



## CO2 DELIVERY SOLUTIONS - EXECUTIVE SUMMARY

We (CO2 GRO Inc.) naturally dissolve CO2 gas into water without bubbles for use by indoor AND outdoor plant growers for peak plant yields, quality and profitability.

**CO2 is essential for all photosynthetic plant life.** Dissolved CO2 is **far more effective** when applied on leaves than CO2 gassing. Plants can easily take in all the dissolved CO2 their genetics allow for peak growth. Our science-based CO2 plant studies demonstrated a 400% increase in chlorophyll A growth from an 800% increase in CO2 gas conductance (transfer) on **either side of a leaf surface area**. Our first three cannabis, two pepper and two lettuce commercial grow trial results **all showed a minimum 45% value increase**.

Water can hold 1700 PPM of dissolved CO2 gas or 0.17% at room temperature without bubbling out, **making 100% of the dissolved CO2 molecules available to plants**. CO2 gas only comprises 400 PPM of the atmosphere. That means only 0.04% of gaseous CO2 molecules are available to plant leaves.

Greenhouses gassing CO2 to 1300 PPM **lose an average 60% of their CO2 gas** according to an Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) study. It requires **far less** CO2 gas to elevate CO2 levels in small volumes of water spray on leaves than to alter the entire greenhouse atmosphere. We will **save most of this 60% CO2 gassing loss** when a greenhouse grower uses one of our CO2 Delivery Solutions instead.

All our 2018-9 grow trials and commercial demos on cannabis, tobacco, lettuce, flowers, peppers and micro greens **showed major increases in plant biomass that grew 25-33% faster to sexual maturity**.

**In 2019, we also became the first to showcase supplying CO2 Delivery Solutions for peak plant growth outdoors with the U. of Guelph in Ontario.**

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# CO2 DELIVERY SOLUTIONS BACKGROUND

## EXPERIENCED GAS INFUSION MANAGEMENT

Our 2019 Management team:

- 1) John Archibald, President and CEO. He founded gas infusion companies Canzone and inVentures in 2000 as well as CO2 GRO Inc.'s predecessor Carbon2Algae in late 2007
- 2) Sam Kanes, VP Communications. He co-founded Carbon2Algae in late 2007 with John and has been a Director of CO2 GRO Inc. and its predecessor companies Solutions4CO2 and Carbon2Algae and
- 3) Aaron Archibald as VP Sales. He was VP Operations for inVentures from 2005-2017, commercializing gas infusion business verticals such as groundwater remediation, wellness and aquaculture. He heads five CO2 GRO Reps and co-ordinates four Industrial Ag Partners.
- 4) Dr. Matt Julius as Chief Science Officer effective July 2019. He is a Biology Professor at St. Cloud State University (SCSU) who chose to work on Sabbatical with us. He is instrumental in all of CO2 GRO's scientific grow trials and designing commercial demonstrations.

John and Aaron sold both CO2 gas infusion patent owner Canzone and gas infusion equipment manufacturing company inVentures (a Canzone licensee) in July 2017. They then joined CO2 GRO to commercialize a dormant since 2014, CO2 gas infusion license that they assigned from Canzone to CO2 GRO Inc. in its 2012 IPO (then Solutions4CO2). Perpetual royalty free license field of use is for capturing and dissolving all CO2 gas sources into water to enhance all plant growth.

**Strategy.** John executes the Board approved 2019 Business Strategy and Budget via his VP Sales, VP Communications, Chief Financial Officer and a Chief Science Officer.

**Communications.** Sam heads private and public funding and communications with media, government, investors and initial Agri-Industrial partner, potential customer and Regional Representative screening.

**Operations.** CO2 Delivery Solutions technology installations and commercial demonstrations are led by Aaron via his project engineering team and five Regional Reps. Commercial CO2 Delivery Solutions design, installation and long-term site license and royalty negotiations or commercial sales are under Aaron and John.

**Agri Industrial Partners.** We are working with companies specializing in organic micronutrients, retail cannabis product delivery, greenhouse construction, irrigation and industrial CO2 gas supply to broaden and accelerate our CO2 Delivery Solutions technology reach. **The first four are Organic Grow Solutions focusing on cannabis markets in Canada and California, U.S. based Henry James LLC that focuses on greenhouse nursery, specialty ag, turf and golf course**

**products and services, the Growcer on urban grow containers and Greenstream Botanicals that focuses on cannabis in Western Canada. They report to our VP Sales.**

## **PATENT PENDING CO2 DELIVERY SOLUTIONS TECHNOLOGY**

"We" (CO2 GRO Inc. GROW.TSXV, BLONF.OTCQB, 4021 Frankfurt) dissolve CO2 gas without bubbles into water up to 2000 PPM **naturally, safely and economically**. When applied to plant leaves with our patent pending CO2 Delivery Solutions, we have proven **sharply higher and faster** lettuce, cannabis, tobacco, flower, pepper, micro green and algae plant growth. Misting dissolved CO2 on plant leaves **lets the entire leaf surface area absorb dissolved CO2 versus CO2 gas that can only be absorbed in the tiny leaf stoma pores on the underside of leaves**.

In 2019, we filed for five more related patents in plant pathogen resistance, plant metabolism and two for outside applications and one for a retail hand held CO2 Delivery Solutions device for home use. We also have an exclusive perpetual royalty free global license to use two other gas infusion patents dissolving CO2 with micro porous hollow fiber for plant growth enhancement. The gas infusion patent owner (Canzone) granted this CO2 gas infusion technology license to us in 2012. There are other dissolving gas technologies we will use in certain conditions for our CO2 Delivery Solution installations for dissolving oxygen if our customers ask for it.

Over 1600 patented microporous hollow fiber gas infusion devices have been sold or leased since 2000 by Canzone and its gas infusion manufacturing affiliate inVentures into every Province and State. The first success was in 2000 accelerating bacteria growth via dissolving pure oxygen into groundwater for accelerated hydrocarbon spill cleanup by oxygen enriched bacteria. In aquaculture, dissolved oxygen is used to accelerate fish fingerling growth and to reduce death rates in ocean well boat transport of lobster and other high value fish.

## **PENDING CO2 DELIVERY PATENT APPLICATION**

Our global PCT patent for CO2 Delivery Solutions went pending in August 2018 after a year of both filed scientific and commercial trials with 100% success. We are fast tracking its progress in the US PTO and continuously add our growth, pathogen and other trade secret results to our PCT filing to strengthen our patent pending status.

Our patent pending global PCT is for method of use to accelerate plant growth using any misting, spraying or atomizing methods of delivering dissolved CO2 onto plant leaves. Of the 10M US patents granted, there were **no** similar CO2 Delivery Solutions patents granted to date. At the 2017 and 2018 MJ Biz Con Las Vegas cannabis growers' conferences, **there were no booths providing similar dissolved CO2 Delivery Solutions techniques**.

## OUR CO2 DELIVERY SOLUTION TRIALS, PILOTS AND INSTALLATIONS

We started manual trials in February 2018 on microgreens, followed by cannabis, lettuce/micro greens, flowers and peppers. As of Q4 2019, we have about 30 CO2 Delivery Solutions commercial demonstration proposals sent to owners of a collective 20M square feet of grow space. Over half of our proposals were sent to North American cannabis

We have also been approached by about 30 LPs who are waiting for an approval of carbonated water use clarity language from Health Canada's Office of Medical Cannabis (Cannabis Compliance). Our CO2 Delivery Solutions dissolve 0.1%-0.2% CO2 gas into 99.8-99.9% water. Both Health Canada's Pesticide Management (PMRA) and the Canadian Food Inspection Agency (CFIA) have exempted our dissolved CO2 Delivery Solutions technology for use by all other Canadian plant food and non-food growers.

All our 2018 Canadian cannabis trials were with Health Canada medical cannabis growers that have ACMPR licenses to grow 500-2000 allowed plants each. There were no negative effects of spraying dissolved CO2 onto cannabis plant leaves but we stopped misting at cannabis plant budding. Globally, there is no other issue we are aware of yet in using our CO2 Delivery Solutions on any food, non-food or cannabis plants.

In 2018, we performed twenty grow trials on cannabis, micro-greens, flowers and peppers in a number of Ontario and Michigan locations and two completed scientific lettuce and green pepper grow trials at St. Cloud State University ("SCSU") in Minnesota. **All showed major plant value improvements by growing larger and faster.** A SCSU pepper grow trial also demonstrated **we needed only 50% of the CO2 gas to produce 20% more value than peppers grown in 800 PPM of controlled CO2 gassing conditions.**

For cannabis, three strains of cannabis buds grown using CO2 Foliar Spray versus a control group of plants that received none had no issues with powdery mildew or bugs. Average increase in bud weight (more buds plus heavier weight) was **21% in a 20-22% range**. Average faster growth to cannabis plant flowering from plant cuttings **was 30% in a 28-33% range**.

One Michigan flower grow trial on 42,000 flowers under a fully integrated automatic irrigation boom using a CO2 Delivery Solution has gone on for a year. We now understand the annual grow cycle for flower grower and more limited incremental value achieved in opening up new flower greenhouse time slots.

### 2019 GROW TRIAL COSTS TO BE PARTIALLY PAID FOR BY GROWERS

We demonstrated much higher plant values that we gave away to client growers in 2018. For 2019, we expect some or all of our new fully automated commercial demonstrations to be paid for by our grower customers as we want them to have skin in the game with us. If they do not, we move to their competitors. All have contributed to date in 2019 to trial costs.

