



2020 - 2023

BOULDER COUNTY CARBON CONSCIOUS CERTIFICATION

PROGRESS REPORT



Sustainability,
Climate Action
& Resilience



The
Cannabis
Conservancy

TABLE OF CONTENTS



01 | EXECUTIVE SUMMARY

02 | INTRODUCTION

03 | PROGRAM GOALS

04 | STANDARDS

05 | CULTIVATOR SUPPORT

06 | BENEFITS

07 | PERFORMANCE

08 | IMPACT

09 | PROGRESS

10 | CULTIVATOR HIGHLIGHTS

16 | SUMMARY

17 | ACKNOWLEDGEMENTS

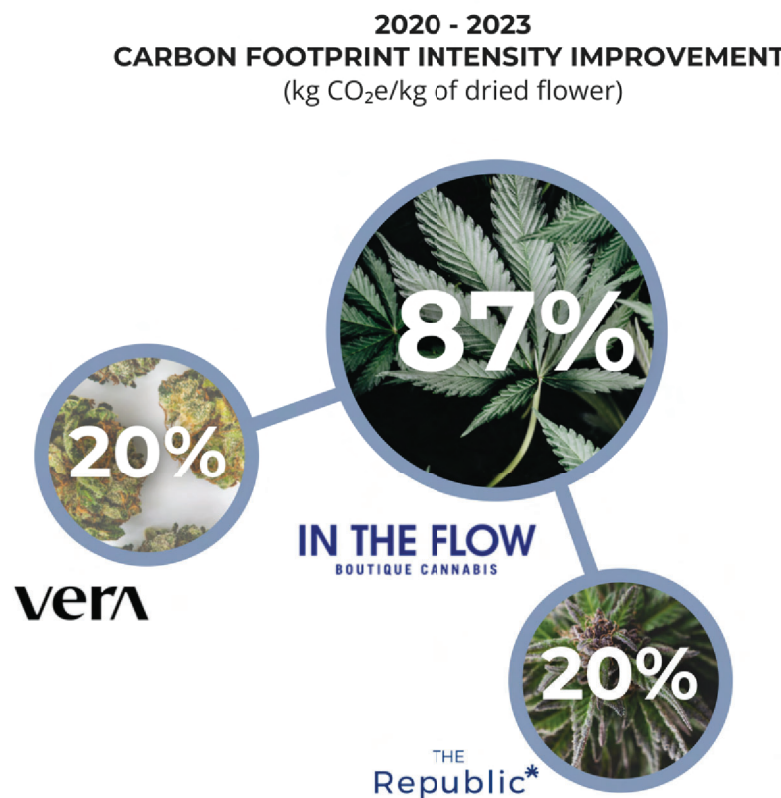
18 | ABOUT US

19 | APPENDICES

EXECUTIVE SUMMARY

The Boulder County Carbon Conscious Certification (BCCCC) program, initiated in collaboration with Boulder County's Energy Impact Offset Fund (EIOF), has made significant strides in promoting sustainable cannabis cultivation. This report highlights the program's achievements from 2020 to 2023, showcasing the successes and challenges of three certified cultivators as they implement energy-saving and greenhouse gas reducing practices.

The BCCCC's comprehensive framework has helped cultivators progress toward carbon neutrality while enhancing their operational efficiency and market competitiveness. Future standards aim to further these gains, ensuring long-term sustainability and alignment with Colorado and Boulder County's broader environmental goals.¹



While the pursuit of sustainable cannabis cultivation is never linear, through hard work and dedication progress is attainable; evident by the fact that all certified cultivators have successfully reduced their carbon footprint. This report is intended to provide a high-level overview of the BCCCC and the successes of its participants. Unlike a scholarly study, we will only be showcasing certain metrics.

This is to protect participants' privacy and data confidentiality. For any follow-up questions, please contact us using the information provided at the end of this report. As we celebrate our collective achievements, we encourage continued efforts within the programs' guidelines and hope to inspire you, the reader, to adopt a more carbon-conscious approach to both business and life.

INTRODUCTION

The Carbon Conscious certification recognizes cannabis cultivators committed to reducing their carbon footprint. This voluntary program began in 2020 with funding from Boulder County's Energy Impact Offset Fund (EIOF) as a complimentary benefit for Boulder County cultivators. Since its inception, 29% of eligible cultivators have obtained certification.

