An Introduction to Closed Loop Aquaponics Systems

This presentation will demonstrate how commercial cannabis farmers can optimize their **annual** crop production values, on a **gram/meter** basis, and do so in response to new and emerging government mandated energy and water savings standards.

When it comes to organically grown food and medicine, a Closed Loop Aquaponics System will never rely on any nutrients, pesticides, insecticides or fungicides applied to the plants that could harm the fish, or those who would consume these products, in any way.

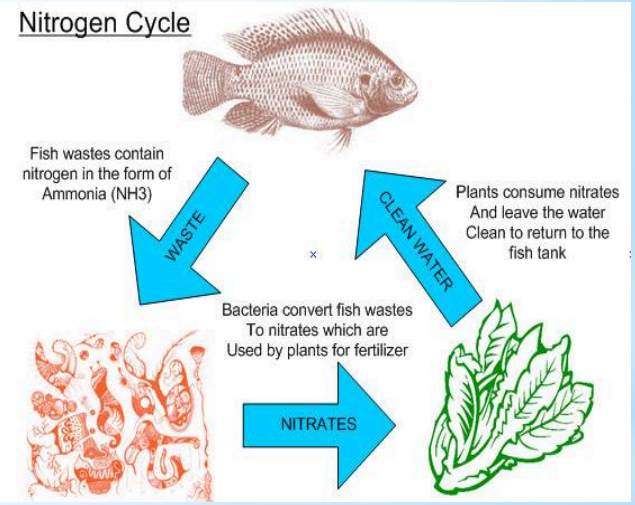
The 151 Farmer pledges to grow, at a minimum, 1 pound of Cannabis to 5 pounds of Food for 1 World. Their World. The World they can influence. The World they can inspire. The World they can change. One Garden at a Time!

ww.151farmers.org

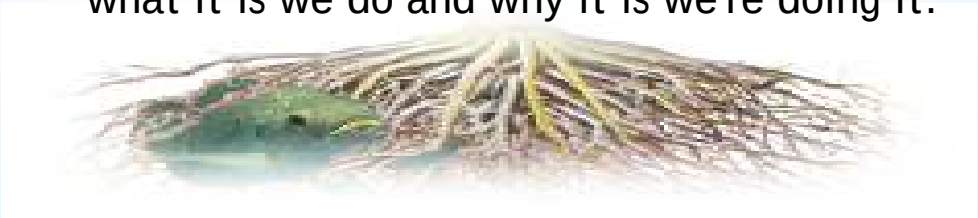
An Introduction to Closed Loop Aquaponics Systems

A Closed Loop Aquaponics System relies on the basic chemistry that exists between plants and fish that moves the nutrient rich fish water between the plants and the fish in a traditional flood and drain type of cultivation style.

But, as it relates to cannabis cultivation, we employ some not so traditional techniques that serve to improve crop quality and yield while reducing our energy, water consumption and times to harvest.



Before we go into greater technical details as to how this all works, we really need to cover the elements of what is a 151 Farm, what it is we do and why it is we're doing it.



Changing the World One Garden at a Time!

ww.151farmers.org

What is a 151 Farm?

The name 151 was picked as a way to reference the two main elements of our farms which combine medical cannabis and food. 151 may reference our minimum crop production values of 1 pound of cannabis to 5 pounds of food for 1 community.

or

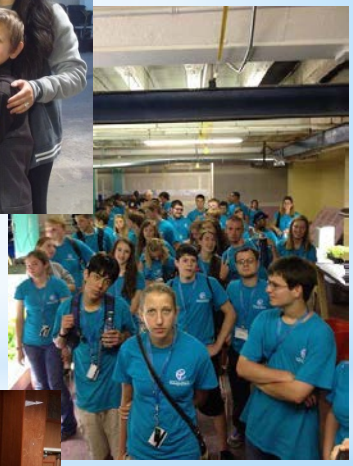
151 is also an easy way to remember the ideal target ratios relative to the number of fish and their size to the amount of water in the system relative to the plant media bed area.