## GROWTH INHIBITION OF PATHOGEN AND POWDERY MILDEW WITH CO2 DELIVERY SOLUTIONS

We have performed two series of pathogen experiments to date on peppers (Q4/18) and cannabis plants (Q1/19). Both CO2 Delivery Solution pepper and cannabis results exposed to E. coli showed dramatic reductions in the bacteria's growth on plant leaves treated. Pepper plants exposed to Wilt Fusarium fungus also showed dramatic 99% lower fungus growth with CO2 Delivery Solution applications versus the control group pepper plants.

Pepper plants intentionally infected with powdery mildew receiving CO2 Delivery Solution applications also survived materially longer post infection than control plants.

In a more limited trial at two commercial cannabis locations, all twelve cannabis plants coated with dry powdery mildew got infected while all twelve cannabis plants coated but CO2 Delivery Solution misted showed no visible signs. A powdery mildew infection is pictured below:



The E coli. and powdery mildew pathogen experiments on cannabis plants were in the U.S. at two separate commercial locations. Those press released results were filed with Health Canada's Cannabis Compliance Department.

## GLOBAL MARKETS FOR CO2 DELIVERY SOLUTIONS

### THE OPPORTUNITY

The global plant markets are **enormous** at a retail value of over \$9 trillion/year. **There is no other way to add CO2 outdoors to plants grown or indoor facilities that are too porous to economically use CO2 gassing other than by using our dissolved CO2 Delivery Solutions technology.**

**CO2 Delivery Solutions' use will increase the globe's food production and plant yield and value potential while using less CO2 gas more productively.** There is no photosynthetic plant species we are aware of whose growth would not be optimized by using a CO2 Delivery Solution. We have never had a negative trial results in ten years.

## AG INDUSTRIAL PARTNERS

Our 30 commercial demonstration proposals are mostly in North America. We have three out to the EU, Middle East, and South American countries. We are in discussions with international irrigation system manufacturers, greenhouse builders, industrial CO2 gas suppliers and wholesale/retail agriculture entities to be our Agri-Industrial partners in those areas for penetrating global markets faster.

## WHY CO2 DELIVERY IS SUPERIOR TO CO2 GASSING or CO2 IN THE ATMOSPHERE

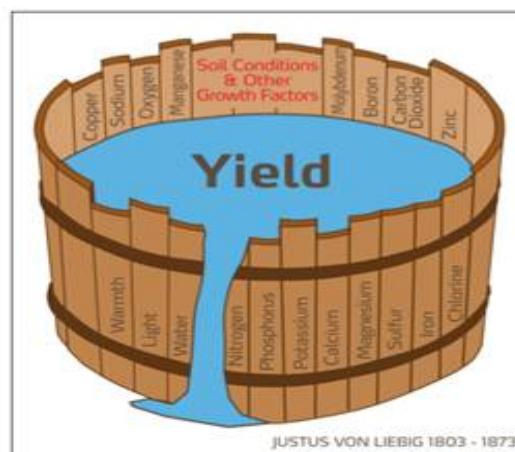
Most plant growth enhancers have by now, been optimized, particularly in greenhouses, such as light, nutrients, moisture, heat, pesticides, growth metals etc. The last major missing link to maximizing plant yields has been how to deliver more effective CO2 so plants can absorb all the CO2 they are genetically capable of, naturally.

**We have shown that CO2 gassing is NOT the best way to do that and far better than just using air's 400 PPM of CO2 gas. By far the best way to feed CO2 to plants is in dissolved form applied frequently onto plant leaves during daylight.**

Justus Von Liebig's "Law of the Minimum" shows CO2 is one of the essential nutrient planks of optimizing the plant yield barrel. In other words, CO2 levels have to be high enough in order to not lose plant yield versus applying all other nutrients. **If CO2 levels are deficient, ALL of the other plant nutrients in excess of that CO2 level can be wasted.**

**Justus von Liebig's  
"Law of the Minimum"  
published in 1873**

**"If one growth factor/nutrient  
is deficient, plant  
growth is limited,  
even if all other  
vital factors/nutrients are  
adequate...plant  
growth is improved  
by increasing the  
supply of the  
deficient factor/nutrient"**



## **CO2 DELIVERY SOLUTIONS RISKS**

**Is There Sufficient Value Added.** Our key risk is whether we create enough value-added plant growth to more than offset the cost to growers for us to install commercial dissolving CO2 Delivery Solutions and cover the cost of delivered CO2 gas. Our first two customers are focused on cannabis and hemp CBD strains which are high value plants. We do not see economic applications for corn, wheat, soybean or rice outdoors anytime soon. We do see lower value plant and tree nursery greenhouses using our CO2 Delivery Solutions if they are grown using overhead irrigation booms which are the lowest cost to connect to.

**Is There Indoor and Outdoor Powdery Mildew Risk. No indoor trial in 2018 or YTD 2019 commercial facility has had an issue.** We only spray thin films of dissolved CO2 water for 3-10 seconds at a time. All CO2 Delivery Solutions grown plants still require deep irrigation for plant root feeding indoors or outdoors.

**What Are Dissolved CO2 Gas Usage Limits.** Plant responses to dissolved CO2 misting do vary by crop and species, their maturity and leaf size. We have seen some plant leaf yellowing using maximum dissolved CO2 up to 2000 PPM at 20-minute intervals so we typically back off to 30 minute or hourly intervals at lower PPM CO2 levels until we optimize. We have to date, proven that lettuce, algae, cannabis, tobacco, micro greens, flowers and peppers thrive with up to 2000 PPM of dissolved CO2 misted in 30 to 60-minute intervals.

**Is There Any Technology Risk. None.** It has been commercially installed and proven since 2000 with over 1600 commercial dissolving gas infusion installations and in 2019, two commercial CO2 Delivery Solutions have been installed in the U.S.

**Is There Any Scale Up Risk? None** as existing large commercial gas infusion systems have been proven to dissolve pure oxygen gas into water at a rate of 3000 gallons per minute on ocean well boats. Our two largest units in inventory can each cover 2 million square feet of grow area.

**Is There Financing Risk. None** short term entering Q3, 2019 with \$1.05M of cash on hand and no secured or unsecured debt. Our annual burn is \$700K versus generating about C\$240K/y of lease revenue. We may get a non-equity drawdown facility or receivables factoring instrument. We have fully paid for and built 6M square ft. of growing area units (20 that can cover up to 150,000 square ft. and two each at 2M square ft.)

**CO2 Delivery Solutions Commercialization Risk. None as we are commercial** with two installations of CO2 Delivery Solutions to date.

**CO2 Gas Supply Risk. None.** CO2 gas supplies have always been plentiful other than once during the EU beer scare caused by World Cup soccer fan consumption in 2018.

**CO2 Gas Pricing Risk. Some.** Industrial CO2 gas companies can charge up to \$500+/tonne for remote outdoor and indoor farming locations. That may offset higher plant yield value from use

of our technology. We are in discussions with a stationary CO<sub>2</sub> gas extraction company (California based Air Capture Co.) that is starting to make 1000, 2000 and 4000 tonne/y CO<sub>2</sub> gas capture machines and is working on smaller 100 tonne on-site units. At certain price points, they will be price competitive with higher cost remote CO<sub>2</sub> gas delivery. Canada's Carbon Engineering raised US\$86M for CO<sub>2</sub> capture units but they are too large for our use at a rated minimum 100,000 tonnes/y of CO<sub>2</sub> gas capture.

## THE GLOBAL CO<sub>2</sub> RETAIL OPPORTUNITY

**Our estimates and percentages of the addressable global retail plant markets for dissolved CO<sub>2</sub> foliar spray are:**

- 1) 10% of \$8 Trillion/y of food grown outdoors favoring leafy greens
- 2) 25% of \$400 Billion/y of food grown indoors favoring leafy greens
- 3) 25% of \$800 Billion/y of tobacco grown indoors and outdoors favoring medical plants
- 4) 25% of \$200 Billion/y of flowers and non-food plants grown indoors and outdoors
- 5) 100% of \$72 Billion/y (by 2022) legal cannabis and hemp CBD grown indoors and outdoors

## OUTDOOR CO<sub>2</sub> DELIVERY SOLUTION MARKETS

**About 40% of all food grown outdoors is irrigated while 100% is irrigated indoors.** Outdoor irrigation can be sub-irrigation, drip irrigation on roots or water captured in tidal or monsoon areas or by canal flooding.

CO<sub>2</sub> Delivery Solutions do not work on plant roots so these root irrigation methods (half of all irrigation) are not directly opportunities. However, it is possible to install drip line feeders with small spray heads pointed upwards at leaf canopy from the ground up or use mobile side or top misters or for high value crops – drones.

**That leaves half or 20% of the 40% of food being overhead irrigated where our CO<sub>2</sub> Delivery Solutions will be best utilized.** Irrigation spray systems vary from pressurized sprinkler systems and pivots, water wheels, hoses, sprayers, misters, foggers, etc. To be clear, CO<sub>2</sub> Delivery Solutions may also benefit a majority of the lower value non-irrigated crops grown but with much lower returns. The lower the revenue per crop acre, the more likely the cost of installing our value-added CO<sub>2</sub> Delivery Solutions will be marginalized. We do not see use economically on low value corn, wheat, soybean or rice acres.