The certification aims to educate, encourage, and reward growers for their energy optimization and strategic energy management efforts. The program's standards were developed collaboratively with the EIOF Steering Committee and local Boulder County growers. These standards emphasize measurable reductions in energy consumption and carbon polluting emissions along with an increased in carbon offsets.

The multi-year program's pragmatic, incrementally rigorous structure ensures that cultivators' compliance remains manageable without being onerous. Technical expertise, compliance support, and detailed guidance documents are provided to support cultivators throughout the certification process.

The Carbon Conscious seal, which is displayed on product packaging and marketing materials, signifies that cultivators are actively working towards net-zero carbon cannabis production. This report documents progress from 2020 to 2023, showcasing the program's achievements and future goals.

CERTIFIED BRANDS





PROGRAM GOALS

The Carbon Conscious Certification aims to mitigate the carbon-intensive nature of cannabis cultivation^{2,3,4} by providing a structured framework for achieving carbon neutrality. This incremental approach focuses on stewardship and accountability, encouraging cultivators to reduce their greenhouse gas emissions based on their individual progress and challenges.^{5,6}

BENCHMARK

YEAR ONE

- Establish baseline energy & productivity metrics.
- Implement low-carbon policies and facility optimization commitments.

IMPLEMENT

YEAR TWO

- Incorporate energy management systems.
- Apply energy-reducing recommendations.

OFFSET

YEAR THREE

- Participate in emissions accounting & offsetting.
- Demonstrate significant improvements in energy efficiency and reductions in annual energy consumption.

By setting clear, measurable emission reduction goals each year, the BCCCC program ensures that cultivators make consistent progress towards sustainable cannabis production, benefiting both the environment and their operations.

OUR STANDARDS

STANDARD	COMPONENTS
LOW CARBON ENERGY POLICY	• Codify Organization's Environmental Values • Outline Intentions and Target Goals • Establish Specific Action Items • Executive Leadership Commitment
ENERGY MANAGEMENT	• Documented Facility Maintenance Plan • Establish Employee Training Program* • Optimize Climate Control Setpoints*
ENERGY USE	• Establish Energy Tracking System • 3rd Party Energy Assessment, Annual Audit • Develop Benchmarks and Performance Metrics
ENERGY IMPROVEMENTS	• Annual Energy Optimization Goals • Implement Energy Efficiency Recommendation • Use Metrics for Facility-specific Improvements* • Measurable Performance Metric Improvements*
CARBON FOOTPRINT	• Participate in Carbon Offset Program* • Collect Scope 1 & 2 Emissions Data* • Implement GHG Inventory Management Planⁱ • Conduct Waste Stream Auditⁱ • Collect Scope 3 Emissions Dataⁱ

*Year 2 Standards ⁱYear 3 Standards



CULTIVATOR SUPPORT

Boulder County cultivators are primarily small businesses working in a competitive emerging market with limited time and resources.^{7,8} So to encourage enrollment and continual compliance, a comprehensive support framework was developed. This consisted of annual workshops, technical documents, and access to sustainability expertise.

With 80% of cannabis consumers⁹ concerned about environmental issues, marketing materials and social media assets were created to help promote the accomplishments of certified cultivations. Since 2020, certified cultivators have been provided with the following services:



Data
Collection
Templates



Equipment &
Operational
Records



Analysis of
Performance
Metrics



Annual
Energy
Audits



Marketing
Materials &
Collateral



Budtender
Training &
Materials



Policy &
Energy Mgmt
Recommendations



Energy-
Efficiency
Workshops



BENEFITS

In addition to operational support, cultivators receive physical marketing assets and participate in social media campaigns that celebrate their emission reduction accomplishments. To avoid the potential for greenwashing, informational assets for dispensaries and budtenders were created in 2022. These sustainable assets provide an opportunity for certified cultivators to connect with the public and differentiate their brands based on measurable achievements.

Through certification, cultivators implement systems that improve their resilience by increasing their strategic planning, production oversight, and risk management capacity.



