# COMPETITIVE COST ANALYSIS

## INTRODUCTION*

This competitive cost analysis is provided to demonstrate the major factors affecting the profitability of a regulated commercial cannabis cultivation facility. The biggest areas of potential cost savings for a cultivation facility are:

- Product Yield
- Energy Costs
- Labor Costs
- Materials Costs
- Indirect Costs

Other important economic considerations such as strain acquisition, vendor relationships, development of and adherence to Standard Operating Procedures (SOP's), staffing support, Human Resources (HR), Integrated Pest Management (IPM), and Research and Development (R&D) are areas that drive economic and regulatory risk, though are harder to quantify a specific value of savings or benefit.

For comparison purposes, competitor facility and cultivation information was obtained through multiple sources. First I have acquired and/or renovated detailed facility plans, flower yield data, costs, and production schedules from the numerous facilities that MJardin manages as well as over twenty-one other cultivators in the Denver, Colorado area. Additionally, data was obtained through cultivators and facility designs in 4 other states (Arizona, Nevada, Vermont, and Washington). What follows is a comparison of an "average cultivation facility", taken from the data sources outlined above, compared to an MJardin managed facility. In my opinion, the MJardin numbers are what an owner should expect from an excellent third-party cultivator.

An examination of the economics associated with trim by-products (i.e. "shake") is outside of the scope of this analysis, given the number of different product types, complexity of yield differences and varying price points. It is important to note, however, that cultivated trim by-products are consistently proportional to the total flower production and are used in the creation of a number of different valuable consumer products such as oils, tinctures, and edibles.

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## FACILITY DESIGN PARAMETERS AND YIELD

When comparing cultivators, there are several noteworthy differences to point out. By having a properly designed facility, adhering to proven SOP's, and using the most up-to-date technologies, a good cultivator is able to, on average, increase flowering square footage by 22%, obtain 52% more harvests per year, and increase yields by 68% over an average facility. The combination of increased flower space, additional numbers of annual harvests, and improved yields all amounts to a total increase in facility productivity of 152% (see Table 1 below).

**Table 1 - Comparison of Facility Design Parameters and Yield**

| Parameter | Average Facility | MJardin Facility |
|---|---|---|
| Flower sq. ft. / building sq. ft.* | 0.30 | 0.45 |
| Harvests / year | 4.00 | 6.08 |
| Grams / sq. ft. flower/ cycle | 42.00 | 46.44 |
| Grams / flower sq. ft. flower/ day | 0.46 | 0.77 |
| Grams / flower sq. ft. / year | 168.00 | 282.33 |
| Grams / facility sq. ft. / year** | **50.40** | **127.05** |

* "Flower sq. ft. / building sq. ft." represents the ratio of facility space allocated to revenue producing flower space.
** "Grams / facility sq. ft. / year" represents the total revenue generating capacity of the facility (i.e. productivity)

Production schedules and yield data for the 'Average Facility' used in this analysis were collected from the aforementioned sources and analyzed in order to model facility yields. When analyzing these facilities' data, the true yield data was typically much lower than the self-reported averages as many of these facilities included by-product with their flower weights.

The data used for the 'MJardin Facility' comparison represents actual averages from MJardin managed facilities, and only accounts for flower weights. Facility design parameters used for the MJardin flower/sq. ft. capture are based on a "worst case" scenario, and in some facilities up to 22% additional flowering space square footage capture can be achieved depending on building characteristics (facility layout, support column placement, room dimensions, etc.).

## ENERGY COSTS

The design of the cultivation facility and the equipment selection installed within has a very large influence on the energy usage and associated costs of that facility. A well-designed facility should focus on using the latest technologies to reduce energy costs associated with plant illumination and cooling. Optimized design parameters also remove wasted energy by eliminating over-allocation of vegetative space.

Energy costs were modeled at $0.11 per kWh, which includes demand charges and other fees typically billed by energy companies. The effect of equipment selection on energy costs is highly dependent on local energy costs. The combination of reduced vegetative space and increased energy efficiency in a facility can reduce the energy costs to produce a pound of cannabis flower by almost $90 per pound (see Table 2 below).

