decisions within your growing operation.

Light Quality (Spectrum)

Understanding spectral quality is critical when selecting a lighting system. An optimized light spectrum can improve the value and quality of a cannabis crop. Plants respond to wavelengths from 400-700 nanometers (nm) for photosynthesis. Light within these wavelengths is referred to as photosynthetically active radiation (PAR). The light emitted within the PAR range, helps drive photosynthesis, which generates carbohydrates for plant growth.

Light Intensity

While light quality can influence the morphology and synthesis of secondary metabolites, light intensity is known to influence cannabis yields. To maximize yields and increase overall plant quality, it's important to ensure your crops are getting the recommended amount of light each day.

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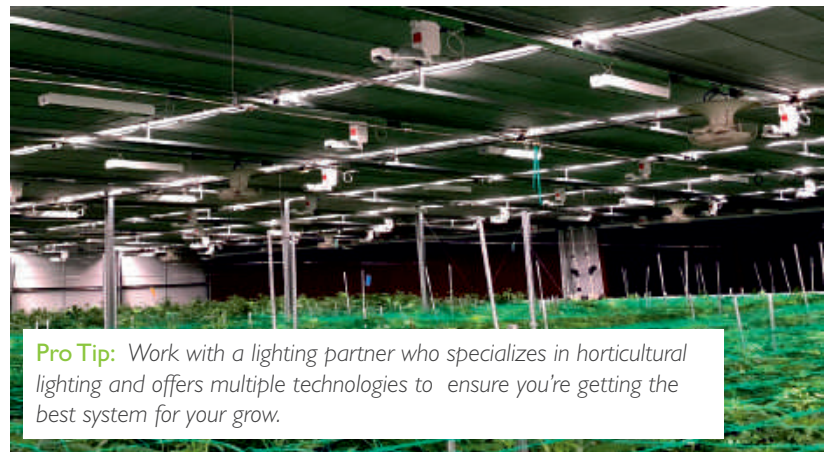
1% more photosynthesis, growth and yield
(and same in reverse)

There is however, a point of diminishing return with too much light. The growth curve of the plant will start to level off as the DLI reaches the upper 30's and beyond.



Photoperiod Duration

Cannabis is an obligate short-day plant, meaning it will only flower when there are 12 hours or less of light. Photoperiod refers to the number of light hours within a 24-hour period. However, it is the total number of hours of continued darkness that contributes to a photoperiod response. During the vegetative stage, or for mother plants, light duration is kept at around 14-18 hours to prevent plants from flowering and to encourage new shoot growth and development. To achieve short days to promote flowering, growers will often use blackout screens to mimic the darkness of night time.



Pro Tip: Work with a lighting partner who specializes in horticultural lighting and offers multiple technologies to ensure you're getting the best system for your grow.

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4. the same pressures that push product into the illicit market will work against desirable cultivation and testing practices, forcing cultivators and dispensaries that bear the expense of safe and compliant production and distribution into competition with a large supply of potentially contaminated, but cheaper, illicit-market product.

In short, when a state licenses too many producers (think: Washington state with a population-to-grower ratio of 5,300 to 1), the state creates extremely undesirable competitive pressures. It often seems that politicians like to spread around the business opportunities that seem to exist in our industry. The reality, however, is that awarding too many licenses, especially producer licenses, ensures that very few of the licensed businesses will succeed. In addition, the state's program may well feed the state's existing illicit market and work against compliance with respect to tax collections and product safety. In the end, everyone loses.

BACK TO THE TOUGHEST QUESTIONS

You should also ask the following:

- What will the state's program roll-out look like?
- Will there be a reasonable list of products that may be produced and sold within the program?
- Will there be a reasonable set of conditions approved for treatment within a medical program?
- Will there be a reasonable number of dispensaries to distribute product to registered program participants?
- Will political forces delay all, or large portions, of the program?
- How long will it take for the program to register a sufficient number of patients and/or consumers to make the program viable?

Finally, how will the state regulator administer the program? For example, some states and their regulators support their programs by encouraging in-state banks to work with registered cultivators and dispensaries. Some states and their regulators respond quickly to unanticipated problems in their programs, offering reasonable solutions. Others do not.