Risk Mitigation

Cost savings

Climate Leader
Recognition



Enhanced
Brand Image

Market
Differentiation

PERFORMANCE

To evaluate compliance to the certification standards and progress towards carbon reduction goals, policies and performance metrics are analyzed on an annual basis. These benchmark metrics allow for comparisons within the program and throughout the cannabis industry.

ENERGY MANAGEMENT

The energy management standards are based on strategic energy management principles requiring written policies and procedures that establish a company's environmental values, commitments, and emission reduction goals. These standards include a plan for ensuring operational efficiency through facility maintenance and employee training. There has been a 100% compliance rate amongst certified cultivators.

The following table is the range of all indoor and greenhouse participants in 2023.

	PERFORMANCE METRICS	2023 RESULTS (RANGE)
ENERGY USE	Energy productivity	0.6 - 1.4 grams of dried flower/kWh
	Electricity Productivity	1120 - 1651 kWh/kg of dried flower
GREENHOUSE GAS EMISSIONS	Carbon Footprint	49 - 3625 tCO ₂ e*
	Carbon Footprint Intensity	90 - 3,624 kg of CO ₂ e/kg of dried flower*

*SCOPE 1 & 2 ONLY

FUTURE COMPLIANCE STANDARDS

Starting in 2024, waste management & recycling standards will be added to the certification. These metrics include sustainable packaging, waste generation, and waste diversion rates. Future compliance standards will expand on Scope 3 emissions to include travel miles, product distribution and material sourcing emissions. Metrics to be assessed will align with current international reporting practices.

IMPACT

Certified cultivators in the BCCCC program showed significant improvements in their resource use efficiency and carbon footprint when comparing initial baseline metrics to 2023 metrics. One of the most substantial indicators of the program's success is that

100% of certified cultivators successfully reduced the energy usage required to produce a gram of dried cannabis flower; demonstrating an overall increase in the participant's energy efficiency. Cultivators, irrespective of grow method, increased their energy productivity by an average of 17.3%.

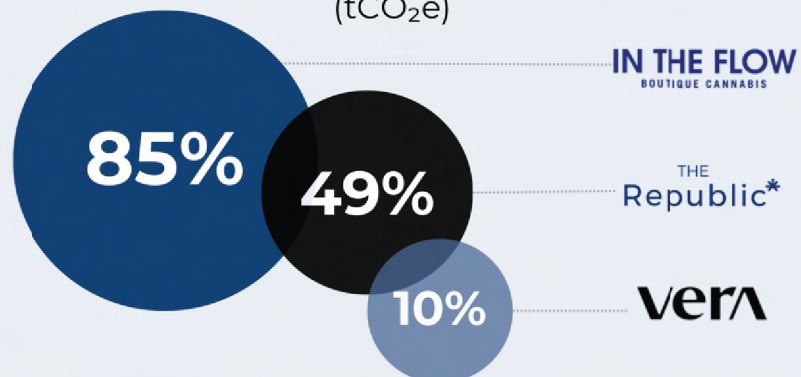


2020-2023 INCREASE IN ENERGY PRODUCTIVITY



These results underline the critical impact of the carbon-conscious certification program in promoting sustainable practices within the cannabis cultivation industry. These improvements demonstrate the program's success in delivering meaningful environmental benefits, even amid the complexities and uncertainty inherent to cultivation.

2020 - 2023 CARBON FOOTPRINT REDUCTION (tCO₂e)