1 Pound of Cannabis to
5 Pounds of Food for
1 Community

OR

1 Pound of Fish to
5 Gallons of Water to
1 Sq-Ft of Media Bed

A 151 Farmer Uses Their Farm to Promote the Importance of:



- Education and Outreach to the Community and to our Youth, the Farmers of Tomorrow.
- Locally Grown Food and Medicine.
- Maintain and Increase Crop Quality and Yields.
- Ecologically Responsible Cultivation Practices.
- Year Round Polycultural Crop Production.
- Fresh and Unprocessed Food and Medicine.
- Minority and Disadvantaged Business Opportunities.
- Growing from Heirloom Seeds that have not been Genetically Modified.
- Reduction of Our Carbon Footprint.
- Saving Energy and Water.
- Organically Grown Food and Medicine.
- Fish Co-Cultivation in Non-RO Water Systems.
- No GMO's, Meal or Soy Products for our Fish.
- Urban Farms Development Opportunities.
- Locally Sourced Jobs and Products.
- Essential Oils Research and Development.
- Political Stewardship in Affecting Positive Change in our Local, State and National Food and Drug Policies.
- 151 Franchise Opportunities. We Need More Gardens Not Less!

When it Comes to Cannabis Farming Water Really is the New Oil

As you go through this presentation you will see for yourself the obvious economic benefits to utilizing a Closed Loop Aquaponics System for cannabis cultivation at your farm.

However, under new government mandated regulations, what is going to be equally important to the success of your business will be determining the impact your farm has on the environment.

Prior to the full implementation of AUMA in January 2018 the CDFW has been recently been shutting down licensed grow operations based on environmental law violations.
http://www.thecannabist.co/2017/08/24/mendocino-california-marijuana-raids/86607

What is apparent is that when it comes to cannabis cultivation, as well as pesticide and toxicity standards, the rules and regulations are not yet set in stone, nor will they likely ever be. To the traditional gardener trying to maintain compliance to these ever evolving standards, this will represent a real challenge to “day-to-day” cannabis operations.

In a regulated cannabis industry this will be important because what might have been legal one day may not be the next.

What Being Legal Means to the Cannabis Farmer

It should come as no surprise that with the passing of laws making cannabis and its cultivation legal, environmental agencies will play an increasingly important role in determining who can cultivate and who can not.

Make no mistake about it, we're not saying that environmental protections are a bad thing but what we are saying is that farmers need to be aware, that within the language of these laws, new and existing governmental agencies will now have authority that will forever change the way we cultivate cannabis.

For example, in California you can see that with our recently passed 'recreational' cannabis law, Prop 64, The Adult Use of Marijuana Act, aka AUMA, the law specifically addresses water diversion and waste water discharge issues. It is within the language of this law, and within the discretion of up to 13 government agencies, to revoke a cultivation license when defending the environment as detailed within the AUMA language in SECTION 2- FINDINGS and DECLARATIONS paragraph (F).

F. Currently, illegal marijuana growers steal or divert millions of gallons of water without any accountability. The Adult Use of Marijuana Act will create strict environmental regulations to ensure that the marijuana is grown efficiently and legally, to regulate the use of pesticides, to prevent wasting water, and to minimize water usage. The Adult Use of Marijuana Act will crack down on the illegal use of water and punish bad actors, while providing funds to restore lands that have been damaged by illegal marijuana grows. If a business does not demonstrate they are in full compliance with the applicable water usage and environmental laws, they will have their license revoked.

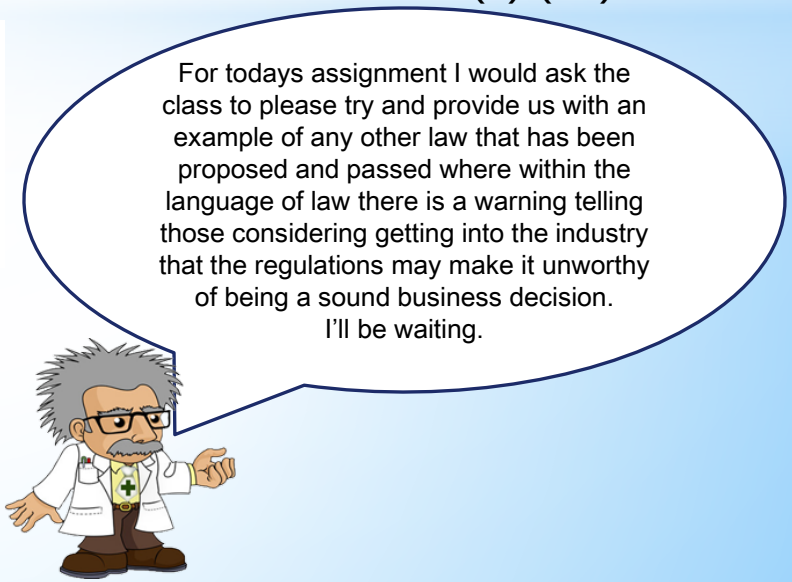
What can anyone do to protect themselves from the unknown?