OTHER CONSIDERATIONS

Of course, in evaluating a state for a potential investment, we consider many other factors, including:

- whether outdoor or greenhouse cultivation is allowed,
 - cost of electricity,
 - types of grow lights,
 - optimal approaches to canopy,
 - HVAC,
 - carbon dioxide enrichment,
 - strain selection,
 - test lab selection,
 - banking,
- and other matters. The Occupational Safety and Health Administration (OSHA), the Environmental Protection Agency (EPA), the IRS (remember that the IRS administers Form 8300 compliance) and their state counterparts also will be very interested in our operation. These considerations are relevant in most states. We do not, however, consider them as seriously as we consider the toughest questions mentioned earlier.

The toughest questions help us define the character of a license, the character of the local jurisdictions, the character of the regulator and the character of the state's politics. Answers to the toughest questions give us some sense of our probable cost of getting a facility into operation and of the probable rate of return on the investment. These factors extend beyond the considerations involved in evaluating an investment in a conventional business and are subject

to far greater variability. The local jurisdictions, the regulators and the politics are generally frightening, and there are no rules as to how they will play out.

Last but not least, there's always the illicit market already operating in any given state. We accept the estimates that place the size of the national illicit cannabis market at \$50 billion. This makes the illicit market every registered producer's and dispensary's largest competitor. To get a sense of the illicit market in any state, we take the proportion of the national population living in that state and multiply it by \$50 billion. We then acknowledge that we have a large competitor with an established distribution network, established customers and lower (nonexistent) costs of compliance and taxation.

As Mark Twain said, "There are two times in a man's life when he should not speculate: when he can't afford it, and when he can." Speculating on market potential, state and local regulatory outlook and attitudes, as well as the other topics outlined above, is not wise in any market, but especially so in cannabis. ●

Note: The authors do not provide legal, accounting or tax advice. This material has been prepared for informational purposes only and is not intended to provide, and should not be relied on for legal, accounting or tax advice. You should consult your own legal, accounting and tax advisors before acting on any related matters.

This column originally appeared in the June 2018 issue of Cannabis Business Times.



Greenhouses used for other crops are not always a fit for cannabis cultivation, especially if they include gravel flooring and don't have sophisticated drainage systems.

Greenhouse: Retrofit or Build?

BY ROBERT EDDY

10 critical considerations to determine which is best for your operation.

One should use a critical eye when considering an existing greenhouse for cannabis cultivation. Many were built without the need to power and support heavy light fixtures or provide clearance for overhead curtains, and often the floors and structure are not to cannabis cultivation regulation standards. Here are key considerations and questions to ask when examining the viability of an existing greenhouse:

1. STRUCTURAL INTEGRITY. It's important to start with the foundation when examining whether to build new or retrofit, as a weak structure would quickly drive your decision toward a new build. Inspect the knee wall (low foundation wall) and cement floors for cracks. Settling foundations can put pressure on heating pipes fastened to perimeter walls, resulting in dangerous steam or hot water leaks. Older greenhouses may have steel or wood supports that rust or rot, typically where they fasten to the knee wall, due to moisture

pooling. This deterioration may be covered up with layers of paint.

2. CROP HISTORY. In a 2018 study, plant pathologists surveying Canadian cannabis greenhouses correlated the presence of disease with past crop history. Greenhouses that were used to grow tomatoes or cucumbers were more likely to have *Botrytis* and *Penicillium*, and these problems persisted and affected the new cannabis crops as pathogens remained airborne.

3. FLOORS. Likewise, greenhouses with dirt or gravel floors are much more likely to have insect larvae and pupae. These insects may be "super bugs" that have resistance to pesticides from decades of routine spraying.

4. HEIGHT OF SIDEWALLS. Greenhouse construction trends during the past decade have been to increase sidewall height, providing a larger volume of air to buffer against rapid changes in environment and room for

equipment. Note these important questions: Can lights hang far enough above the canopy and not cause burn? Is there room to install light-deprivation curtains and for a second set of curtains for shade reduction in summer light?

5. FRAMING. If you plan on replacing the glazing (glass, plastic or acrylic panes), are the glazing bars the correct width apart to hold the new glazing, or will they need to be completely replaced, adding to cost? If you are keeping the same glazing, does it need to be resealed to prevent leaks and insect infestation? Stand in the greenhouse during a windy rainstorm to find out.