**We have scientifically demonstrated** that the tops of leaves can absorb 90% of the dissolved CO<sub>2</sub> gas that the bottom of leaves can. **Any overhead or side irrigation system can therefore work** for us. It is possible to design new high-pressure drip lines pointing upwards where drip lines are being used in desert like areas like California.

We assume **half** of this above ground irrigation for typically high value vegetables and other cash crops can use CO2 Delivery Solutions. **That nets to 10% of the \$8 Trillion global retail food market or \$800B/y of addressable outdoor irrigated plant food grown.**

## INDOOR CO2 DELIVERY SOLUTION MARKET

**Praxair has estimated that about 90% of all greenhouses do NOT use CO2 gassing as most of the globe's grow facilities are too porous, too small or it is too expensive.** Reasons are high cost power to manage humidity, air conditioning and ventilation needs in hot climates versus additional plant value grown, making delivered CO2 gas too expensive to use.

Year-round dry warm areas like California, Arizona and Texas grow plants in open air greenhouses called shade houses. **They have studs for walls so it is impossible for them to use CO2 gassing:**



We visited this 2M square foot shade house nursery that grows seedlings and plant plugs year-round for California farmers to transplant. It has numerous overhead irrigation booms.

**We conservatively assume 25% of the greenhouse food and flower plants grown can profitably use CO2 Delivery Solutions.** Some may need irrigation retrofits with misters. Most like this one does not as it has installed boom irrigation structures ideal for us to integrate into:



This 230,000 sq. ft. Ontario greenhouse has 28 irrigation booms over double tables of grow medium.

In September 2018, we automated our first CO2 Delivery Solution with a larger dissolved CO2 water container and a 3/8 high pressure hose into one of those 28 booms. We set it to mist every 30 minutes on various micro-green plants for several seconds at a time.

In July 2018, we partially automated a similar irrigation boom and overhead misters at a Michigan flower greenhouse using our CO2 Delivery Solutions equipment and a bladder pump. It has been misting dissolved CO2 for over a year now on a variety of flowers. The owner provides testimonials for other flower growers that enquire about our CO2 Delivery Solutions.

We signed a commercial flower grower to a commercial demo in Ontario using several automated booms and overhead structure on separate grow tables. We have costed out three configurations of our CO2 Delivery Solutions for commercial 2019 installations and now offer to sell these, lease to buy these or permanently lease these.

**We know California is ground zero for our best revenue opportunities in North America.** We are also looking at **ALL** existing automatic overhead boom irrigation configurations to assess those that are least cost to install and of greatest value to our plant growing customers.

### **Plant Root Feeder Irrigation Retrofits More Costly**

Other greenhouses have root feeders only like most large cannabis operations. Their irrigation will need to be modified with floor foggers/misters to reach their cannabis plant canopy. That will require more greenhouse capital to add our CO2 Delivery Solutions to or to retrofit an existing greenhouse that gases with CO2. However, the incremental value of cannabis buds grown using a CO2 Delivery Solution will still **dwarf** the cost of additional cannabis greenhouse irrigation capital required.

## **WHOLESALE (WH) GLOBAL REVENUE/EBITDA**

We assume wholesale food and non-food plant growers get 20% of retail revenue other than cannabis growers who still get about 50%. We also assume 20% EBITDA is generated by food growers on their wholesale revenue, 15% EBITDA for tobacco and 40% of EBITDA for cannabis bud growers. The wholesale global revenue and EBITDA grow market for CO2 foliar spray potential is therefore:

- 1) 10% addressable x 20% WH x 20% EBITDA x \$8 Trillion = \$32B/y of EBITDA
- 2) 25% addressable x 20% WH x 20% EBITDA x \$400 Billion = \$4B/y of EBITDA
- 3) 25% addressable x 15% WH x 20% EBITDA x \$800 Billion = \$6B/y of EBITDA
- 4) 25% addressable x 20% WH x 20% EBITDA x \$200 Billion = \$2B/y of EBITDA
- 4) 100% addressable x 40% WH x 40% EBITDA x \$72 Billion = \$11B/y of EBITDA

Conservatively, this is \$55 Billion/y of wholesale grower EBITDA that our CO2 Delivery Solutions could sharply improve. It is actually **much higher** as any incremental value we provide and only take 20% of, **will have a much higher EBITDA percentage and value to our customers.**

## **REGIONAL AND GLOBAL LICENSING PROSPECTS**

**The scope of global market potential for licensing our CO2 Delivery Solutions patent pending use is huge.** We have at least six verticals (cannabis, hemp CBD, food plants, non-food plants, medical tobacco and algae) in five major geographies we could license that could ultimately be 6-30 potential licensees. To date, all discussions re licenses have been for cannabis.

## **HIGHER CROP VALUES PROVEN INDOORS**

### **Cannabis Trials Detail**

**In 2018, we demonstrated a minimum 45% more cannabis plant value** using three different cannabis strains with 120 plants trialed per strain that had dissolved CO2 applied. We used five one-hour spray intervals during plant cloning/cutting rooting and vegetative growth periods only.

In Q3, 2018, Health Canada approved SGS Canada Inc. labs provided us the following bud results from growing these three distinct cannabis strains using CO2 Foliar Spray:

	<b>THC/CBD With CO2 Foliar</b>	<b>THC/CBD without CO2</b>	<b>% Increases</b>
Sativa strain	10.3%/.035%	8.6%/.026%	20%/35%
Indica strain	14.4%/.055%	8.2%/.029%	75%/89%
Hybrid strain	12.3%/.037%	10.3%/.032%	22%/16%

These strains also grew a net 20% faster with 22% more bud weight than control plants grown with no CO2 gassing. **A minimum 45% more value was therefore created** using a CO2 Delivery Solution **plus** the additional value of 20%-75% more THC depending on the strain.

The indica strain results were by far the highest value added due to its much larger leaf surface area versus other cannabis strains. Our indica grow trial leaf comparison. after five weeks:



## Canadian Cannabis Market Status

Health Canada (“HC”) stated Canadian Licensed Producers (“LPs”) will have 2020 greenhouse capacity for growing 800M grams of cannabis buds/y. **We believe using our CO2 Delivery Solutions could take Canada’s 2020 capacity towards 1B grams/y without one additional greenhouse.** HC has also estimated that up to 20% of cannabis grown in Canada may be outdoors by 2021. We believe we could add 45% of value to these outdoor growers that have no other way of delivering additional CO2.

After mid-2018 approvals of our CO2 and water mixing technology from both HC, Pesticide Management Regulatory Agency (PMRA) and the Canadian Food Inspection Agency, we filed with HC’s Office of Medical Cannabis (Cannabis Compliance) to allow LPs to use our CO2 Delivery Solutions’ non-bubble carbonated water on not just their cannabis clones/cuttings but also on vegetative plant growth pre-flowering as pictured below.



HC is in the process of clarifying that only potable water may be used if it touches any part of cannabis plants effective October 17, 2019. That implies our carbonated water is fine for use by LPs at that time provided it is potable. Water is allowed for use in diluting the 24 allowed bio-pesticides to then be foliar sprayed.

We are of the view as some LPs are that using carbonated water for pesticide dilution is already approved. We are asking HC for further wording clarity as owners of a majority of Canada's cannabis greenhouse capacity have enquired about our technology effects but have not proceeded to demos without clear approval wording.

## Lettuce 2018

**We demonstrated** using CO2 Delivery Solutions: 1) up to **100% more lettuce biomass grown using a CO2 Delivery Solution** over lettuce grown using 800 PPM of CO2 gassing, 2) **400% more chlorophyll A growth** than CO2 gassing chlorophyll A growth and 3) **800% more CO2 conductance (transfer)** into a leaf surface than CO2 gassing into leaf underside stoma.

## Flowers 2018

**We demonstrated 25%-33% more flower plant speed to maturity** on a variety of flowers including periwinkles and chrysanthemums. They grew with more vibrant colors, thicker foliage and larger roots. This one-year commercial flower trial continues and the owner is a positive testimonial for us with other flower growers such as the Ontario grower who we press released with 500,000 square ft of flower grow space.

## Peppers 2018

**We demonstrated 50% higher value** growing peppers with a CO2 Delivery Solution versus peppers grown without CO2 gassing at two different US sites. One was a scientific study at SCSU and one was at a commercial Michigan greenhouse.

**We demonstrated 20% higher value** growing peppers with a CO2 Delivery Solution versus peppers grown using 800 PPM of CO2 gassing. **We also demonstrated** we only needed **half the CO2** in dissolved form to achieve 20% more pepper plant value.

## Micro Greens 2018

**We demonstrated** an 8%-35% value increase range over a variety of micro-greens grown versus 800 PPM of CO2 gassing in a commercial micro-green greenhouse setting focusing on arugula.

## 2019 Outdoors

**We believe we will replicate these major cannabis, pepper, lettuce and flower plant value increases outdoors in dry areas.** We started an outdoor trial in July with the University of Guelph on celery, carrots and onions at the Muck Station in Holland Marsh Ontario. We will use this work to move outdoors in 2020 with, at minimum, U.S. cannabis and organic hemp CBD strains to start. In Canada, we are looking at several Ontario and south BC cannabis growers who have HC approvals to grow cannabis.