That's the key question any business person, and **this is** especially **true for** those who are looking for a place in the regulated canna-industries, must ask themselves. How can they play by the rules, provide for the community and their employees, and work to create a profit from their work in an evolving industry? A reasonably prudent business person must ask themselves, "is all this risk and uncertainty worth the time and the money being spent to maintain compliance?"

Fortunately, the lawmakers recognize that risk, and even warn those who will venture into this industry, that the regulations and the measures, many of yet to be defined but will need be followed, may in fact make the entire endeavor "Unreasonably impractical". This is language that is in AUMA under Division 10, Chapter 1 General Provisions 26001 (2) (dd).

(dd) "Unreasonably impracticable" means that the measures necessary to comply with the regulations require such a high investment of risk, money, time, or any other resource or asset, that the operation of a marijuana establishment is not worthy of being carried out in practice by a reasonably prudent business person.

Should the regulations become too burdensome and the business is ultimately forced to close their doors, it can not be said you were not warned.



Cannabis Farmers Can Save the Day!
A Strategy

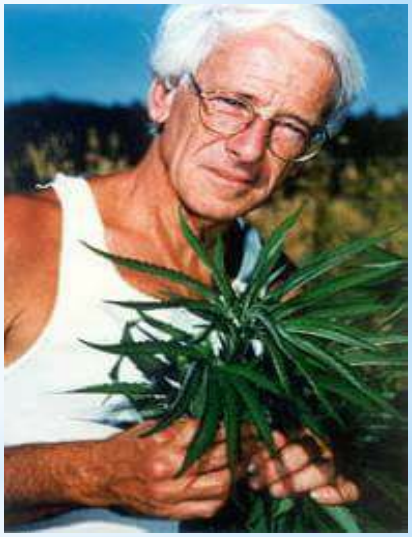
Cannabis farmers are by nature, a creative and resilient group. If they have been cultivating for any length of time, they have dealt with disease, pest infestation, theft, interdiction, lack of water and a host of other issues that would have most people giving up and walking away. But that's not most cannabis farmers.

Cannabis farmers are tough cookies and they will work within the law if they intend to stay in business. What many of today's cannabis farmers are concerned with though, is will compliance or attempted compliance in a regulated system be the final straw that puts them out of business? These are entirely legitimate concerns, but at least in regards to environmental compliance, it does not have to be.

Cannabis farmers need strategies that would mitigate those environmental issues, whereby these agencies are given the authority to revoke a license for noncompliance. To accomplish that, cultivators really need to be at the forefront of any and all energy and water savings strategies. It is through this approach, of leading by example, that we show how to be the good stewards to the planet while not running afoul of those environmental agencies who oversee any and all licensed and unlicensed cannabis cultivation activities.

Leading by Example
The Recipe for a Successful Strategy

When talking strategies going forward it helps to understand what made for successful strategies in the past. To that end, all we need to do is look back at what Dennis Peron accomplished back in 1996. It was Dennis Peron who, as one of the original co-sponsors of California's Proposition 215, got the very first medical cannabis law passed in the United States. There is no disputing the fact that Dennis remains one of the world's greatest cannabis activists. Without Dennis and the countless other activists who have worked tirelessly on behalf of patients rights, we would not even be having the discussions we're having today as to what the legal and regulatory framework for cannabis will look like going forward.



Legendary Canna-Activists Dennis Peron and Michael McShane talk strategy at 151 Farms. It was through these and other discussions that the Cannabis Manifesto was developed.

http://151farmers.org/2016/10/21/a-cannabis-manifesto

What made Proposition 215 successful was that it was simple, straightforward and easily understood. What has made Dennis successful is his unerring sense of what needs to be done to educate more people as to the benefits of what fresh, organically grown cannabis can do to help people with a myriad of health conditions, as well as how often it can replace opiates and other prescription drugs. That strategy of education and leading by example worked in 1996 and it can work today.

Changing the World One Garden at a Time!