6. SCREENS. Insect screens on greenhouse openings will greatly reduce infestation, but it is difficult to retrofit an existing greenhouse with screens because they reduce air flow. To compensate for this, a large surface area can be created around the opening by building a box around intake vents or fans and using accordion-style pleated screen fabric on vents.

7. ENVIRONMENTAL HAZARDS. Old greenhouses often have lead paint and asbestos requiring remediation, which isn't a dealbreaker, but should be considered in the cost estimate and timeline.

8. DRAINS. If the existing greenhouse has cement floors, where does the water drain?

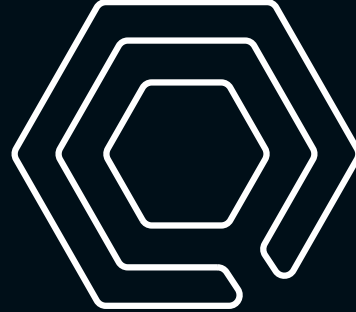
9. LAYOUT. Does the existing greenhouse have adequate room for a loading dock and clearance for trucks? Will there be room for a security fence and a secure employee parking lot? Does the interior of the greenhouse lend itself to efficient flow of materials and labor? Can separation be achieved between plant stages?

10. UTILITY COSTS. Older greenhouses will not be tightly sealed, so will cost more to heat. They will cost more to control insects and disease. They may also not utilize more efficient, higher voltage supplies, so it is important to determine if the savings to retrofit now will outweigh potential higher utility costs of the future. ●

Robert Eddy is a consultant and former Purdue University greenhouse manager.



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Indoor: Retrofit or Build?

8 things to consider when it's time to build or expand your indoor operations. **BY ANDREW LANGE**

As you plan your first cannabis cultivation operation or as your company expands and you are deciding how best to expand your operation to satisfy increasing market demand, you will have many critical decisions to make. Choosing between retrofitting an existing facility or building from the ground up will be one of the biggest choices you will make for your business. Here are a few things to consider when making your decision.

RETROFIT:

1. Maximize existing spaces: For expansions, focus on maximizing square footage you already have. This also applies for new operations retrofitting facilities. Look into vertical solutions for cloning or vegging plants. In post-harvest, automation can dramatically lower your required space. For example, by automating trimming, you can trim the same flower volume more quickly and with fewer employees working at tables, potentially freeing up hundreds of square feet for cultivation.

2. Downtime: Almost any retrofit is going to have some impact on existing operations' production, from minimal day-long to multi-week shutdowns to replace major systems. Have a plan for disruptions, as one of the most often overlooked aspects of a retrofit is the extent of the downtime required to complete work.

3. Efficiency increase: For expanding operations, increases in efficiency can be just as profitable as production increases. Look at big energy users such as lighting and HVAC and consider more efficient equipment. This can help new businesses get off the ground more profitably as well.

4. Employee amenities: Make sure to account for employees (and adding employees as the business grows) when planning (or expanding) restrooms, locker rooms, parking spaces, break rooms and office spaces.

GROUND UP:

1. Reflect: If this is not your first facility, objectively look at what you did right and wrong on your first facility. Consider hiring an architect and engineering professionals—ideally with cannabis industry experience—to help improve upon your vision. Professional guidance can be invaluable to startups as well. A lot of early operators in the industry didn't have sufficient capital to hire professionals nor did many professionals have cannabis experience. You can't be an expert on all aspects of the building process, and bringing in experts will not only lead to a better facility design for the long term, but less stress.

2. Modular building: Future-proof your investment by building in a modular fashion. Most pre-engineered steel buildings (the most common building method) can be designed to add additional structures to one or more sides of the building with very little, if any, additional cost. This allows you the flexibility to build out what you need now and then add additional sections as your needs increase, without having to start from scratch.

3. Build in efficiency: A brand new build is the perfect time to increase or maximize your operation's efficiency. Building from scratch gives you nearly unlimited options. Efficiency doesn't stop at energy usage. Look at things like workflow efficiency. If you can, sit down with a process engineer or consultant and optimize your facility's workflow to see profitability and employee happiness increase. An example is movable cultivation tables, which can free up dead space to less than 15% of a room.