## CO2 DELIVERY SOLUTION BUSINESS MODELS

**WE have expanded our lease only revenue model of X\$ per square foot per year to allow customers options to buy or lease to buy our customized CO2 Delivery Solutions.** We try to tie the lease rates or price to proven plant yield and quality value increases in proposed commercial demos or by negotiation.

Our first two commercial installations at U.S. cannabis and hemp greenhouses where the owners were satisfied with all our grow trial work and scientific research to move directly to installations. However, they did do powdery mildew and E. coli pathogen resistance studies with us as part of due diligence to ensure there were no moisture risks from frequently applying light carbonated mist.

Our outdoor business model may differ a little from our indoor business model since no one can gas CO2 outdoors as CO2 dissipates immediately without sealed walls. CO2 gassing usage savings can only occur indoors and only where CO2 gassing is used.

### CO2 DELIVERY SOLUTIONS OUTDOORS – SAME AS INDOORS

We are now also offering purchase or lease to purchase options outdoors as well as lease only X\$ per acre per year technology site licensing fee. This mostly matches the equipment lease practices of industrial CO2 gas companies like Praxair, Air Products, Air Liquide and Messer. They lease their CO2 tanks installed at customer premises for five to seven-year terms and pre-sell their CO2 gas on a fixed price per tonne delivered basis for that term.

### DISSOLVED CO2 DEAL CUSTOMIZATION

**All our CO2 Delivery Solutions require some customization** based on facility size, plants grown, CO2 needs, irrigation levels and irrigation modifications required etc. We are agreeing to terms sharing 80-85% of incremental value once defined to the grower and 15-20% to us prior to any commercial installations. Our licensing fee is set to cover 100%+ of our installation and CO2 gas infusion equipment cost in year 1 fees. Revenue from our first two installations will cover our capital and variable installation costs in less than 6 months.

## KIMBALL CO2 GASSING PLANT STUDIES ON PLANT YIELD

B.A. Kimball's 1983 indoor CO2 gassing plant yield study analyzed 437 CO2 gassing studies on 37 plant species. **Conclusion- greenhouses average 33% more plant yield using 800 PPM of CO2 gassing above outdoor plant yields.** Selected lowest to highest CO2 plant yields with 800 PPM of CO2 gassing:

<b>Yield at 800 PPM of CO2</b>	<b>Number of Observations</b>
Tomatoes/Peppers	1.20
Roses	1.22
Strawberries	1.22
Cucumbers	1.30
Grains (avg.)	1.32
<b>Avg of 37 species</b>	<b>1.33</b>
Lettuce	1.35
Potatoes	1.64
Beans/Peas	1.85
Cotton	2.59

Mr. Kimball's conclusion on lettuce was that a grower could not get more than a peak 145% lettuce yield increase at 800 PPM of CO2 gassing versus no gassing and a 153% maximum at a 99.9% confidence level. **We have proven that is wrong as our best scientific lettuce grow trial at University of Guelph yielded 100% more dried lettuce biomass over lettuce grown at 800 PPM of CO2 gassing.**

The **ONLY** explanation has to be that frequent dissolved CO2 use **dramatically increases** lettuce yields beyond Kimball's maximum CO2 gassing yield improvement limit of 153%. We now have scientific proof why through further SCSU lettuce plant science research work done.

**SCSU plant research successes to date:** 1) demonstrated an 800% increase in dissolved CO2 conductance over CO2 gassing when initially applied to leaves, 2) demonstrated 4a 00% increase in chlorophyll A growth as a result, 3) demonstrated dissolved CO2 can fill a plant leaf's CO2 capacity storage cell needs for photosynthesis in 90 seconds, 4) demonstrated that both the top and bottom of plant leaves can absorb dissolved CO2 similarly and 5) demonstrated 99% less E. coli growth on peppers and cannabis and 99% less growth of wilt Fusarium fungus counts on peppers when frequently applying dissolved CO2 mist.

# types of cannabis

## S. indica



Indica plants are normally shorter and stockier plants than Sativas. They have wide, deeply serrated leaves that overlap, branches that are closer together, coloration that tends towards deep olive green, and a compact and dense flower cluster. The effects of Indicas are predominantly physical and sedative. Due to the relaxing nature of Indicas, they are best used for non-active times of the day, and before bed. Indica strains generally have higher levels of C.B.D and C.B.N and lower levels of T.H.C.

## S. sativa



Generally, the Sativa plant is a taller and lankier variety, characterised by narrow serrated leaves, branches that are farther apart, coloration that tends more towards spring green, and loose spear-like flower clusters that can be extremely resinous. The primary effects of Sativas are on the mind and emotions. These benefits can be particularly helpful for the psychological aspects of many illnesses, giving people an increased sense of well-being. Due to the stimulating nature of Sativas, they are generally better for daytime use. Caution should also be taken for people experiencing heightened anxiety or those with mental health conditions. Sativa strains are generally have higher levels of T.H.C and lower levels of C.B.D and C.B.N.

## S. ruderalis



Cannabis Ruderalis is characterized by varied leaflets in the mature leaves, a shorter stature and generally small size. This subspecies is used to create S.Sativa or S.Indica hybrids with the select desired traits.



[www.kingstoncompassion.org](http://www.kingstoncompassion.org)

## MANIC BOTANIX ([www.manicbotanix.com](http://www.manicbotanix.com)) CANNABIS AND CO2 GAS

From to their CO2 Enrichment - Gaseous Gold article for cannabis using 800 PPM of CO2 gassing:  
"over 90% of dry matter in every plant came from CO2"  
"elevating CO2 levels in cannabis grow rooms can increase yields by 20-30% and reduce growing time by 10%-30%"

"adding CO2 will thicken stems, and create larger leaves and root systems"

"higher CO2 levels leads to higher trichome production, flavonoids and phenolic content in some cannabis species"

## OUR 2018 CANNABIS TRIAL OBSERVATIONS

**We demonstrated a minimum 45% more cannabis bud value creation in all our 2018 cannabis trials versus no CO2 gassing cannabis plant bud value.** For cannabis greenhouses that do gas with CO2 (our first two customers do), we believe we will add 20% more value as we did with peppers versus 800 PPM of CO2 gassing pepper yield results but at half the CO2 gas usage/cost. That equates to one more cannabis crop/y of value indoors to six from five. **Outdoors, we believe we will get the same 45% minimum cannabis bud value increase we demonstrated indoors (20% more THC and 20% more bud weight). We do not add value for plants grow 20% faster outdoors.**

Our first three cannabis grow trials using a CO2 Delivery Solution showed about 90% larger leaves, 45% increased plant size and 20%-22% more bud volume which grew 28%-33% faster during the vegetative growth stage (60% of a cannabis plant life cycle). Quality analysis performed by SGS showed 20%-75% higher THC concentration and 16%-89% higher CBD versus cannabis plant buds grown with no CO2 gassing.

We have visited indoor and outdoor US and Canadian cannabis growers that grow from 1,000 to 100,000 cannabis plants (1M sq. ft greenhouse). The smaller the facility, the less likely they use CO2 gassing. Same with porous and plastic greenhouses. In California, we met a cannabis grower with 200,000 square feet of plastic greenhouses that are too porous to use CO2 gassing. We have seen growers gas CO2 from 800 PPM-2000 PPM based on strain acceptance. There is a limit of CO2 gassing when cannabis plant yields begin to fall. Pictured below are cannabis plant leaves burned by excessive CO2 gassing use:



**There are thousands of cannabis strains.** CO2 Delivery Solutions plant yield and speed to plant maturity varies a little based on strain. Indoor/outdoor conditions, grower skills, irrigation needs, nutrient and light availability levels, temperature and humidity variability and control, air

movement etc. will all weigh on how well cannabis plants are grown with or without a CO2 Delivery Solution.

## **OPTIMAL CO2 FOLIAR SPRAY DELIVERY AND OTHER GROW VARIABLES**

**Dissolved CO2 gas use on cannabis plants is most effective and safest during clone/cutting transplants and the five to seven-week vegetative plant growth period pre-flowering in roughly 30-minute light misting intervals during daylight grow hours only.**

Typically, CO2 gassing levels are raised to targeted CO2 PPM levels within thirty minutes of daylight break and dropped to 400-500 PPM by dusk as cannabis and most other photosynthetic plants do not absorb CO2 gas while “sleeping” at night. CO2 Delivery Solutions applications would only be during this daylight time frame.

Most cannabis growers would like to vary their CO2 gassing levels to the maturity of their plants if they can. “A lot of growers believe” in using CO2 gassing through the vegetative growth period until the last two weeks of bud flowering ([growweedeeasy.com](http://growweedeasy.com)). Opinions vary. **Our first customer used a designed CO2 Delivery Solution right through budding with no powdery mildew issues.**

Use of a CO2 Delivery Solution will allow cannabis growers to more accurately tailor their CO2 applications during the vegetative growth phase and perhaps early stage flowering, maximizing their cannabis crop growth and value potential.

**Large Cannabis Greenhouses Constrained.** Owners of large open space cannabis greenhouses **have no choice** but to keep a constant CO2 gassing level as CO2 gas rapidly spreads out equally in open greenhouses. We visited Aphria’s Leamington facility that uses an 8-9 week grow rotation from potted 14-18 inch juvenile plants to bud harvesting of full-grown 36-42 inch potted plants.