**Table 2 - Comparison of Facility Energy Costs**

| Parameter | Average Facility | MJardin Facility |
|---|---|---|
| kWh (veg) / sq. ft. / day | 1.45 | 0.89 |
| kWh (flower) / sq. ft. / day | 0.98 | 0.74 |
| Veg sq. ft. / flower sq. ft. | 0.30 | 0.25 |
| Total kWh / flower sq. ft. / day | 1.41 | 0.96 |
| kWh / gram | 3.06 | 1.25 |
| $ / lb. | **$150.99** | **$61.47** |

## LABOR COSTS

By using the latest technologies, processes, having SOP's in place, and an adequate employee compensation programs, a cultivator can significantly influence the contribution of labor prices to the cost per pound of cannabis flower. Compared to the average cultivator, the above-mentioned drivers can contribute to a reduction of cultivation labor costs by 24%. These reductions, coupled with the increased facility yields, contribute to a total reduction of 54.77% in cultivation labor costs.

Additionally, good cultivators can increase the efficiency of post-harvest laborers (i.e. "trimmers"). One way to decrease employee turnover in these specific areas is by increasing base compensation. Although the post-harvest staff modeled here for the MJardin facility is compensated at 30%-40% more per hour than the industry average, this kind of compensation program proved to increase employee productivity by 2.3X. Despite the increased pay, the overall productivity increase reduces the labor costs to produce a pound of cannabis by 62.9% (see Table 3 below).

**Table 3 - Comparison of Cultivation and Post-harvest Labor costs**

| Parameter | Average Facility | MJardin Facility |
|---|---|---|
| Cultivation labor (cost / sq. ft. / day) | $0.09 | $0.07 |
| $ / gram | $0.19 | $0.08 |
| $ / lb. | $108.50 | $49.07 |
| Post-harvest labor ($ / lb.) | **$83.20** | **$52.34** |

## MATERIALS COSTS

It is important for any cultivator to be able to procure, source, and/or manufacture the majority of the materials needed for a cultivation facility for a cost well below market or even wholesale value. These materials range from gloves and scissors, to trellis and pots, and everything in between. However, the areas in which I have found to be most quantifiable to determine savings are in fertilizer, media, and light bulbs.

### *FERTILZER*

The greatest area where a cultivator can save on fertilizer costs is if they are able to manufacture a complete fertilizer themselves. By eliminating the costs associated with branding, wasteful packaging and shipping liquids long distances, there are substantial costs savings for plant fertilization. Additionally, this approach allows the cultivator to use far fewer fertilizer products and save on valuable storage space.

Many fertilizer manufacturers place portions of their fertilizer profile in a variety of different products, despite the fact that the components are chemically compatible with one another in a single concentrate solution. This necessitates using a number of different products in order to obtain the complete fertilizer profile needed to maximize cannabis growth. This also increases the overall fertilizer costs and makes it both difficult and costly to use fertilizer injector technologies.

Compared to two major brands of cannabis-specific fertilizers (listed as Brand A and Brand B in Table 4 below), I found that using a custom fertilizer blend drastically reduced the effect on the cost per pound to produce cannabis. This is done by using a nutrient profile for engineering a fertilizer with fewer parts, thus saving on the cost to manufacture and reducing the necessary labor. It also allows for the use of fertilizer injectors, while minimizing the costs associated with these systems.

**Table 4 - Comparison of Fertilizer Solution Costs**

| Parameter | Brand A | Brand B | MJardin Fertilizer |
|---|---|---|---|
| $ / gallon (flower) | $0.80 | $0.68 | $0.14 |
| $ / gallon (veg) | $0.28 | $0.60 | $0.09 |
| Gallons / flower sq. ft. / day | 0.17 | 0.17 | 0.17 |
| Gallons / veg sq. ft. / day | 0.20 | 0.20 | 0.20 |
| $ / flower sq. ft. / day | $0.15 | $0.15 | $0.03 |
| $ / flower sq. ft. / cycle | $9.16 | $9.13 | $1.69 |
| $ / gram | $0.22 | $0.20 | $0.04 |
| $ / lb. | **$68.40** | **$61.66** | **$16.30** |

Fertilizer costs were calculated using average water usage rates in cultivation areas. The reduced water usage in flowering areas is used to compensate for the fact that a certain percentage of the flowering rooms are fed plain water (i.e. "flushed") during certain parts of the cultivation cycle. It is also assumed that the cultivator is able to obtain Brand A and Brand B products at 30% lower than MSRP. Actual fertilizer costs for the average cultivator may vary depending on the distributor relationships.