4. Location: Will you need to collaborate or transport goods from your first location? If so, consider the distance and travel time between locations. If building in a new area, make sure to consider your hiring pool. Locating an extraction and food processing plant in a rural area may save money, but it could be difficult to secure the technical labor force that would be required. ●

Andrew Lange is the president of Ascendant Management, a cannabis consulting firm.



In this retrofitted facility, additions of easily cleanable PVC wall coverings and steel doors were used to increase cleanliness in the facility, while electrical infrastructure expansion allowed for proper mechanical systems to be installed.

PHOTO BY ANDREW LANGE



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BY KENNETH MORROW

13 Cultivation Considerations



Expert advice on key growing, post-harvest and business practices to help cultivators prepare for success.

To help growers achieve ongoing success, I've compiled a list of common cultivation challenges they are likely to face. From breeding to business planning, here are some key tips cultivators should consider to reduce risk and maximize profits in their operations.

INFECTION PREVENTION 101

Experienced growers have read or have been told many times over to quarantine clones before introducing them into a pest- and disease-free environment. But I still hear about very large-scale facilities being infected with broad or russet mites due to the introduction of infected clones. Some growers and facility employees also don't completely decontaminate themselves or change attire after working in a quarantine environment.

TIP 1: The best solution to avoid infecting your facility when introducing new genetics is to use tissue culture for all specimens you introduce to a clean environment. Tissue culture, or meristem culture, is the only way to guarantee you are starting with clean stock.

TIP 2: The next best option is to have an off-site quarantine environment, which allows

for compartmentalization so that new specimens are separate from others. Some quarantine those genetics at the same location at which they grow or in close proximity, but that is risky, as they should never be in close proximity unless they are deemed completely pest and disease free.

TIP 3: Lab test any specimens that are pest and disease free for powdery mildew and record them microscopically. Review the video on a large screen so you can more easily detect pests as well as their larvae, eggs or feces. This is a critical step because broad mites or russet mites can be devastating to an operation.

TIP 4: The only sure treatment once an outbreak is confirmed is to destroy all plants, disinfect the entire facility and start from scratch—hopefully after successfully preserving the genetic library via tissue cultured specimens.

TIP 5: Another entry point of infection is typically from the fresh air intake. Greenhouse growers must incorporate and use bug screens as a pre-filter, then at the very least sterilize the air by utilizing UV air sterilizers.

TIP 6: In addition to UV air sterilizers, both greenhouse growers and indoor growers

should use HEPA filters on all incoming air whenever possible. Filtering and sterilizing all recycled air can help prevent mold and mildew from proliferating in cultivation areas.

SUSTAINABLE SOLUTIONS

Sustainable production can help growers reduce costly waste and differentiate themselves in a crowded marketplace. Wastewater recycling is one of several sustainable practices growers can consider in their operations. Unfortunately, some growers may take shortcuts and reuse untreated water because they're limited on what equipment they can use due to space or financial constraints. But reusing unsterilized water is a recipe for disaster; it can throw off your pH and nutrient levels or spread disease throughout your crop, as it only takes one plant to infect the water supply.

TIP 7: Growers should always properly filter and sterilize their water prior to re-application. They should filter recycled water through reverse osmosis before using it. Then, sterilize the water using UV sterilizers or ozone.

TIP 8: If sustainability is a priority for you, whenever possible, use recycled materials in

packaging and irrigation lines.

As demand increases for recycled packaging, we will likely see an increase in the availability of recycled materials across the supply chain.

DRYING AND CURING BEST PRACTICES

Bud density is a major factor in the drying and curing stage. Small buds dry faster than large ones, meaning if you wait for the large buds to completely dry, the small and medium buds will be overdried. Overdried buds have fewer terpenes available, as they evaporate along with the water during the drying process, making the buds less flavorful and aromatic than they could potentially have been, resulting in a lackluster consumer experience.

TIP 9: Sort through large, medium and small buds to gain better control of the drying rate of each. Also, if cultivators separate and dry by bud size and then recombine each batch as it dries over the curing stage, the final result is typically a more homogeneous and uniformly dried product that has maximum terpene preservation (if all other conditions are met).

TIP 10: Make sure the buds are prop-

erly stored, as THC degrades rapidly when exposed to oxygen, light and heat, the primary enemies of THC. Even when properly stored, cannabis has a six-month shelf life, after which THC begins to convert to CBN. Not to say this cannabis is necessarily bad, but it has passed its peak THC and terpene content.

