



CLIMATE-SMART URBAN AGRICULTURE SUPPORTING HISTORICALLY UNDERSERVED PRODUCERS



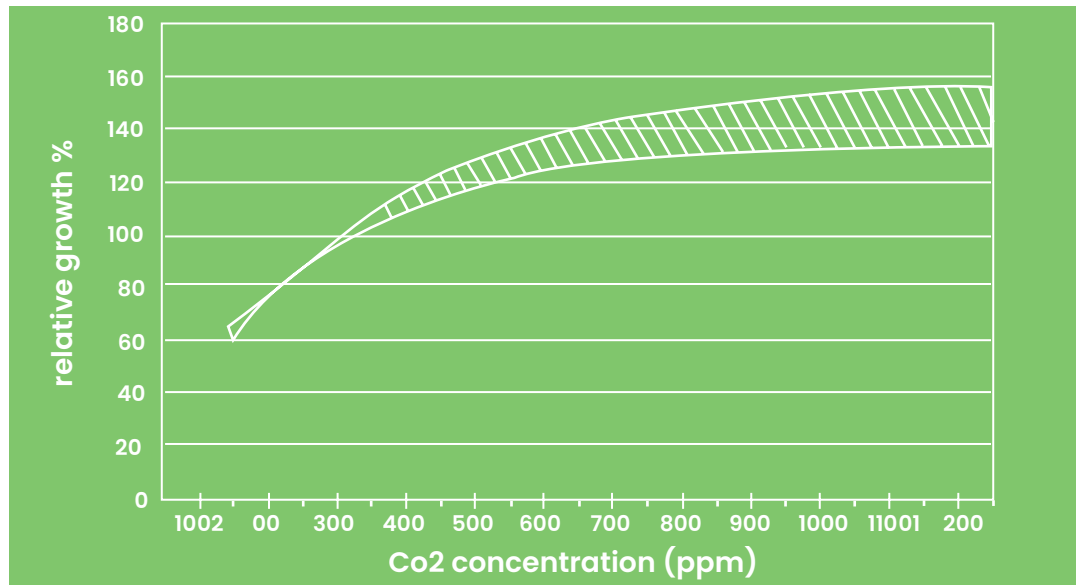
FACTORS EFFECTING CO² LEVELS

Levels of ambient CO² differ depending on time of day, microbial activity, and plant type. At night, expect to see a higher concentration of CO² and during daylight hours levels can decrease to below 200ppm in a greenhouse environment due to CO² utilization in photosynthesis. Plants have different photosynthetic pathways C3 & C4. Both responding differently to CO². C3 plants are more responsive to higher levels of CO². Lettuce, tomatoes, and legumes are some common examples of cultivated C3 plants. C4 plants have higher carbon conversion rates and are less responsive to higher levels of CO² but only comprise 15% of plant species.



PROPER CO² LEVELS

Maintaining a level between 340–900ppm is ideal:



<https://ceresgs.com/growing-plants-with-carbon-dioxide/#:~:text=Figure%20%20below%20summarizes%20data%20from%2060%20scientific,700%20ppm%2C%20CO2%20can%20increase%20growth%20by%2030-40%25.>

| Method | Pros | Cons |
|------------------------------|---|--|
| Compressed CO ² | Effective at providing high amounts of CO ² . | Expensive, unless utilizing a very small growing space. |
| CO ² Generator | Combusting hydrocarbon is an efficient method of producing CO ² with an estimated cost of 0.38 per square-foot per year according to Oklahoma State University Extension. | Without adequate oxygen combustion can cause impurities that can damage plants. |
| Decomposition & Fermentation | Decomposing organic matter in plastic containers produces CO ² . Additionally, CO ² the biproduct of fermentation. Using sugar and yeast can produce small amounts. Decomposition & Fermentation are a cheap method to supplement CO ² . | Large quantity of substrate required to produce adequate CO ² . |
| Dry Ice | Dry Ice produces a large amount of CO ² . For a 10,000sq/ft greenhouse to reach 700ppm it would require about 50lbs of dry ice at 1-3\$ a pound per day. | Dry ice over a long period of time could become expensive in an operation. Additionally, release times are variable. |

CO² BEST PRACTICES

- Younger plants utilize CO² supplementation better than mature plants.
- Add CO² two hours after sunrise and stop two hours before sunset.
- Monitor levels and use set points for release.
- Distribute CO² with horizontal fans above crops.
- Be prepared to fertilize more than usual.

ADVANTAGES OF CO² SUPPLEMENTATION

- Increase plant growth and biomass accumulation, up to 100% for C3 plants and 25% for C4.
- Decreased time to maturity, for a faster crop turn around.
- Higher CO² may cause a reduction in transpiration, increasing water use efficiency (WUE).



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These efforts are seen, appreciated, and of the utmost importance.



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