***MEDIA***

Having a direct vendor relationship where a cultivator can source substrate directly from the production plants allows that cultivator to save considerable amounts of money by cutting out supply chain middlemen. Additionally, this can have great plant health care benefits if the manufacturer is able to custom blend these substrates to the cultivator's exact specifications in order to provide the optimal physical and chemical properties that are not found in other soilless mixes. These vendors can also provide supplementary quality control of their product, which helps prevent adulterations often found in other soilless products. These extra quality-assurance steps help prevent plant health issues and shorten vegetative cycles.

For the comparison of media costs (see Table 5 below), it is assumed that the media from Brand A and Brand B can be obtained for 30% off of MSRP.

**Table 5 - Comparison of Media Costs**

| Parameter | Brand A | Brand B | MJardin Substrate |
|---|---|---|---|
| $ / sq. ft. / cycle | $1.99 | $1.23 | $0.50 |
| $ / gram | $0.05 | $0.03 | $0.01 |
| $ / lb. | **$21.19** | **$13.14** | **$4.84** |

***BULBS***

When working with 100% artificially illuminated plant growth environments, light bulb replacements can be costly especially if changing bulbs every 4-6 months to ensure maximum light intensity with traditional bulbs. If a cultivator is able to scale their purchasing power, bulk purchasing through established vendor relationships can offer substantial cost savings on bulb replacement. There are also more efficient lighting technologies that allow for fewer bulbs to be needed.

The combination of bulk purchasing, using technologies requiring fewer bulbs, and increasing the number of cycles per bulb allow for even greater cost savings (see Table 6 below).

**Table 6 - Comparison of Bulb Replacement Costs**

| Parameter | Average Facility | MJardin Facility |
|---|---|---|
| $ / bulb | $84.00 | $100.00 |
| Sq. ft. covered/ bulb | 16 | 22 |
| Cycles / bulb | 3 | 12 |
| $ / sq. ft. / cycle | $1.75 | $0.38 |
| $ / gram | $0.04 | $0.01 |
| $ / lb. | **$18.67** | **$3.65** |

## INDIRECT COSTS

Research and Development is regularly overlooked as an indirect cost of production. To remain competitive in a constantly evolving cannabis industry, significant monetary resources, facility bench space, and labor needs should be dedicated to R&D. Testing new technologies, chemicals, cultivars (i.e. "strains"), and horticultural techniques is a pricey investment, and may not always result in fruitful gains. However, if a cultivator is able to afford the luxury of an in-house R&D department or obtain outsourced R&D data, then that grower will be able to remain on the cutting edge of technology and best-practices. A cultivator can gain access to the most up-to-date horticultural technology for testing by collaborating with institutions of higher learning, horticultural technology companies, agricultural suppliers, lighting companies, and third-party cultivation management companies. These relationships allow the cultivator to access not only the newest technologies, but confidential information on developmental products, prototypes, and technologies that have not yet been released to the public. All of this helps in preventing the cultivator invest in wasteful expenditures on antiquated technologies.

Another area that is often ignored as an indirect cost to production is Integrated Pest Management (IPM). Pests and pathogens are becoming more and more scrutinized in today's cannabis industry, and if a cultivator has enough science knowledge that it could become a licensed commercial pesticide applicator, that knowledge can provide immense value in proactively maintaining controls over pests and disease infestation. In addition to promoting proactive plant health care, an established IPM program can aid in compliance with state and federal pesticide laws, and remove significant liability from a cultivator's business.

## SUMMARY

There are numerous costs, direct and indirect, associated with any commercial cultivation facility. If a cultivator is able to have or have access to an intellectual property (IP) portfolio, well-developed SOP's, vendor relationships and purchasing power, and use operational and labor efficiencies, they are able to achieve immense

savings for materials, labor, and energy. The difference in the costs to produce a pound of cannabis between an efficient, well-managed facility and the average cultivation facility is almost $250 per pound (see Table 7 below), plus more cost savings in the indirect costs such as out-sourcing R&D and pest management compliance.

**Table 7 - Differences in Cost per Pound for Energy, Materials, and Labor**

| Cost | Average Facility | MJardin Facility | Difference |
|---|---|---|---|
| Energy | $150.99 | $61.47 | ($89.52) |
| Labor | $191.70 | $101.41 | ($90.29) |
| Materials | $93.47 | $24.79 | ($68.68) |
| | | **TOTAL** | **($248.49)** |