Growers who are stocking cannabis for longer than six months should store it in sub-zero temperatures in oxygen-free containers (where the oxygen is displaced by gaseous CO₂ or nitrogen).

THC in concentrates also rapidly degrades and converts to CBN. This, in turn, applies to all products manufactured from a distillate, including all edibles. While a gummy is on a shelf, the THC within is in a constant state of degradation/conversion.

UNDERSTAND DESIRED GENETICS

Is your product destined to be sold as flower? For extraction? To be used in specific product formulations?

TIP 11: Growers should select genetics that suit their specific requirements, meaning if their intent is to produce a specific product, grow a plant that produces elevated levels of that compound, whether

it's a cannabinoid or terpene. If growing for flower, then the so-called "bag appeal" of a given cultivar becomes important, and you should be looking for genetics with "traditional" bud structures.

TIP 12: When breeding, select genetics based on lab results and data. Let lab results be a companion to observations when breeding for desirable traits. When scouting phenotypes, take notes, keep records and document (with photos and/or videos) the prospective cultivars to be bred to accumulate as much data as possible to aid in the selection process.

TIP 13: Breeding takes a lot of time and effort, and the payoff isn't always what growers hoped it would be. Have a clear objective when selecting which cultivars to cross or when breeding the same cultivar with itself. There is no reason for taking a scattershot approach to breeding without a desirable outcome or at least intended beneficial traits in mind. ●

This article was adapted from "Cannabis Cultivation Essentials: 17 Tips" and "The 9 Most Pressing Facility Design Questions Growers Ask." Kenneth Morrow is an author, consultant and owner of Trichome Technologies. k.trichometechnologies@gmail.com

Grower FAQs Plus More Articles to Help You With All Your Startup Needs

WHAT LIGHTING SHOULD I USE?

Do you want to use light-emitting diode (LED) fixtures or high-pressure sodium (HPS) fixtures? Should they have dimmable capacity and/or spectrum adjustability? What is the preferred spectrum? What is its heat output?

Selecting a lighting type can quickly turn into an overwhelming barrage of questions, and lighting depends on your situation.

It's important to follow lighting manufacturers' upgrades and new technologies on the market, as rapid technological innovation has taken place during the past six years. These refined technologies have been developed with a specific focus on cannabis production. Major incentives exist to utilize these latest technologies. For more lighting considerations, read "8 Lighting System Design Principles" here: bit.ly/CBT-Light-Design

WHAT ENVIRONMENTAL CONTROLS SHOULD I USE?

What method of powdery mildew control will be most suitable for your operation? How will you control your humidity levels in daytime and nighttime? How will you control temperatures?

There are many manufacturers to choose from for your environmental controls and HVAC needs. The choice depends on what you will need and what is available on the market.

Read tips to improve your HVAC system, here: bit.ly/6-HVAC-tips and

how to balance HVAC needs with CapEx, OpEx and yield, here: bit.ly/CBT-HVAC-Costs

SHOULD I CONSIDER MULTI-TIERS (VERTICAL CULTIVATION)?

Vertical cultivation systems have become more sophisticated over the years. When considering these vertical systems, ask yourself, "Are these really more efficient, or just efficient at maximizing floor space?" In other words, is the increase in labor cost and equipment needs worth the increase in canopy? The answer depends on your exact situation. Read how three cultivators approached vertical lighting in their facilities here: bit.ly/CBT-Grow-Up

WHAT EXTRACTION EQUIPMENT SHOULD I INVEST IN?

Deciding which extraction manufacturing company is right for you depends on your desired final product, and the method required to produce that product efficiently. Examine each method's energy consumption and labor requirements, the required time it takes to produce a given amount of extract and the yield of extract relative to the plant weight you are processing. Also, consider all ancillary costs such as CO₂ or solvent refueling and storage, compliance costs for production facilities and the cost of all materials and inputs required to produce the final product on a commercial scale. For more, read CBT's free "Cannabis Extraction Guide" e-book: bit.ly/CBT-extraction-guide.



BY LEW MERLETTI, UNITED STATES SECRET SERVICE (RETIRED)

Secret Service-Level Security: 9 Tips

Lew Merletti, director of security at cannabis cultivator Buckeye Relief and the 19th Secret Service director, shares his tips on developing a robust security program.