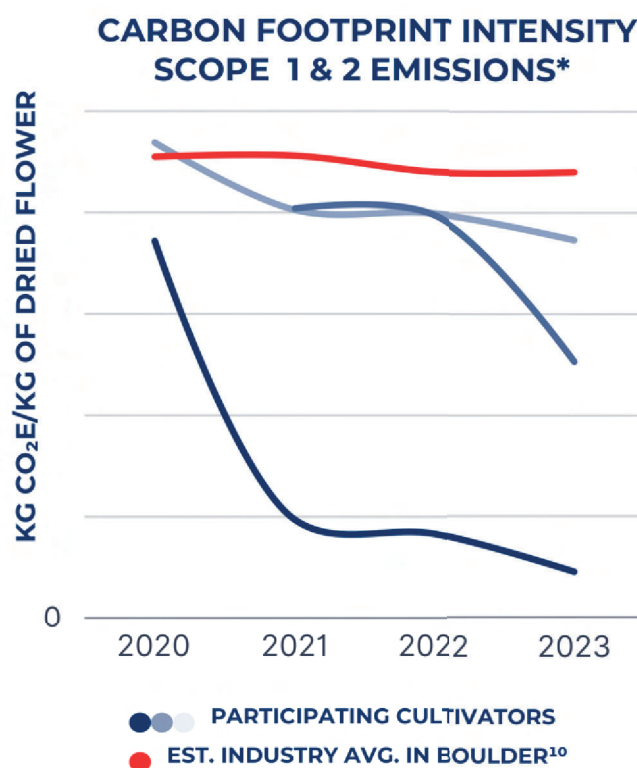




PROGRESS

The pursuit of sustainable cannabis production is a journey composed of many incremental steps. Each step is based on the individual needs and resources of the cultivator, who determines which significant source of emissions to efficiently apply their limited resources. The improvements witnessed over the past four years mainly revolved around energy efficient equipment, process improvements, and strategic material sourcing and substitution.

All certified cultivators showed improvements in their energy and carbon efficiencies. With the lack of locally available, affordable, and certified energy offsets limiting further carbon-neutral achievements.



*To protect participant's privacy and confidential data specific values have been hidden.



IN THE FLOW

CULTIVATOR HIGHLIGHTS

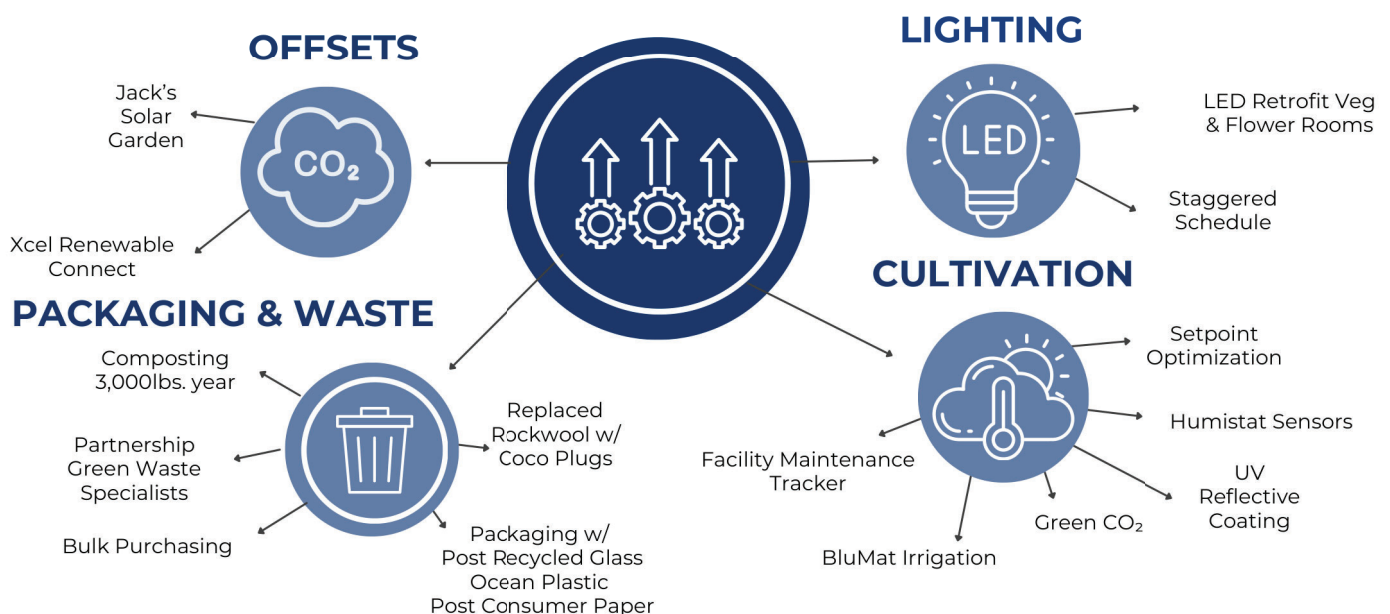
In The Flow is a families-run cannabis company who are devoted to sustainability and the art of cultivation. Their passion for the environment permeates throughout the company with equal consideration given to their impacts and emissions. As an environmental leader, they took the initiative to purchase all locally available renewable energy credits, culminating in an 85% energy offset in 2023.