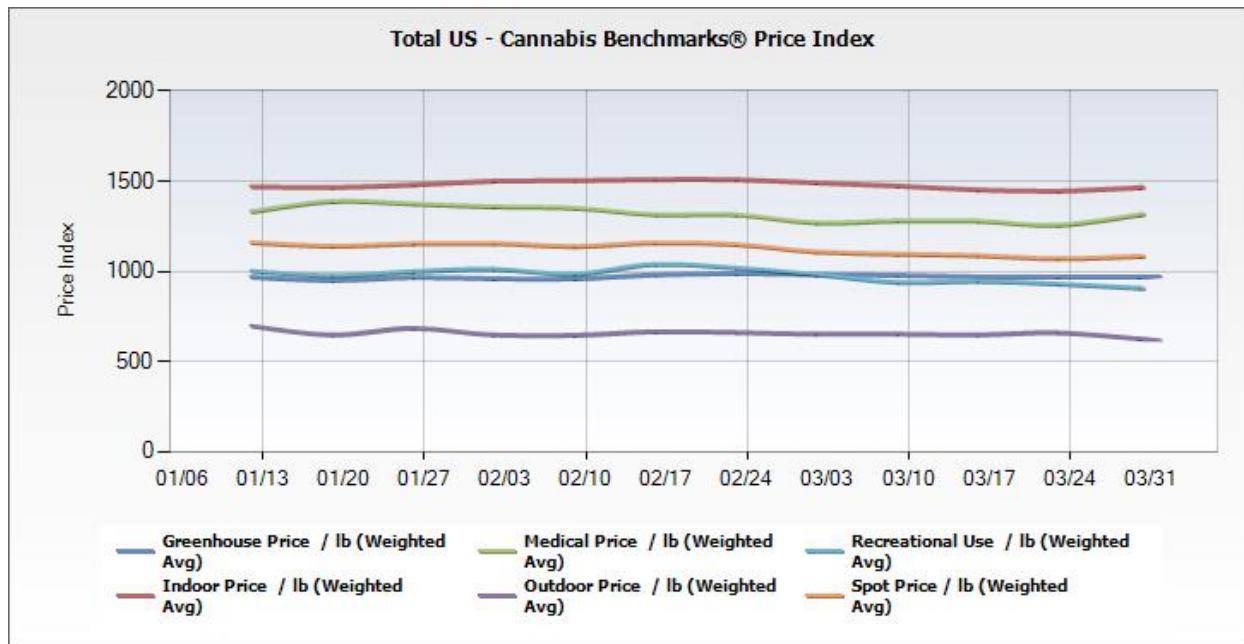
This plant rotation takes place in the same open greenhouse area that is held to 800 PPM of CO2 gassing in day periods. That is not ideal for optimal cannabis growth. A CO2 Delivery Solutions use can enhance their plant growth profile as it can be tailored to their plant grow cycle. **The flexibility of setting CO2 Delivery Solutions’ CO2 concentration and application rates is a key advantage over CO2 gassing.**

## **HIGH VALUE CANNABIS VERSUS LOW VALUE TOMATOES**

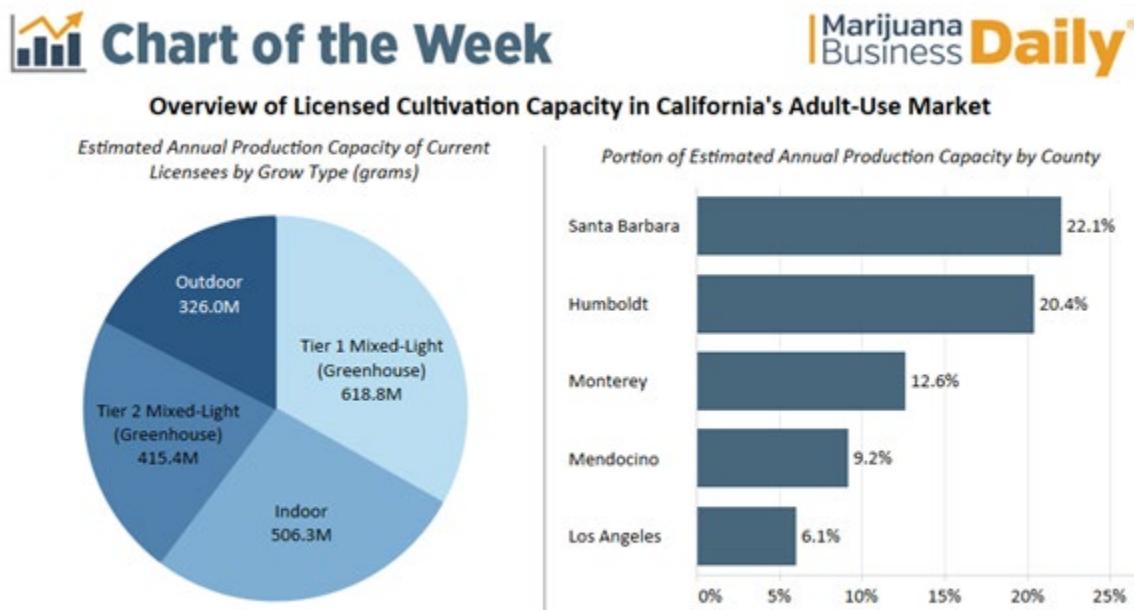
**Currently there is much more profit potential in cannabis than tomatoes.** The Canadian cannabis price in the illegal market was estimated by Stats Canada in the low \$6/gram area with legal prices averaging about \$10/gram. About 80% of Canada’s cannabis market is still serviced by the illegal sector.

Meanwhile, California’s posted indoor price is \$1500/lb., C\$2000/lb. or C\$4/gram. However, 56% of cannabis sold in California is achieving much higher pricing according to various U.S. company

presentations. According to Marijuana Rates (Aug 2019) prices per gram have risen to \$16 from \$14 due mainly to the new 15% California excise tax on legal retail.



Where California cannabis is grown:



Note: Includes only active licenses, data current as of 11/21/18.

Source: Marijuana Business Daily, California Department of Food & Agriculture

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As California's cannabis market is more mature and the same size as Canada's, we will update this State index as we update our Outlook as well as provide quotes from Health Canada or Stats Canada.

Cannabis growers currently realize far more revenue per sq. ft. of up to \$300/sq. ft. /y (assuming a conservative C\$3 or US \$2.25 per gram longer term) than tomato growers who realize about \$80/square foot/y. Also, growing cannabis bud yield EBITDA margins are **currently about 40%** while growing tomatoes yields about 20% EBITDA margins.

**This means indoor cannabis growers longer term will get about 8X more EBITDA per sq. ft. than tomato growers.** Any cannabis yield improvement using a CO2 Delivery Solution will thus generate **about 8X more EBITDA than a mature tomato grower.**

**We believe using a CO2 Delivery Solution will add 20% more value (faster growth, larger buds, higher THC and CBD) or a sixth net cannabis crop/y** of value due to both plant growth acceleration and greater bud weight. This would mean another \$60M/y of bud revenue that would generate closer to 80% EBITDA or **\$48M/y pre-tax to owners of 1M square foot cannabis greenhouses using a CO2 Delivery Solution.**

Announced new Canadian cannabis greenhouse costs are roughly C\$100M for a new 1M sq. ft. cannabis greenhouse. **We would be saving 17% of the cost of a new Canadian greenhouse by adding one more crop/year of value.**

Other than more medical tobacco greenhouses being built for high value human flu vaccines (Medicago is building a \$245M 500,000 square foot greenhouse near Quebec City) and for cancer drugs extracted from tobacco plants, **using a CO2 Delivery Solution is by far the most valuable to cannabis companies per sq. ft. over all other non-cannabis plant growers.**

## **LEGAL 2019 U.S. HEMP OBSERVATIONS**

**The US legalized hemp growth as of January 2019 while Health Canada treats hemp grow by LPs under all the same Regulations in place for cannabis.** Hemp is a strain of sativa cannabis with sub-0.3% THC levels but can have high CBD levels. Casey Research estimates the US CBD market will grow to \$10B/y by 2025. Brightfield Group forecasts US hemp and cannabis CBD growing to \$22B/y by 2022 from a mostly imported CBD demand estimate of \$591M in 2018 of which a third or \$6B/y will be derived from hemp CBD.

The FDA legalization of GW's CBD based Epidiolex opens the door for removal of sub 0.3% THC cannabis as an illegal Class 1 drug in the US. Both the Senate and the House also have cannabis decriminalization Bills filed for possible 2020 action.

We have received organic U.S. hemp grower interest from Michigan, Colorado, Kentucky, North Carolina, California, Texas, New Mexico, Florida and Hawaii. Hemp can now be certified as organic

by the USDA. Some growers have hemp nursery greenhouses as well as hemp acres outdoors. In Canada, we have received some hemp grower interest in Alberta and Southwest Ontario to date.

We are mostly focused on hemp CBD strain growers that propagate and grow early stage hemp plants in greenhouses for re-transplanting outdoors as a number have overhead irrigation booms. Outdoor hemp plants can grow from 6-15 feet high and time between planting and harvesting can range from 70-140 days. Pictured below is an organic hemp hoop house with plants ready to transplant outdoors:



In 2018, Canada was the #2 hemp grower next to China when Saskatchewan planted 56,000 acres, Alberta 45,000 acres and Manitoba 30,000 acres of mostly industrial hemp. This was 97% of Canada's mostly industrial 2018 hemp planting. We are working with the Canadian Hemp Association to expand our opportunities. Health Canada oversees hemp seeds to be used for CBD production under its cannabis oversight regulations.

