



State of the

Cannabis Nutrients Market

An exclusive research report on
nutrient practices and strategies
in the cannabis industry.

IN PARTNERSHIP WITH



EMERALD HARVEST®
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CANNABIS
BUSINESS TIMES



“

Our mission at Emerald Harvest

is to help
growers achieve
simple, easy
success through
our streamlined
product line.

Maximizing Plant Potential to Grow Your Business

Cannabis cultivators sink enormous amounts of time, money, and effort into their high-value crops. These investments require the right skills, techniques, and inputs to pay off.

In this report, you'll learn how professional growers use nutrients to maximize plant potential, and thereby grow their businesses, in three main ways:

- **Increasing yields.** We're talking volume here—scaling production for more sales. To achieve this, you can either grow more plants or make each plant more productive. Or, ideally, you can do both! A powerful bloom booster—in addition to the right lighting, CO₂ enrichment, and other cultivation techniques—is crucial for getting the biggest yields possible, resulting in more dry weight per plant.
- **Improving quality.** You can demand top dollar *only* if you offer a product unequaled in the marketplace. Your customers value flavor, fragrance, color, and (above all) potency. Once again, a superior bloom booster and other flowering supplements, including both a premium plant tonic and an aroma and resin enricher, are what you need. You also need a brand you can trust—nutrients low in heavy metals and other impurities.
- **Safeguarding against losses.** Your investment and care could get squandered without grow-room hygiene. The roots are especially vulnerable, so inoculate them! If beneficial microbes get a foothold early in your grow, they'll help to fight off the bad stuff. Other supplements can help your crops stand tall and fight off upper-plant diseases. Finally, deficiencies and burn must be guarded against.

Our mission at Emerald Harvest is to help growers achieve simple, easy success through our streamlined product line. To that end, we've positioned ourselves to know all we can about the industry, our products and growers' needs.

These efforts are made knowing that, in a changing industry, there's always more to learn. That's why we chose to support this research by *Cannabis Business Times*. Emerald Harvest shares *CBT's* mission of educating growers to help their gardens—and businesses—thrive.

We hope you'll find this report as interesting, informative, and helpful as we have.

Our best wishes for your success!

Robert Higgins
CEO, Emerald Harvest

A close-up photograph of a cannabis plant with green and orange-tinted leaves, set against a blue background.

Convert Data Into Action

The law of conservation of energy tells us that energy is neither created nor destroyed; rather, it is converted from one form to another. How plants convert nutrients such as nitrogen, phosphorus, and potassium, as well as other micronutrients and supplements available in their environments, into energy and new biomass is a great example of this principle.

What cannabis cultivators feed their plants, and in what amounts, has a direct impact on plant quality, both in terms of yield and secondary metabolite production. Studies have shown how well cannabis and hemp plants can absorb elements in their soil and growing media, and the influence that ability has on a crop's value.

With this second "State of the Cannabis Nutrients Market" report, *Cannabis*

Business Times offers new research on nutrient use in cannabis cultivation. This data can serve as a benchmark against which to measure your operation's practices and help guide future cultivation business decisions. The research, made possible with the support of Emerald Harvest, builds on the 2019 study and explores several nutrient-related topics, including: what growers spend on nutrients, supplements used, optimal levels, what results growers prioritize from their nutrients, and more.

The findings from the research, along with comparisons to the 2019 data, are shared in the following pages.

While there still is much to be learned, this special report marks another step toward gaining a better picture of nutrient use in cannabis.

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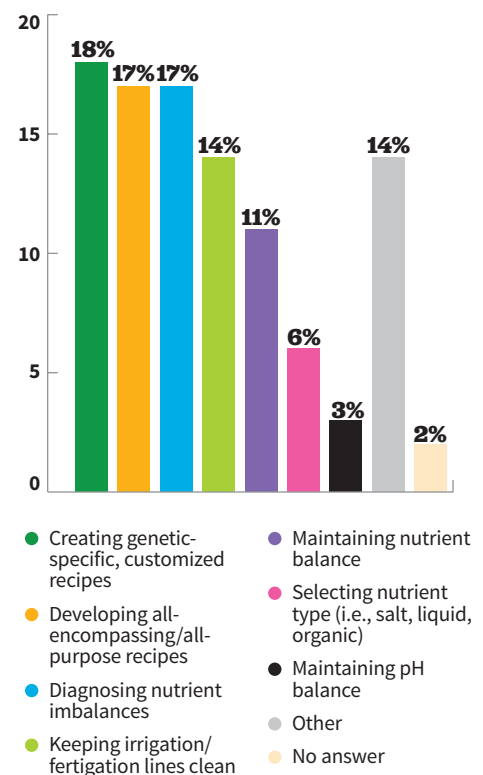
Range of Nutrient Challenges