A highly functional security program must include attention to detail, dynamic communication, and building and fostering relationships. Whether during my time serving in a combat environment in Vietnam as a medic with the U.S. Army's 5th Special Forces Group, leading the United States Secret Service as its 19th Director, or developing security practices for all NFL stadiums during my tenure as the director of security

for the Cleveland Browns, these core pillars have always been required for success.

The same holds true for a top tier security program for a regulated cannabis business. Here is my advice for startups developing their own security plans.

1. PAY ATTENTION TO DETAIL. Details are important. Certainly, this applies to highly complex evolutions, like designing and configuring sophisticated intrusion detection

systems. However, it is equally important for maintaining a fleet of delivery vehicles that are mechanically sound, mission ready, and clean/sterile for today's COVID-19 world.

2. CONDUCT A RISK ASSESSMENT, AND NEVER STOP. A detailed approach begins with an initial thorough risk assessment. This evaluation should not only examine the threat environment (i.e., the actors, their capabilities, and the

realities of your environment), but also be tailored to effectively support the regular and sustained operations of the facility and business. Additionally, the risk assessment must include the local community, its resources, its geography, and prospective mutually beneficial partnerships with first responders and community leadership. Undoubtedly, the ongoing risk assessment program is not only vitally important, but it becomes more complex with intelligence management, defensive strategies, and evolving environments. Most any security company can perform a security assessment, although the quality of the assessment is contingent on the quality of the security company.

3. OVERCOMMUNICATE. Communication works in all directions, up and down the chain of command and outward to clients, vendors, and the local community. Communication has already failed if it addresses only confirmed concerns and issues—it must be proactive and anticipate conflicts. Practice the (often overlooked) basics of communication: Self-awareness, seeing yourself (or your team) from the optics of others, identifying shortcomings or breakdowns in others' expectations vs. actual performance.

4. BUILD A RAPPORT WITH LOCALS AND LAW ENFORCEMENT OFFICIALS.

I was very fortunate in this respect, as Andy Rayburn, CEO of Buckeye Relief, prioritized communication with the local community at the business's very early stages. This was a team effort that included educational discussions in announced public forums with concerned citizens and local city, county, and state leaders. From the very beginning, Buckeye Relief was committed to working with and giving back to the community. Matt Winningham, Buckeye Relief's security lead, and I built a strong, mutually beneficial relationship with the local police department by inviting them into our facility, volunteering, supporting multiple annual fundraisers, and more. These

relationships continue to pay dividends for security operations at Buckeye Relief.

5. CREATE A PLAN THAT INCLUDES YOUR IT DEPARTMENT.

Additionally, a relationship with the information technology (IT) director or department is a paramount security connection that requires accurate, relevant, and timely communication. In a world that is continuously becoming more technical and automated, no state-of-the-art security program can be absent of cutting-edge technology; therefore, a security program and the people behind it must understand the latest technical vulnerabilities and be well-versed in cybersecurity. Andy Rayburn put John Grafton in place, who is perfectly suited to meet this challenge. My security program would significantly struggle without cutting-edge technology.

6. MAKE EVERYONE'S ROLES AND RESPONSIBILITIES CLEAR.

Communication is also needed to ensure that everyone is aligned and understands their roles within the overall security department and its operations. Furthermore, security leadership must communicate and align with management to understand possible risks and exposures, as well as to identify and understand all acceptable risks. This process begins with the initial security plan and its submission to the governing body, and continues through construction, building operations, product transportation, and all future modifications, updates, and unforeseen events.

7. DO NOT DISCOUNT THE VALUE OF CORDIALITY.

Everyone, including security officers and the secure transport team, must have customer service skills to communicate effectively and build and maintain relationships. This is critical for our team, as security personnel are regularly the face of Buckeye Relief to its visitors, guests, potential customers, and, most importantly, its dispensary partners. Having a team that can address any perceived discrepancies in manifests during deliveries (which can avoid product rejection) requires communication with sales, the shipping/manifest team,

and various dispensary personnel. This is especially true during the ramp-up of a new industry, as there are often deliveries with compliance issues, both perceived and actual, and updated orders from dispensaries with an expected turnaround time of less than 24 hours.