It's important to our company that we do everything we can to address the issue of energy-intensive cannabis cultivation.

Bonnie Bahlmann,
In The Flow

In the Flow began their internal emission reduction efforts by optimizing their current system. A new lighting schedule was introduced to minimize peak loads and prevent overlapping loads. A preventative maintenance plan was introduced along with a employee training program to ensure equipment was running at optimal efficiency. The following year began the transition to LED lights and improvements to the building envelop. Next came an analysis of the HVAC and dehumidification systems to address the increased dehumidification needs resulting from the loss of heat generated by the replaced HPS lights. New sensors and setpoints helped mitigate this problem with a minimal number of additional dehumidification units.

IMPROVEMENTS



IN THE FLOW

CULTIVATOR HIGHLIGHTS

To further reduce their environmental impact, In the Flow took a holistic approach to water management and installed an efficient drip irrigation system controlled by soil sensors. Fabric pots further reduced water usage during washing. As part of their green procurement initiative, coco coir replaced rockwool plugs which improved their compostable waste landfill diversion to almost 3,000 lbs. a year with the added benefit of increasing water retention.



EST. BOULDER AVG.

3,974

kg CO₂e per kg of dried flower



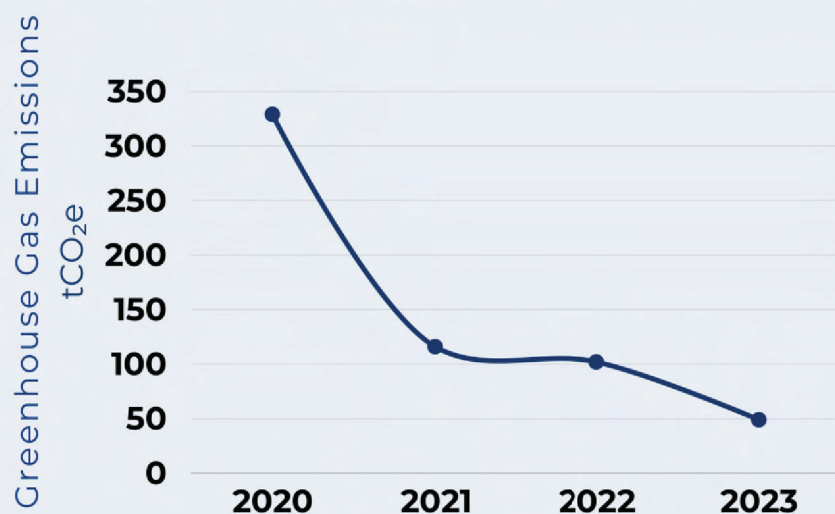
IN THE FLOW™

682

kg CO₂e per kg of dried flower

In comparison to the estimated industry average for Boulder, CO¹⁰, In the Flow is 83% more carbon efficient. This has been achieved by minimizing as many sources of emissions as possible such as eliminating supplemental CO₂ leaks, adopting sustainable packaging, and optimizing delivery and distribution. Renewable energy credits were used to negate the remaining unavoidable emissions.