Many growers say cannabis cultivation is both a science and an art—the science is based in proven results, and the art is in the fine-tuning based on genetic and environmental variables, for example. While science is objective, art is not, and nearly every grower has put their own spin on their processes, yielding unique results and challenges. Results from the 2021 “State of the Cannabis Nutrients Market” research indicate that cultivators experience a wide range of nutrient-related issues, and while no single issue appears to prevail significantly over

others, the top nutrition-related challenge (noted by 18% of research participants) was “creating genetic-specific, customized recipes.”

Interestingly, the second most commonly cited top issue was “developing all-encompassing/all-purpose recipes” (tied with “diagnosing nutrient imbalances” at 17%), indicating that many cannabis cultivators are taking drastically different approaches to their nutrient strategies. “Maintaining nutrient balance” (11%) was another top-cited nutrient challenge. These issues could be aided by further data collection (more on that later in this report).

What is your top challenge when it comes to plant nutrition?





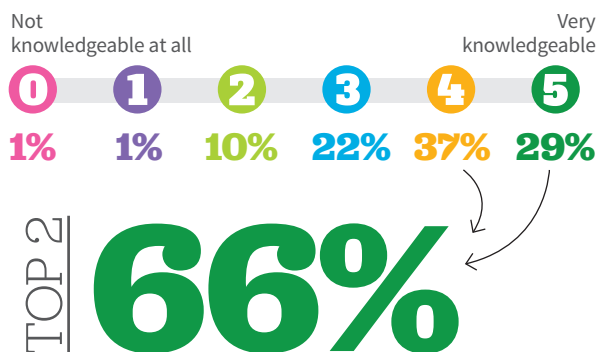
Nutrient Knowledge and Purchasing Factors

One notable contrast in this year's "State of the Cannabis Nutrients Market" report, compared to the 2019 study, is that fewer cultivators indicated they are confident in their nutritional knowledge. On a scale of 0 (not knowledgeable) to 5 (very knowledgeable), 66% of this year's participants selected 4 or 5—compared to 76% who did so in the 2019 report.

As far as what cultivators prioritize when choosing which nutrients to use, "results/performance" is key—two-thirds of cultivators noted this as an important factor when selecting a nutrient line. This is in contrast to "product claims," which just 8% of cultivators noted as among the most important factors in selecting nutrients. This could indicate growers rely on proof-of-work more than marketing in their decision making. "Price" is also significant in decision making, rated as an important factor by 42% of cultivators in this year's study. More than one-third of participants indicated that nutrients being "organic" was an important factor in nutrient selection.

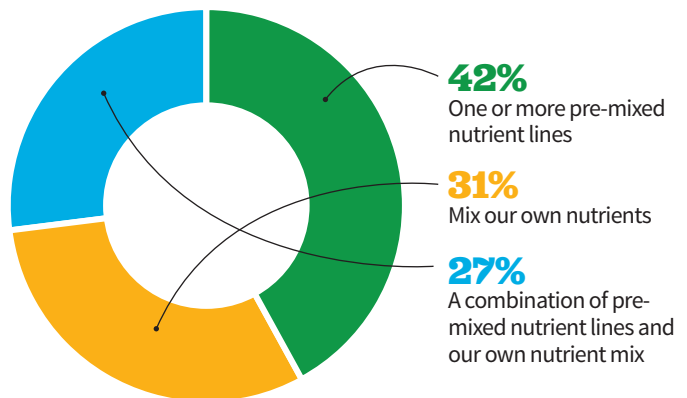
Nutrient Know-How

How knowledgeable do you feel about the nutritional needs of your plants?



Nutrient Mixes

For plant nutrition, we use:



Which of the following are most important to you when selecting a nutrient line?



Note: Totals exceed 100% because respondents could select all that apply.

What portion of your annual production budget is used for nutrients?