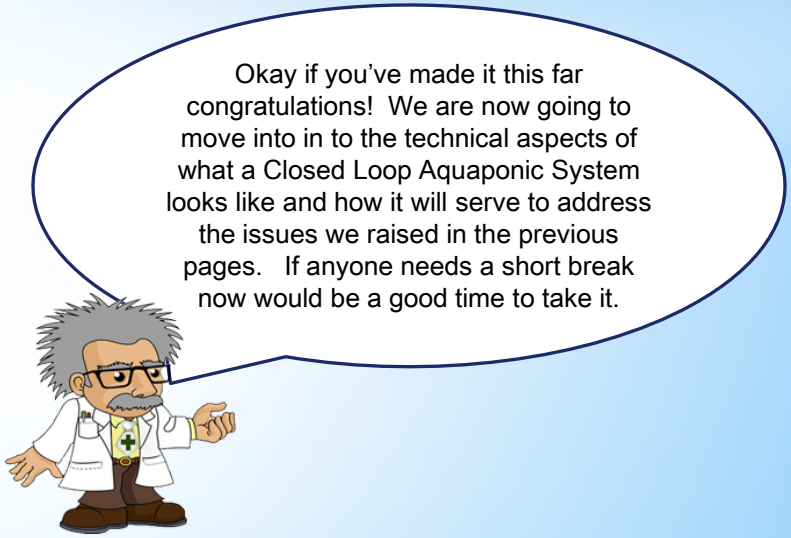
ww.151farmers.org

What's Our Recipe for Success?

Under any state regulated cannabis program farmers will have to be transparent in demonstrating that they are the "good actors" not the pirates that set up grows on public lands who often times would divert water and destroy downstream ecosystems.

Farmers will also need to demonstrate that they power conscience. That they are the "good actors" who are not stealing power because it is so expensive but instead are utilizing the latest energy saving equipment and controls. It is through these energy savings strategies that todays cannabis farmer will maintain or even increase quality and yields while lowering their cost per sq-ft (meter) values as it compares to traditional growing systems methods and equipment.

With the ever increasing cost of power and the fact that our aging utility grid is often overloaded during certain times of the year, cannabis farmers will play an increasingly important role in proving how responsible cultivation methods can help set the standards for other industries to follow.



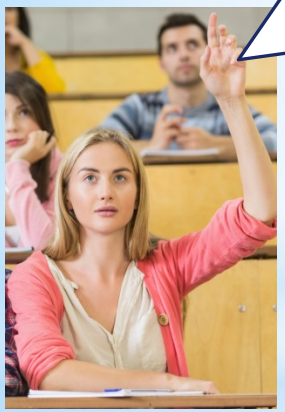
What's Our Recipe for Success? Soilless Closed Loop Aquaponic Systems for Better Water Management

In a Closed Loop Aquaponic System when it comes to **WATER CONSERVATION** the only times you're adding water is when it's necessary to replace water losses from evaporation or plant uptake. The recirculation of the water between the plants and the fish means the overall plant systems water requirements will be 5-10% of that when compared to a traditional soils garden where mature per plant daily water requirements can be 3-6 gallons of water per day.

When it comes to **WASTE WATER RUNOFF** in these systems there is little to no water runoff from the property to begin with. However should any water ever happen to escape the closed loop system, the important thing to remember is that when using these practices you can NEVER apply to the plants any fungicides, pesticides, aerocides or nutrients that would harm the fish or those who would consume our plant based products.

Closed Loop Aquaponic Systems for Better Water Management

I get that these are soilless systems and that the water usually recirculates between the fish and the plants but what happens if there is a breakdown and the system were to leak water out? What impact is that runoff going to have on the environment?



While every effort is taken to contain unplanned water losses so that precious water need not be replaced, the reality is that this is just fish water. That runoff is not going to harm the downstream ecology in any way.

When the environmental authorities do show up at your cannabis farm, you'll not only get to show them your happy, healthy fish but also your amazing, pesticide free, organically grown cannabis plants that derive the majority of their nutrients from fish waste.

For those who are tasked with enforcing environmental laws and to those who would consume our products, when cultivating cannabis in a Closed Loop Aquaponic System, the fish really are the 'Canary in the Coal Mine'.

We're Taking our Garden on the Road!
It's Why We Grow in Tractor Trailers!

This might not be for everyone but it works for us because we like to have the plants above the fish tanks whenever possible. This way we're only having to pump the water in one direction and gravity takes over when the water wants to return to the fish tank. The fish tank also fits under the trailer nicely so the fish are protected from the elements and predators.