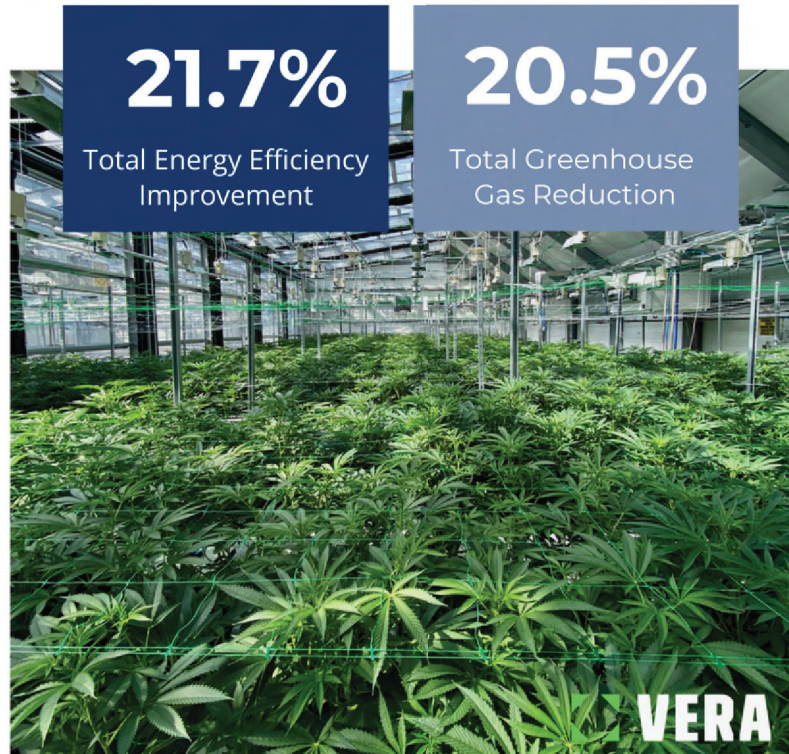
GREENHOUSE GAS IMPROVEMENTS



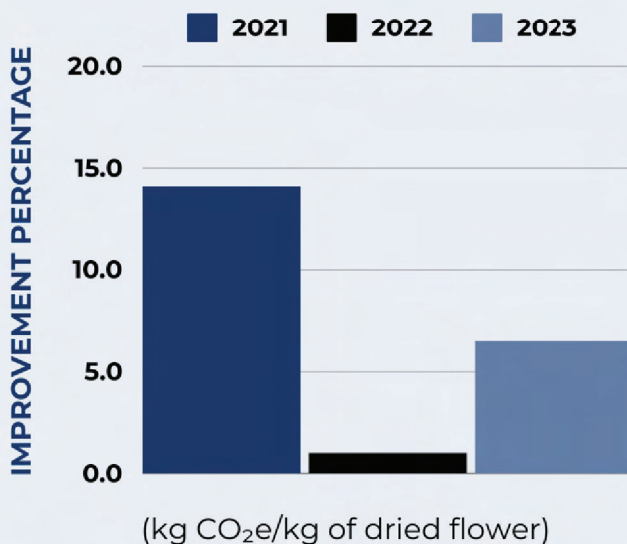


CULTIVATOR HIGHLIGHTS

The collected data only tells part of Vera's story - with successful reductions in energy and emissions expected to become strongly evident in the coming years. While Vera has shown continual improvement over the past four years, they have yet to hit their stride. Their progression slowed in 2022 (see chart below) due to a change in growing methodology from deep water culture hydroponics to living soil cultivation, combined with unforeseen degradation of the greenhouse structure, which temporarily reduced productivity.



CARBON FOOTPRINT INTENSITY



Vera's improvement in 2023 is a testament to their robust operational systems, optimization mindset, and resilient company culture. Now that they have mastered their operational systems, significant carbon reductions are on the horizon. Vera's commitment to sustainability and innovation remains unwavering. As they continue to innovate and refine their practices, Vera is poised to achieve significant greenhouse gas reductions starting in 2024, showcasing their dedication to becoming a carbon-neutral cultivator.

THE Republic*

CULTIVATOR HIGHLIGHTS

The Republic is one of Boulder County's premier cannabis farms, situated on 25 acres with a repurposed school that houses their retail, manufacturing, cultivation, and administrative offices. The Republic's internal reduction efforts have concentrated on expanding their regenerative practices and implementing circular economy best practices. As a vertically integrated operation, The Republic has focused on optimizing their supply chain, infrastructure, and internal processes.