The US Farm Journal for Feb 2019 featuring hemp estimated U.S. hemp acres planted can range from 1500-4000 plants typically planted with four row tobacco transplant machines started in hemp greenhouses and planted in 40-inch rows. Hemp CBD strains typically like sunny and dry climates similar to tobacco and corn but hemp is more labor intensive than tobacco. Hemp CBD growers target 10% raw CBD oil. Hemp CBD plants must be 100% female and not planted nearby industrial hemp males. Pollen from industrial or wild hemp males can travel up to 3 miles (Kansas State U research in Nursery Management Sept 2019). If female plants are pollinated, they quickly

turn to seed production stopping bud production by female hemp plants. so male hemp plants and pollen are a large issue.

Average 2019 wholesale hemp CBD flower pricing of about US\$25-\$35/lb. at 6-10% CBD is much lower than wholesale California cannabis flower pricing of \$1000-\$2000/lb. However, **the potential value per outdoor hemp CBD acre is up to 1000% higher than outdoor industrial hemp and most other commodity crop acres.**

Lesser value hemp products include organic hemp seeds that sell for \$1.40/lb. while non-organic seeds sell for only \$0.60/lb. Per acre hemp fiber costs have been quoted at \$286/acre with returns ranging from \$116-\$403/acre.

**We target new organic CBD oriented organic hemp farmers who could have per acre values approaching US\$60,000 per acre ([www.journaladvocate.com](http://www.journaladvocate.com)) in 2019-20.** Each CBD hemp plant can produce 1 pound of flowers. At 2500 plants per acre, that is US\$60,000 of potential revenue assuming a \$24/pound flower selling price.

We believe we will also add 20% more hemp bud weight with 20% more CBDs based on our indoor cannabis sativa results in 2018. **That could lift US CBD hemp revenue potential per acre from US\$60,000 to US\$85,000 per acre using a CO2 Delivery Solution.**

## **LETTUCE AND MICROGREEN OBSERVATIONS**

We have demonstrated at both the University of Guelph and SCSU that lettuce grows much faster and larger than control group lettuce using CO2 gassing set at 800 PPM. We believe we will **add 1-2 more lettuce crops/y outdoors in areas like California and 3-4 more lettuce crops/y grown indoors year-round.**

All five main types of lettuce – looseleaf, crisphead, butterhead, romaine and bavarian grow from 45 days (green ice and red salt looseleaf) to 120 days (arctic king butterhead that is grown outdoors). **We expect to grow all those lettuce varieties 33%-50% faster using dissolved CO2 Delivery Solutions.**

**Numerous other leafy greens and micro greens will also benefit such as arugula (where we added 35% more biomass) that are cut early before plant leaf maturity and flowering. Besides greenhouse lettuce nurseries and outdoor lettuce growers in California we met with, we are in discussions with several indoor vertical, horizontal and hydroponic lettuce growers (picture below) and systems developers in Canada, the U.S. and in the UAE.**



## FLOWER GROW TRIAL OBSERVATIONS

Our flower trials in Michigan have led to our first Canadian commercial demo. Results to date show 25%-33% faster flower growth to maturity with stronger root formation and coloring. All flower growers wish to improve yield/square foot and better manage flower maturity timing as prices can be higher before peak flower harvest periods. Our commercial grower is using an automated 150,000 sq. foot capacity unit tied to several irrigation booms and an overhead misting structure on selected grow tables.

Most flower growers that start from seeds or seedlings have overhead irrigation spray applied numerous times per day in the early stage of flower plant propagation. That is **ideal for a CO2 Delivery Solution**.

The trick with year-round flower growers is that it takes a year cycle to fully understand the time schedule openings using a CO2 Delivery Solution that will allow a greenhouse to insert additional flower strains and therefore generate more revenue. Most US flower growers are tied into annual contracts to deliver to Wal-Mart, Lowes etc. based on their delivered volume schedules. While we have learned that our flower revenue opportunities will be constrained by these flower delivery schedules, we have received U.S. and international interest for further commercial flower demos.

## SCIENTIFIC AND COMMERCIAL PEPPER TRIAL OBSERVATIONS

We demonstrated a 50% pepper value increase over no CO2 gassed peppers at two separate US locations AND a 20% value increase over peppers grown at 800 PPM of CO2 gassing at SCSU in Minnesota. The scientifically measured CO2 Delivery Solutions pepper trial that was set at 1000 PPM used only HALF the CO2 gas that was used in the adjacent CO2 gassing pepper trial at 800 PPM. **This greatly increased our confidence that we will cut CO2 gas usage in half while adding 20% more plant value to greenhouses that gas their plants with CO2.**

## MEDICAL TOBACCO PLANT FOR BIOPHARMA OBSERVATIONS

Our optimized medical tobacco commercial demo tobacco plant growth results for a Biopharma company as measured by U of Guelph plant scientists that we announced in September 2019:

Measure	Percentage Increase/Decrease
Height	+ 48.9 % *
Wet Weight	+ 112% *
Dry Weight	+ 133% *
Leaf Area	+ 147% *

This 133% dry weight tobacco leaf increase exceeds our best 2013 hydroponic lettuce result of 100% more dry biomass using a CO2 Delivery Solution. Tobacco leaves are an outstanding grow medium for various human health medical proteins and bacteria targeting cancer drugs, flu vaccines and other human medicines. Our Biopharma company grows their medical tobacco leaves that are inoculated with targeted bacteria for cancer and other related tobacco plant-based drugs.

We have identified 15 Biopharma companies to date in North America that commercially grow their drugs and vaccines inside mostly tobacco or other natural plants. Canada's most prominent medical tobacco grower is Quebec City area based Medicago. They are building perhaps the most expensive greenhouse ever built for \$245M. They refer to their new 44,000 M3 greenhouse (500K square ft.) as a biotech complex. **It is based on growing GM tobacco leaves to 17 days before harvesting.**

Chicken egg flu vaccines are Medicago's replacement target with their plant-based vaccines. Chicken egg flu vaccine success varies from 10% (Australia 2017 and North America 2017-2018) to typically only 60% effective. This is due to the annual guess by the Disease Control Centers six months prior to the actual flu season of which strain(s) will be most active. Medicago can react more accurately in six weeks to the actual strain that develops.

**Medicago estimates a superior 60%-80% success ratio** for its tobacco-based human flu vaccines as it only takes one month from tobacco plant leaf harvest of their grown proteins to make flu vaccine shots. Some believe that medical tobacco plant-based vaccines **will wipe out less effective chicken egg-based vaccines in 10 years**. The global vaccine market is worth \$7B/y.

The potential vaccine and drug value increase using 100% pure dissolved CO2 gas naturally and organically via a CO2 Delivery Solution will vary by company. **We estimate it will be multiples of the value per square foot for growing cannabis if we get similar medicine yield improvements to the additional leaf biomass we are creating.**

## OUTDOOR COMMODITY TOBACCO OBSERVATIONS

Now that we have grown tobacco leaves 133% heavier over a five-week period versus a control baseline group of plants, **we are convinced that a CO2 Delivery Solution outdoors will also be highly effective on tobacco outdoors and certainly indoors.** The global retail tobacco business is worth \$800B/y of which perhaps \$120B may be paid to tobacco plant growers.

We have deferred doing an outdoor commodity tobacco grow trial initially in South Ontario with the Ontario Tobacco Research Centre in Tilsonburg, Ontario. This is due to this R&D tobacco grow trial at the University of Guelph on potentially much more valuable medical tobacco plants grown indoors. We are aggressively following this initial indoor success reaching out to others.

## COMMODITY VERSUS MEDICAL POTATO OBSERVATIONS

Tubers like potatoes respond extremely well to CO2 gassing as they have a very large leaf canopy and their fruit is about 80% pure carbohydrates. We however, continue to delay outdoor potato grow trials due to low potato value per acre to focus on higher value indoor potato and medical potato plants.

Some of the mini-potatoes are getting a premium value and are grown in greenhouses with overhead irrigation booms. They are of greater interest but we currently have no specific grow trial for mini-potatoes. **We have however, made contact with a U.S. potato-based vaccine company and are trying to move them towards a commercial demonstration.**

## US DISSOLVED CO2 IRRIGATION TARGET MARKETS

We missed the 2019 outdoor grow trial window after choosing to do outdoor plant research on celery, carrots and onions at the U. of Guelph Muck Station in Ontario. Our 2020 U.S. outdoor CO2 Delivery Solutions focus will be on California and Colorado cannabis.

State	Percentage total withdrawals	Cumulative total withdrawals
California	20.5%	20.5%
Idaho	12.5%	33%
Colorado	8%	41%

The three Western US States listed use 41% of all US irrigation water which is where we are focused. **California is #1 in produce growing \$50B/y in fruits, vegetables, nuts and other crops.** In addition, legalized California cannabis is a **\$5B/y legal retail market, the size of Canada's.**

**The drier the outdoor grow area, the more effective a CO2 Delivery Solution will be.** The arid Interiors of BC and South Alberta in Canada, SW US in California and Idaho, Australia and the Middle East look to be the most promising globally for best plant yield increases. For 2019, our trials and commercial installations will likely be in North America only due to start-up bandwidth. We did present to the GFAI Global Sustainable Ag Tech Conference April 1-2 and met with future potential customers, ag industrial partners, Trade Commissioners and others for 2020 revenue potential.