50-100%	3%
40-49%	4%
30-39%	13%
20-29%	26%
10-19%	24%
0-9%	29%
No answer	2%





Media and Nutrient Use

The vast majority of cannabis cultivators (85%) amend their base nutrients with a wide-range of supplements. The most commonly used supplements are “bloom enhancers/boosters,” which are in use by more than half (53%) of cultivators who participated in this year’s research. Fewer growers in this year’s study reported using “kelp” and “humic/fulvic acid” compared to 2019 report results—34% of cultivators noted they used “kelp” in 2021 vs. 45% in 2019, and 36% indicated they used “humic/fulvic acid” vs. 47% in 2019. In contrast, “silica” was cited more often in 2021 (43%) than in 2019 (30%). That said, more research is needed to confirm whether these are trends or sampling biases.

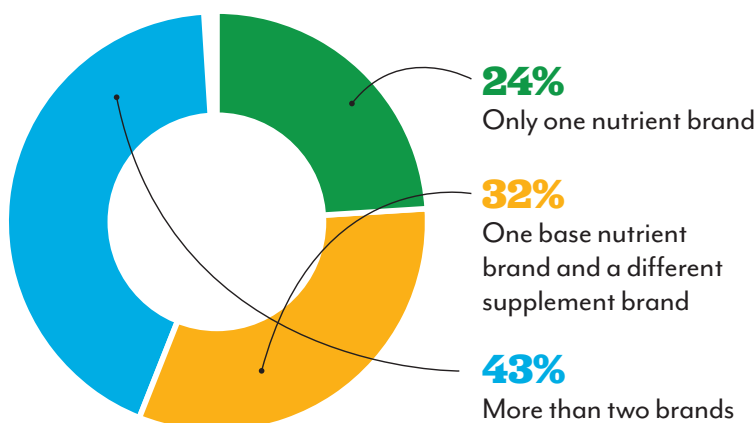
A plurality of growers (41%) indicated they cultivate cannabis using an “organic living soil/compost”-based media. Reported “outdoor field/soil” use dropped this year (23%) compared to 2019’s report (39%). “Deep water culture (DWC)” and “nutrient film technique” also saw drops in use compared to 2019’s report (down 4 percentage points each), but as with the supplements growers use, more research is needed to confirm or contradict a trend.

85%

Portion of research participants who use nutrient supplements in addition to a base nutrient.



Which of the following do you use in your grow operation?



Which of the following supplements (commercially produced or made on-site) do you use, in addition to a base nutrient?

	2019	2021
Bloom enhancers/boosters	48%	53%
Silica	30%	43%
Humic/fulvic acid	47%	36%
Worm castings	36%	36%
Kelp	45%	34%
Compost	28%	30%
Molasses	32%	29%
Guano	30%	24%
Inoculants	28%	23%
Potassium silicate	25%	23%
Calcium chloride	11%	21%
Probiotic teas	28%	18%
Sweeteners (in final phase)	17%	18%

Additional 2021 findings: Iron: 13%; Rock dust: 10%; Bokashi and other ferments: 9%; Organic residuals: 9%; Zinc: 8%; Algae water added "to a 20-20-20 mix": 5%; Frass (insect excrements or debris): 5%; Ammonium sulfate: 4%; Other: 10%. Note: Totals exceed 100% because respondents could select all that apply.

What growing medium and/or system do you use?

Organic living soil/compost	41%
Coco coir fiber and other coconut products	39%
Peat (including Sphagnum, sedge, reed, etc.)	27%
Perlite	27%
Outdoor field/soil	23%
Rockwool or stone wool	20%
Clay pebbles	10%
Vermiculite	10%
Aeroponics	6%
Wood fiber or chips	5%
Deep water culture (DWC)	4%
Pre-charged hydroponic growing medium	4%
Rice hulls	4%
Bark (aged or composted)	2%
Nutrient film technique	1%
Other	1%

53%

More than half of cultivators use "bloom enhancers/boosters," up from 48% in 2019.





Science and Nutrition

When it comes to measuring nutrient data,

88% of this year's study participants indicated they measure nutrient pH levels (vs. 89% in 2019's report). The vast majority of cultivators (84%) aim for nutrient pH levels between 5.5 and 6.4, a slight decrease from 90% in the 2019 report, with nearly half (46%) of those respondents targeting the 6.0 to 6.4 range, compared to 53% in 2019. Of note, approximately one-third of this year's research participants indicated not measuring the parts per million (ppm) levels of various macronutrients.

In the context of the nutrient challenges mentioned previously ("creating genetic-specific, customized recipes," "developing all-encompassing/all-purpose recipes," "diagnosing nutrient imbalances" and "maintaining nutrient

balance"), "[knowing] what these levels are would help [growers] know if [they] are providing adequate and not too little or too much of any element," according to Dr. Brian Whipker, professor of floriculture at North Carolina State University, and contributor to *Cannabis Business Times*' "Cultivation Matters" feature series. He adds that growers risk "wasted money" if nutrient levels are higher than needed, and "lost money" due to yield loss if levels are too low.