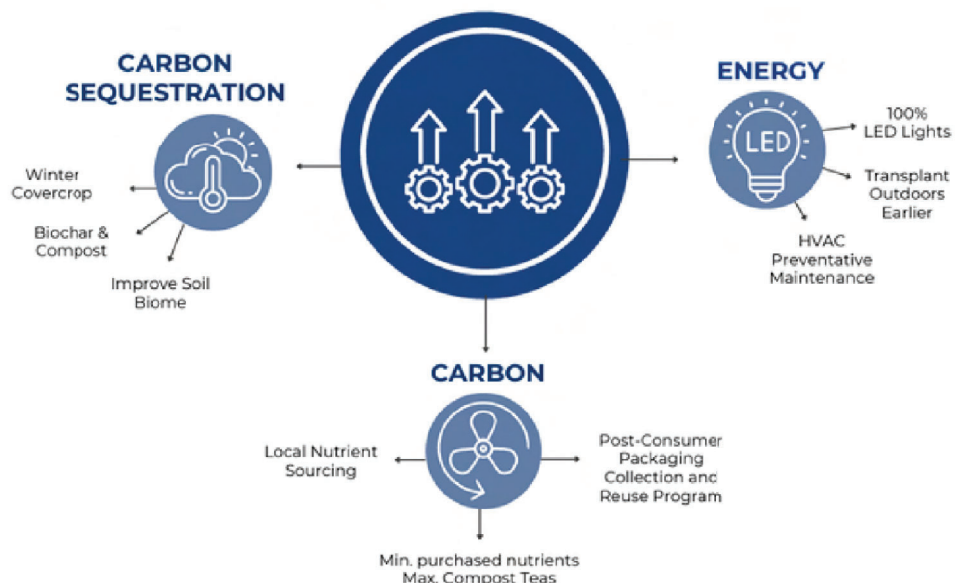


"We consider ourselves a partner with the Earth and take pride in cultivating outdoors and working with nature. It is rewarding to grow healthier plants with less waste."

Shawn Williams,
The Republic



IMPROVEMENTS



Adopting a returnable packaging system can reduce GHG emissions by 22-60% depending on return rates in addition to reducing water and material use.¹¹



THE Republic*

CULTIVATOR HIGHLIGHTS

The Republic is a prime example of nature-based solutions to emission reductions. Their outdoor cultivation emits 97% less GHG than their indoor grow and sequesters carbon through cover cropping, composting, and the use of locally produced soil amendments.

The improved soil health increased nutrient availability and uptake reducing the need for locally produced soil amendments while also reducing irrigation needs due to better water retention capacity.

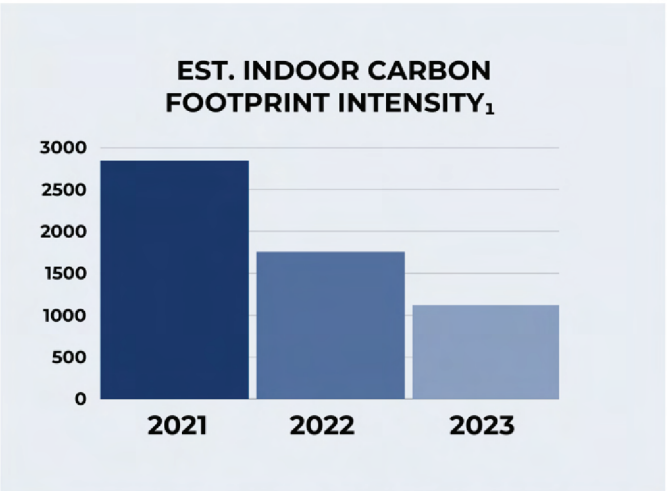
As a result, The Republic's electricity productivity is **62% better than industry average** for outdoor cultivation while their carbon intensity is a remarkable **89% above the industry average¹²**.



2021**2022**

Indoor cultivation was expanded from primarily propagation for outdoor transplant to include a small year-round indoor cultivation space.

The improvements seen in the indoor cultivation are a result of increased yields from shorter, overlapping harvest cycles. The new indoor cultivation occurs in a shared space with no individual submetering so local energy use metrics were used to estimate the non-lighting energy demand calculations.¹³



OUTDOOR CULTIVATION PERFORMANCE			
	CARBON FOOTPRINT tCO ₂ e	CARBON INTENSITY kg CO ₂ e/kg	ENERGY PRODUCTIVITY g/kWh
2021	8.4	14.8	31.5
2022	8.5	12.2	37.1
2023	4.3	11.9	37.8

¹Energy use was allocated based on cultivation space, lighting demand, and % of total use (calculated based on average demand breakdown of additional systems for Boulder-specific cannabis cultivations¹³).