California lettuce growers use 18 to 24 inches of mostly drip line and some sprinkler irrigation water per lettuce crop, producing 3-4 lettuce crops per year. We believe we can add at least 1 more lettuce crop/year in California, **adding \$1B/y to California's \$4B/y lettuce crop.** Initially, we will work with California plant nurseries as they 100% overhead irrigate their plant seedlings in shade houses with open air studs for exterior walls.

## **LIKELY BEST OUTDOOR PLANTS FOR A CO2 DELIVERY SOLUTION**

A CO2 Delivery Solution works best on dark, big leafy green plants such as lettuce, tobacco, cannabis, hemp, spinach, kale, cabbage, leafy micro greens, broccoli, cucumbers, peppers and leafy spices like basil.

**The more surface area leaves have the more dissolved CO2 gas they can absorb.** Lettuce, tobacco leaves and micro greens are picked before they flower as finished produce. A CO2 Delivery Solution is the most effective during the vegetative growth stage of these plants thus maximizing their early stage leaf growth.

Outdoor growers will only get marginal to partial yield success using a CO2 Delivery Solution in only their regular watering schedules of 2-4 times per week. Maximum yield benefits require more frequent CO2 misting applications. About 80% of daily plant growth is typically over by Noon.

**The more automated booms or sprinklers are, the more valuable the crop is and/or the more responsive the crop is to dissolved CO2 misting, the more plant value we will add to plant growers.**

## **HALF THE INDOOR CO2 GASSING USE FOR MORE INDOOR CROP YIELD**

**We demonstrated with peppers we can cut greenhouse CO2 gassing costs in half for those that use CO2 gassing in our scientific pepper trials and still add 20% more pepper plant value.** This is due to being far more precise applying dissolved CO2 on plant leaves for less than 10 minutes per day than CO2 gassing an entire room for up to 18 hours per day.

**Indoor growers will no longer need to CO2 gas their entire greenhouse** when using a CO2 Delivery Solution to reach desired CO2 PPM levels. On average, they lose 60% of the CO2 gas they use (OMAFRA Study). This major CO2 gassing cost saving using a CO2 Delivery Solution will appeal more to lower revenue/EBITDA plant growers in lower margin lettuce, peppers, cucumbers, tomatoes, etc. than cannabis. **The lower the crop value, the more the cost of delivered CO2 gas become a factor.**

## POSSIBLE BIOGAS PLANT CO2 ACCESS

One potentially free source of CO2 gas for us and our plant growing customers could be at adjacent biogas plants that consume potato and other natural organic waste. We have had discussions with biogas plant owners in Coaldale Alberta (the Perry family) and Ontario based CCI BioEnergy, Seaciff Biogas and others. We know we could connect a CO2 Delivery Solution and CO2 gas capture equipment to filter the CO2 gas from their raw biogas streams. We have demonstrated that we can capture and dissolve most of their wasted 40% CO2 gas that is typically found in raw biogas streams.

In return, the biogas plant owners would get higher value purified pipe (97%) or at least truck grade methane (92%) in return while we would get their otherwise wasted CO2 gas for use on indoor and outdoor seasonal crops. In 2013, we demonstrated 90% CO2 gas separation and capture into water from raw biogas composed of 60% methane, 39% CO2 and 1% Sulphur. This 3MW biogas plant is in Grand Falls, New Brunswick that uses mostly McCain's potato waste and local dairy cattle waste.

## Plant Water Use Efficiency Using a CO2 Delivery Solution

We know from plant science literature that **the rate of water vapor transpiration through plant leaves falls in the presence of more CO2 gassing**. We want to demonstrate how much more using intermittent CO2 misting at SCSU in late 2019-20 but revenue generation takes priority. This reduced water transpiration process occurs via plant stoma guard cells that narrow if they have more CO2 gas availability. Narrower guard cells reduce the outflow of water vapor. **This will be more important in desert growing areas that have to use 5x-10x expensive desalinated water (i.e. UAE) as less water will needed per unit of plant yield using a CO2 Delivery Solution.**

## CO2 DELIVERY SOLUTION SAFETY VERSUS CO2 GASSING

Breathing excess CO2 gas can disorient humans at higher PPM levels. Nevada and California mandate excess CO2 gassing alarms that trigger when CO2 concentrations go above 5000 PPM in US grow rooms. There must be immediate pre-built venting capacity that opens when CO2 alarms go off. **At the Ontario Vineland Research Center, CO2 alarms go off above 1500 PPM.**

Astronaut Scott Kelly from his book "Endurance" stated the worst aggravation for him at the Space Station for one year was breathing his own buildup of CO2. "As the levels crept up he'd

suffer from headaches and congestion followed by burning eyes, irritability and thinking straight".

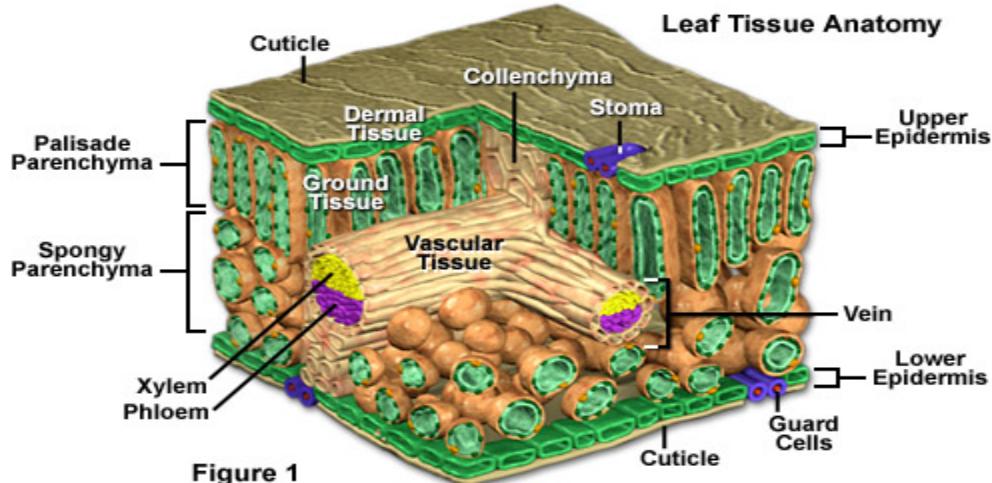
**We can eliminate any CO<sub>2</sub> gassing risk to humans in greenhouses with a CO<sub>2</sub> Delivery Solution versus CO<sub>2</sub> gassing.**

## CO<sub>2</sub> DELIVERY SOLUTIONS USE OVER CO<sub>2</sub> GASSING USE ARGUMENTS

- 1) Dissolved CO<sub>2</sub> leaves no residue as unused spray evaporates,
- 2) It is safer for humans to use dissolved CO<sub>2</sub> than gas an entire greenhouse with CO<sub>2</sub>,
- 3) it is more effective than CO<sub>2</sub> gassing in increasing plant yields,
- 4) Water already has dissolved CO<sub>2</sub> gas that nature continuously dissolves CO<sub>2</sub> gas out of air's 400 PPM into water and,
- 5) Humans drink soluble CO<sub>2</sub> carbonated pop, water and beer without health consequences.

## WHY DISSOLVED CO<sub>2</sub> WORKS - PLANT LEAF PHYSIOLOGY

Leaves can only absorb CO<sub>2</sub> gas via their stoma pores into their tissue cells as pictured below:



However, when dissolved CO<sub>2</sub> water is applied on a plant leaf, most of the leaf cuticle surface is available to diffuse dissolved CO<sub>2</sub>. It passes through the leaf surface into its semi-porous epidermal and mesodermal living cells under the cuticle as the cuticle is semi-porous like human skin. The osmotic pressure on the outside of the leaf due to the dissolved CO<sub>2</sub> concentration and the small size of CO<sub>2</sub> molecules is why nature can force dissolved CO<sub>2</sub> molecules into leaf membranes until in balance or leaf storage CO<sub>2</sub> saturation in its spongy mesophyll (Parenchyma).

A key plant leaf enzyme (Rubisco) attaches to CO<sub>2</sub> molecules entering a leaf's mesophyll that delivers the CO<sub>2</sub> molecules for photosynthesis in chloroplast cells in the presence of sunlight or artificial light. 85% of all plants grown are called C<sub>3</sub> plants. They create two x three carbon chains and combine the two to make C<sub>6</sub> glucose sugar molecules, **the primary source of plant food.**

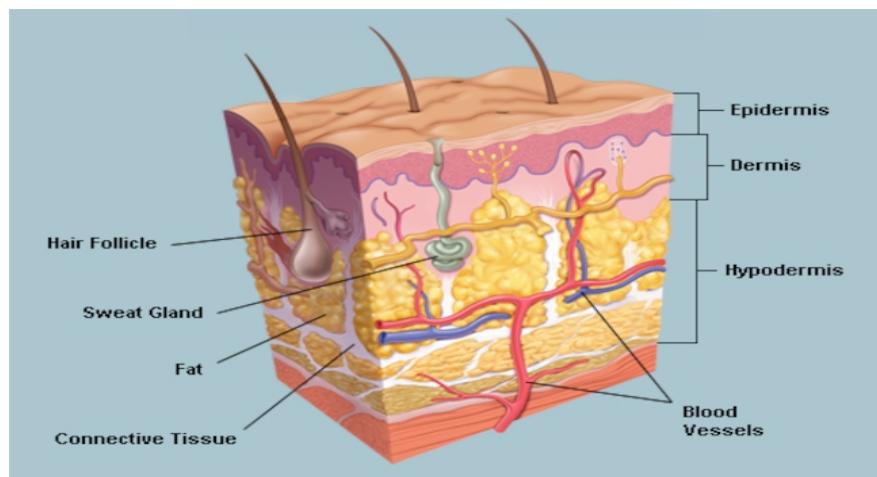
Plants therefore use CO<sub>2</sub> to build energy storage molecules that are then accessed by most of earth's life. Periodically applied CO<sub>2</sub> rich water on leaves allows plants to systematically fill their leaf storage areas with CO<sub>2</sub>. This allows plants to maximize their photosynthetic activity by increasing energy molecule production of C<sub>6</sub> glucose.