Of those who measure their nutrient ppm levels, many indicated they target the 51-200 ppm range across all nutrients and stages. Based on participants' responses, the bulk of growers appear to be using higher-than-recommended phosphorus levels compared to recommendations from NCSU researchers (included in the chart).



	NITROGEN				POTASSIUM			
	PROPAGATION	VEGETATION	EARLY FLOWERING	LATE FLOWERING	PROPAGATION	VEGETATION	EARLY FLOWERING	LATE FLOWERING
301+ ppm	2%	18%	5%	5%	5%	8%	14%	12%
201-300 ppm	9%	13%	15%	4%	7%	15%	20%	29%
101-200 ppm	28%	32%	42%	32%	21%	20%	32%	27%
51-100 ppm	16%	23%	20%	23%	14%	31%	24%	22%
26-50 ppm	23%	10%	12%	16%	25%	17%	8%	7%
1-25 ppm	23%	3%	5%	20%	27%	8%	2%	3%
Median*	63 ppm	143 ppm	130 ppm	82 ppm	50 ppm	92 ppm	151 ppm	168 ppm
Do not measure for this nutrient	30%	27%	28%	28%	31%	29%	29%	29%
Recommended ppm range from NCSU researchers**	50-75 ppm	100-200 ppm	200-225 ppm	100-150 ppm	50-75 ppm	100-200 ppm	200-225 ppm	100-150 ppm
No answer	18%	18%	18%	20%	17%	17%	17%	17%

	CALCIUM				MAGNESIUM			
	PROPAGATION	VEGETATION	EARLY FLOWERING	LATE FLOWERING	PROPAGATION	VEGETATION	EARLY FLOWERING	LATE FLOWERING
301+ ppm	2%	5%	7%	5%	2%	8%	5%	11%
201-300 ppm	5%	10%	7%	12%	2%	2%	7%	9%
101-200 ppm	18%	28%	32%	25%	10%	22%	33%	11%
51-100 ppm	24%	33%	37%	33%	30%	37%	35%	33%
26-50 ppm	24%	21%	14%	13%	28%	31%	18%	25%
1-25 ppm	27%	3%	3%	12%	28%	0%	2%	11%
Median*	51 ppm	91 ppm	96 ppm	89 ppm	46 ppm	76 ppm	95 ppm	72 ppm
Do not measure for this nutrient	33%	31%	31%	30%	37%	34%	34%	34%
Recommended ppm range from NCSU researchers**	50-100 ppm	50-100 ppm	50-100 ppm	50-100 ppm	50-75 ppm	50-75 ppm	50-75 ppm	50-75 ppm
No answer	16%	16%	15%	15%	17%	19%	15%	15%

	PHOSPHORUS			
	PROPAGATION	VEGETATION	EARLY FLOWERING	LATE FLOWERING
301+ ppm	4%	5%	16%	19%
201-300 ppm	4%	7%	21%	18%
101-200 ppm	5%	18%	24%	21%
51-100 ppm	20%	23%	16%	18%
26-50 ppm	40%	36%	21%	18%
1-25 ppm	27%	11%	3%	7%
Median*	40 ppm	57 ppm	143 ppm	137 ppm
Do not measure for this nutrient	33%	31%	31%	31%
Recommended ppm range from NCSU researchers**	11.25 ppm	11.25 ppm	11.25-30 ppm	11.25-30 ppm
No answer	16%	17%	16%	16%

88%

of this year's study participants indicated they measure nutrient pH levels.



*The median is the value that lies at the middle of a distribution; **Source: Dr. Brian Whipker and affiliated researchers' reports in CBT's "Cultivation Matters" series



Plant Yield: The Ultimate Measuring Stick

Cultivators have specific expectations from the nutrients they feed their crops. “Yield” (91%) was the most-cited desired nutrient impact according to both this year’s research and 2019’s, though the number of growers noting they expect nutrients to impact yield increased 14 percentage points from 77% in 2019. Other most-cited desired nutrient results among 2021 research participants include “terpene development/aroma and flavor” (80%), “growth rate” (79%), “plant/flower development” (74%), and “bud structure/density” (72%).