SUMMARY

SUCSESSES

Certified cannabis cultivators demonstrated a significant improvement in their energy efficiency and energy productivity leading to a reduction in their carbon polluting emission. These results underline the critical impact of the robust framework and pragmatic approach of the carbon conscious certification program in promoting sustainable practices within the cannabis cultivation industry.

CONCLUSION

The Boulder County Carbon Conscious Certification program has demonstrated that carbon-neutral cannabis cultivation is feasible with outdoor regenerative agriculture or through the use of carbon offsets. While great strides are being made by a select few dedicated growers, an industry-wide systems change is urgently needed as the production of indoor cannabis still remains an energy intensive process.

CERTIFIED BRANDS



ACKNOWLEDGEMENTS

This program owes its success to the hard work and support of countless individuals. Your unwavering commitment and dedication to sustainability and stewardship are truly inspiring.

SPECIAL THANKS TO:

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Ambra Sutherlin, Boulder County OSCAR

Bonnie Bahlmann, In the Flow

Christian Herrmann, Boulder County OSCAR

Corey Shaw, The Cannabis Conservancy

Dylan Donaldson, Karing Kind

Katie Burrell, PufCreativ

Shawn Williams, The Republic

Boulder County's EIOF Committee

We hope that by sharing our data and experience that the cannabis industry will continue to evolve and improve.



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ABOUT US

The Boulder County Carbon Conscious Certification is funded by the Boulder County Cannabis Energy Impact Offset Fund.

The BCEIOF is funded by a nonrenewable energy use surcharge collected from commercial cannabis cultivators. This fund supports education and implementation of energy usage and carbon pollution reducing best practices.

Boulder County

Office of Sustainability, Climate Action, & Resilience

Boulder County Office of Sustainability, Climate Action, and Resilience (OSCAR) is a key player in Boulder County's sustainability initiatives, collaborates with The Cannabis Conservancy to promote the BCCCC. This partnership reflects OSCAR's commitment to environmental responsibility and climate action. By supporting the BCCCC, OSCAR helps ensure that cannabis cultivation aligns with broader sustainability goals, including energy efficiency and carbon neutrality. This collaboration is a testament to OSCAR's innovative approach to integrating sustainability practices across various sectors, including the burgeoning cannabis industry.

The Cannabis Conservancy

The Cannabis Conservancy is dedicated to fostering sustainability in the cannabis industry. Our partnership with Boulder County's Energy Impact Offset Fund has led to the creation of the Boulder County Carbon Conscious Certification (BCCCC). This program guides cannabis cultivators towards carbon-neutral production, emphasizing energy optimization, and reducing carbon emissions. Our pragmatic, cost-effective certification process supports long-term sustainability, respecting the unique practices of each cultivator while promoting environmental stewardship.

APPENDIX A

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APPENDIX B

MARKETING SUPPORT EXAMPLES



APPENDIX C

ADDITIONAL RESOURCES

The following table simplifies key sustainability metrics used throughout this report. Understanding these metrics is essential for evaluating our progress towards more sustainable cannabis cultivation and energy practices.

TERM	EXPLANATION	SIGNIFICANCE
Carbon Footprint	The total greenhouse gas emissions caused by an entity, expressed in CO ₂ . Measured in tCO ₂ e.	Indicates the entity's impact on climate change.
tCO ₂ e	Tonnes CO ₂ Equivalent. The standard unit for measuring carbon footprints, combining all types of greenhouse gases into a single number.	Allows for comparison of emissions from different sources.
Carbon Footprint Intensity	The amount of emissions per kilogram of product made. Measured in kg CO ₂ e/kg.	Shows how GHG efficient the production process is.
kg CO ₂ e/kg	Kilograms CO ₂ Equivalent per Kilograms. Emissions per kilogram of product, with lower numbers being better.	Helps compare the environmental impact of different products.
Energy Productivity	How much product is made for each unit of energy used. Measured in g/kWh.	A higher number means less energy is used for more product, which is good for sustainability.
g/kWh	Grams per Kilowatt-hour. Measures the efficiency of production in terms of energy use.	An important figure for assessing and improving energy efficiency.