Overall, this plant leaf physiology process is similar to the way humans transfer oxygen from air into human lungs that dissolve the oxygen gas from inhaled air into human blood capillaries and arteries to sustain life.

## HUMAN SKIN PHYSIOLOGY

**The same osmotic effect through plant leaf cuticles with dissolved CO<sub>2</sub> occurs in human skin epidermis that can also absorb dissolved oxygen.** We demonstrated plant leaf mesophyll fills up with dissolved CO<sub>2</sub> in 90 seconds. At InVentures, CEO John Archibald retained Dr. Stacy Reading to analyze blood samples from 500 human that sat in dissolved oxygen rich water or showered with it. Dr. Reading demonstrated that all 500 subjects had elevated oxygen counts in their dermis blood capillaries in two minutes of being exposed to dissolved oxygen saturated water. (Dr. Stacy Reading's Peer Reviewed White Paper).

Human skin layers and blood vessels that feed oxygen to the dermis from human breathing are shown below:



Dr Reading's White Paper refers to the potential to heal or accelerate the healing of certain surface skin conditions like open cuts, exzema and psoriasis. While anecdotal, an Ontario naturopathic doctor was given gas infusion equipment to dissolve oxygen into bath water for use

on several advanced diabetic ulcer patients. Their cases were leading to limb amputation as their ulcers would not close. He demonstrated that open diabetic ulcers can be healed by the skin surface application of enriched dissolved oxygen water that closed these ulcers over time.

Typically, doctors will say one should never get an open skin wound wet. For certain skin conditions, that may not be true as Dr. Reading and this naturopathic doctor have concluded. This human health opportunity was sold along with inVentures and Canzone to a U.S. Company in 2017. It did form part of the knowledge re the patenting of CO2 Delivery Solutions for enhanced plant growth.

## CO2 GASSING ECONOMICS

**Ontario's OMAFRA estimates 60% of CO2 gassing in Ontario greenhouses is LOST to the atmosphere at 1300 PPM** due to air exchange, humidification, dehumidification and porous greenhouse leakage. If no plants were in a typical greenhouse absorbing CO2 gassed, **the CO2 would be 100% gone in 2-3 hours**. A 1 million square foot greenhouse uses about 3000 tonnes of CO2/year.

**It requires much less CO2** to elevate greenhouse levels in small volumes of dissolved CO2 in water that it does to alter the entire greenhouse atmosphere. At 2000 PPM, dissolved CO2 **will stay in water until precision sprayed**. A CO2 Delivery Solution will therefore save most of that lost 60% from gassing CO2.

We have demonstrated that plant leaves fill up their CO2 needs/capacity in 90 seconds. Any residual excess dissolved CO2 not used will simply evaporate. We target applications on plant canopy for only a few seconds to minimize valuable CO2 losses.

**OMAFRA's estimates of CO2 gassing lost at a 500,000 sq. ft Ontario greenhouse is:**

- 1) 0.37 KG or 60% of CO2 per hour for 100 M2 is required to maintain gaseous CO2 at a 1300 PPM level without any plant use **therefore 100% is lost**.
- 2) 0.24 KG of 40% of CO2 per hour for 100 M2 is 100% consumed by plant leaves.

This equals 0.61 KG of CO2 gassing/hour to fill a 100 M2 greenhouse grow space to 1300 PPM of CO2 gas. An average Ontario greenhouse is 13 acres or 500,000 sq. ft. (45,000 M2 at 11 sq. ft./M2).

**Annual Ontario 500K square ft greenhouse CO2 gas usage and cost are:**

- 3) 0.61 KG/hr. of CO2 gassing x 15 average daylight grow hours x 45,000 M2 (500,000 sq. ft./11) x 300 days of growing at 1300 PPM) =
- 4) 1,235,250 KG/y of CO2 used (1,235 CO2 tonnes/y) to gas CO2 at 1300 PPM during light grow periods.

Assuming a \$140/tonne delivered bulk CO2 cost, annual Ontario greenhouse CO2 gassing cost at 1300 PPM would be **\$175,000/y** (1,235 tonnes x \$140/CO2 tonne).

## SOURCES OF CO2 GAS AND CLEANLINESS

Increasingly, large greenhouses are contracting for delivered food grade industrial CO2 gas from Linde, Praxair, and Air Products etc. who install onsite CO2 gas capture and storage towers. If ethanol plants are nearby, their CO2 emissions from corn fermentation **are a cheaper source of CO2 than from refineries**. Older greenhouses still burn natural gas or propane for their CO2 emissions as well as heat and power needs.

While relatively clean, there are chemical reactions from burning natural gas or propane and injecting the exhaust into greenhouses. These reactions cause humidity to rise, add particulates, ethylene and traces of formaldehyde into the air **that greenhouse workers are constantly breathing**. This is partly why more greenhouses are switching to clean food grade CO2.

## WIDE RANGE IN DELIVERED CO2 GAS COST

The US Midwest and southwest Ontario have numerous mostly corn based ethanol plants so CO2 gas users nearby get low priced delivered CO2 gas. About 33% of the weight of corn kernels in ethanol fermentation is emitted as clean CO2 gas along with water vapor. Industrial CO2 gas companies construct CO2 capture units at these ethanol plants to liquefy their wasted CO2 emissions if CO2 demand is nearby like the Ontario greenhouses in Leamington.

**All the CO2 gas** captured at a new Aylmer Ontario Air Liquide CO2 capture facility at IGPC's Aylmer ethanol plant is destined for these Leamington greenhouses. Transport will be via 20 tonne compressed CO2 tankers. We have been quoted \$200/tonne/hour for large truck deliveries so the further from the CO2 source, the more expensive delivered CO2 will be.

**Leamington greenhouses are two hours away from Aylmer which means a four-hour round trip plus an hour to unload.** We estimate Leamington greenhouse owners are paying C\$140/tonne in 2019 for their new ethanol-based CO2 supply **as \$100/tonne is solely for delivery costs.**

CO2 buyers in the US Midwest pay even less than C\$100/CO2 tonne delivered as they have far more ethanol plant CO2 than local CO2 gas demand. In California, we have seen bulk food grade delivered CO2 quotes **up to US\$300/tonne** as there are only three ethanol plants there. We have met with Colorado growers **paying \$500/tonne** as their CO2 gas supplies are shipped via tank car from the US Midwest 1000 miles away.

**High delivered CO2 gas prices are an advantage for our CO2 Delivery Solutions as we cut the CO2 use in half while still adding about 20% more plant value over those that gas with CO2.**

## CANADIAN CO2 GAS EMISSION COSTS RISING

Canada's Federal government has started demanding all provinces charge \$50/CO2 tonne emitted as of 1/1/22 and has won every court battle to enforce it. The 0.37 KG lost per hour attaining a 1300 PPM level in 500,000 sq. ft greenhouses is 750 CO2 tonnes lost/y. At \$50/tonne in 2022, **it will cost an additional \$37,500/y** for Canada greenhouses losing the CO2 gas they bought to reach their desired CO2 gassing levels. This Federal carbon tax cost is now being fought by Ontario and other provincial governments.

## DISSOLVED ONTARIO CO2 COST SAVING SUMMARY

**We will save a 500,000K sq. ft Ontario greenhouse \$100,000/y** of their total \$212,500/y CO2 cost starting in 2022 (\$175,000/y lost CO2 gas cost plus \$37,500/y CO2 emission cost) using targeted dissolved CO2 foliar spray versus CO2 gassing. **This savings number increases as delivered CO2 gas costs increase.**

## OVERALL SUMMARY

Our first two US commercial customers have CO2 Delivery Solutions operating that are generating about C\$240K/y of recurring revenue for us and additional profits for them. We have **conclusive** scientific evidence and commercial plant grow trial proof that CO2 Delivery Solutions sharply enhance food and non-food plant growth and speed to plant maturity over plants grown with or without CO2 gassing.

Our customer proposal pipeline is now at 30 with over 100 interested parties now since our Middle East visit to trial, commercially install pilots or go ahead with full CO2 Delivery Solution installations. A majority of our 30 proposals are out to mostly North American cannabis growers.

**About 90% of greenhouses globally do not gas with CO2 and 100% of all outdoor and porous greenhouse and open-air shade houses cannot.** Their plant yields are capped by nature's 400 PPM of CO2 in the atmosphere. They will have the best positive plant yield effects using a CO2 Delivery Solution.

For those growers that do use CO2 gassing, **we expect 20% further plant value increases at half the CO2 gas use** based on our commercial and scientific pepper, lettuce and micro-green grow trials.