57%

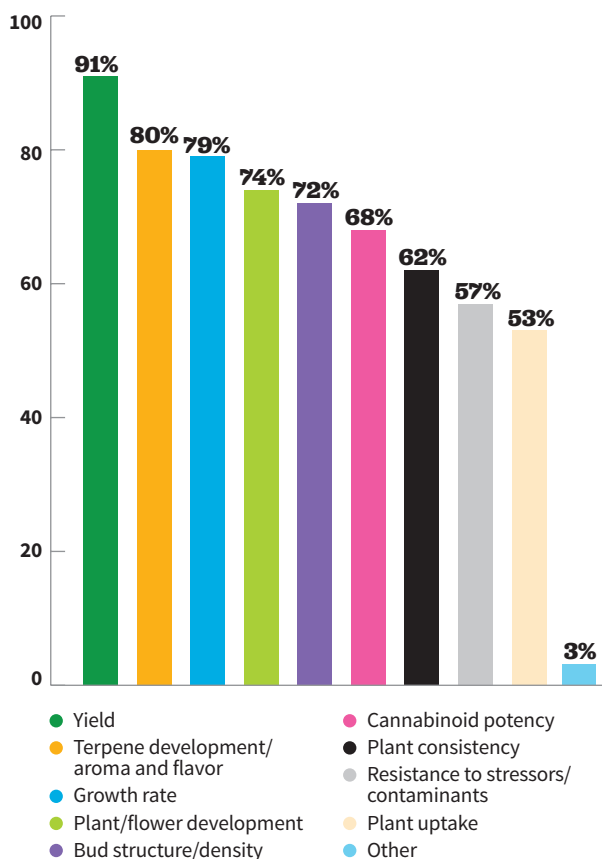
of this year’s “State of the Cannabis Nutrients Market” participants cited “resistance to stressors/contaminants” as a top desired nutrient impact (48% in 2019).

JEREMY POLAND | ISTOCKPHOTO



Desired Nutrient Impact

How do you expect nutrients to impact your crop?

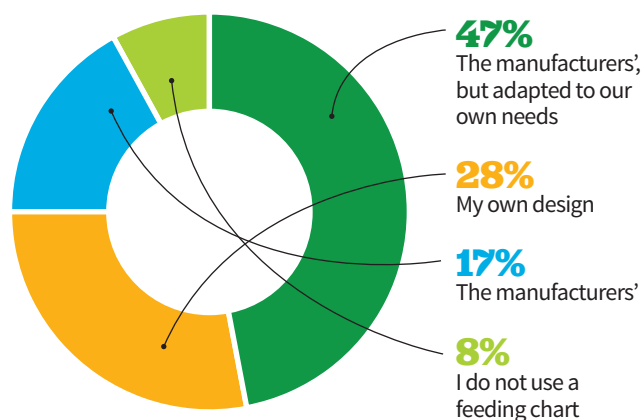


Note: Totals exceed 100% because respondents could select all that apply.

More Growers Are Using Manufacturer's Feeding Charts vs. 2019

When it comes to feeding charts, specifically, this year's research shows an increasing portion of cultivators use the manufacturer's chart adapted to their own needs (47%), up 6 percentage points from 2019 (41%). In contrast, the portion of cultivators using their own feed chart design dropped 10 percentage points (28%) this year from the 2019 report (38%).

What feeding charts do you use?



17%

of this year's study participants indicated only using the manufacturers' feeding charts when making nutrient decisions.

About the Research and Participants

Third-party researcher Readex Research conducted the study and compiled data for the "2021 State of the Cannabis Nutrients Market" report. *Cannabis Business Times* sent the research questionnaire in October 2021 to magazine subscribers with known email addresses and/or e-newsletter subscribers located in the United States, Canada, or other (unknown) North American locations. As an incentive to participate, respondents were able to enter into a drawing for a chance to win one of three \$100 Visa gift cards. The study link was also included in *CBT's* e-newsletters and social media posts.

Results are based on 108 participants who indicated they own or work for a licensed operation that cultivates cannabis for sale. The margin of error for percentages based on the 108 respondents is approximately ± 9.4 percentage points at the 95% confidence level. 💧

A CONSISTENT FOUNDATION OF NUTRITION

Cali Pro 2-Part Nutrient Series is designed for growers who want a premium base nutrient that's easy to use but guarantees professional results. Cali Pro supplies all the essential elements in precise concentrations and ratios for vigorous growth and flowering throughout the crop life cycle. Get everything your crops need to grow, flower and thrive - **with Cali Pro.**



Available at all leading hydroponic retail stores.



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