8. CONSIDER HIRING FORMER LAW ENFORCEMENT OFFICERS AND/OR VETERANS.

Having a team that can respond professionally and maintain the needed attention to detail, especially in stressful situations with unexpected circumstances, has led us to recruit team members with military or former law enforcement experience. This team of professionals has excelled in unknown and sometimes chaotic environments, including the introduction of COVID-19 into our world and society. Our disciplined team has been able to successfully operate a schedule of more than 40 separate deliveries per week, all with minimal impact on operations.

9. THOROUGHLY VET YOUR SECURITY TEAM AND PARTNERS.

The cannabis industry tends to attract large swaths of vendors, contractors, prospective employees, and others, due to the perception that it is an extremely lucrative industry. It can be difficult for stakeholders in a cannabis company to quickly determine qualified and competent security applicants and solutions versus those groups claiming to have the same qualities and same wealth of experience. Some of the security companies with the biggest marketing efforts that I have come across had some of the more significant safety and security deficiencies. Thorough vetting of a potential security program and employee can help you avoid a similar fate. Whether in-house or external, validate verifiable extensive experience, preferably in the cannabis industry, that demonstrates a core mastery of attention to detail, dynamic communications, and the ability to build and foster successful relationships. ●

Lew Merletti is the director of security at Buckeye Relief, a medical cannabis provider located in Eastlake, Ohio, and served as the Secret Service's 19th Director.

No Room For Improvisation

5 tips for fine-tuning standard operating procedures to streamline your cultivation operation and prevent mistakes.

Cultivating cannabis requires multiple standard operating procedures (SOPs) to ensure healthy plants produce consistent products. Nutrition, environmental control parameters and pest scouting programs, among many others, all need SOPs.

Often compared to checklists and scripts, good SOPs not only provide helpful guidelines for teams, but they also direct workflow, keep people accountable and have systems for measuring how people and the business are performing. Especially in a high turnover labor market, ensuring consistency and preventing errors is a challenge that SOPs are especially well-designed to meet.

Here are some of the top tips for establishing or improving SOPs:

1. TELL EMPLOYEES THE HOW BUT SKIP THE WHY. SOPs are about how things are done, not why they are done. Resist the temptation to add explanatory text to them; put that information in your training package, along with your SOPs. The goal of new hire training is to make employees productive as quickly as possible. That is achieved by teaching them how to do their daily jobs to the letter.

2. DETAIL WHO IS RESPONSIBLE FOR WHICH TASKS. Often, the first SOP is one that includes roles and responsibilities. When you identify a clear set of requirements, responsibilities and performance metrics, it's difficult for staff to argue that they didn't know the chain of command or who was responsible for what. When everyone knows who does what task, operations go smoothly.



3. ESTABLISH A WORKFLOW. The foundation of a good SOP is workflow and a schedule because they describe what plants move from where, to where, when and by whom. Workflows also outline all of the tasks involved in growing plants.

4. PROACTIVELY CREATE SOLUTIONS FOR COMMON PROBLEMS. The bulk of an SOP package is made up of task descriptions identified in the workflow, such as: take cuttings, sanitize trays, perform apical pinch and assign work schedules. Understanding each step in these tasks as well as how to control the variables in them is the foundation for developing an effective SOP.

Look at all the moving parts (variables) inside a task and ask of each, "What if it slows down, wobbles or stops ... what happens to the output?" If you don't like the answer you come up with, that is a part you need to pay attention to and manage. Figure out what needs to be done and document those steps in the SOP.

Remember to include regulations and worker-safety tasks in your SOPs; they move, too.

5. BUILD IN OPPORTUNITIES FOR REFLECTION AND METRICS TO MEASURE SUCCESS. SOPs need to produce information to answer the question: How are things going? The number of cuttings of each cultivar shipped from the propagation room this week is a performance metric that provides a clear-eyed view of how that propagation room is performing. Additional metrics, like the number of pests found on cuttings, provide more insight. In aggregate, metrics paint a picture of operational health, and they also provide the explanation behind why the picture looks the way it does. ●

This article was adapted from "Step Up Your SOPs: 12 Tips" and "A Guide to Effective Standard Operating Procedures," written by Kurt and Kerrie Badertscher, co-owners of consultancy Otokē Horticulture, LLC, and published in *Cannabis Business Times*.

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