In our demonstration garden of a Closed Loop Aquaponic System we took a 40' tractor trailer and slightly elevated one end of the trailer to allow the entire interior to be turned into a bed flood and drain table which the plants sit inside. As the water moves back and forth between the fish tank and the plants that water seeps into the holes drilled into the bottom of the buckets.

Save Your Crops!

If Community Development Plans change or there is an emergency such as a fire, relocating your Soilless Garden is easy in a tractor trailer!

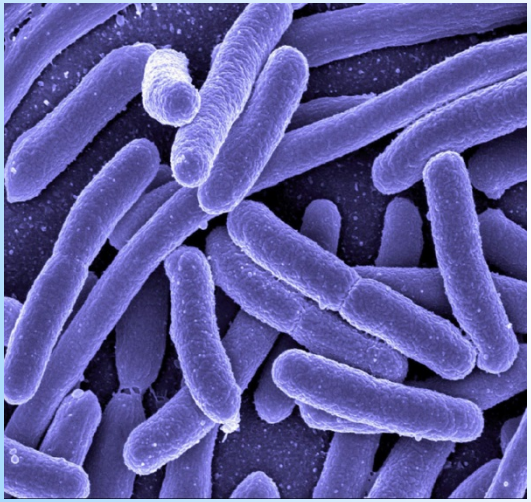
The action of flooding and draining the table with fish water allows the rising water to act like a diaphragm and pushes the air which is trapped at the bottom of the bucket up into the root zone for increased root development. Bigger Roots Mean Bigger Fruits!

The magic of what makes this system work so well lies in the 4" layer of black lava rock that is at the bottom of each of the plant buckets. That lava rock plays an important part in the overall systems balance as each 5 gallon bucket with a plant inside it is it's own little ecosystem!

What's Really Going on in the Bottoms of Those Buckets

If you flip one of the buckets over after a harvest you'll see that the lava rock has really been doing it's job! In our flood and drain tables we don't let the water run up to more that 4" in the table. That means all the water that the plant is getting is coming in from the bottom of the plant. The tap roots will seek that fish water out and get wrapped up in the lava rock. Having the lava rock at the bottom, as opposed to all soil, at the bottom of the bucket also allows water to seep into the buckets without any real resistance.

This is what the bottom of a 5 gallon bucket looks like with a Lava Rock base and a Coco Coir/Soil mix



Since the lava rock is porous it allows beneficial bacteria to live within it. That bacteria lives on consuming the nitrites available in the fish waste. Once consumed the bacteria expels nitrates which of course are the macro-nutrients necessary for happy, healthy and organically grown plants. The symbioses in these Closed Loop Aquaponic Systems is that the plants need the fish and the fish need the plants in order for both to survive For the fish it's all about the plants keeping those nitrite levels from being elevated and becoming toxic. For the plants it's all about getting enough fish poop to meet their nutrient levels.

Let's Talk Media.

Based on the way we primarily bottom feed our plants with a flood and drain of our tables, the lava rock at the bottom of the buckets has worked very well for us. When it comes to what we put on top of the lava rock to fill the rest of the 5 gal buckets over the years we've experimented with many different media. For some time what we were most comfortable with was a coco-coir/soil mix that allowed us to combine the benefits of a soils garden with that of an aquaponic/hydroponic system.

Over time most media gets compacted and aeration levels drop off deeper within the media. As such I've always been looking for a sustainable media that allowed increased aeration throughout the entire root zone but knew that using any media that would compress would be an obstacle to accomplishing that goal.

Having used spun rock media in the past I was very familiar with the benefits of Grodan and the Rockwool products. When it comes to maintaining water and nutrients in the root zone, spun rock type media is outstanding. Unfortunately the problem remained that this media comes in a highly compressed cube or slab form which does not lend itself to the full plant root aeration I was looking for in a bottom fed watering system such as ours. But I wasn't giving up on it. Perhaps this media could be modified to work in our system.

Let's Talk Spun Rock Media.

What I've always liked about Coconut Coir Fiber is that it was loosely packed into our buckets and at least with the Coir we used, it would expand when it got wet. The downside with Coir was that it didn't hold moisture very well so amended soil was added to assist in that. While it worked better than the straight Coir mix when the soil was added full root zone aeration was compromised. It was not the ideal media solution I was looking for.

With spun rock type of media we would want to lay it on top of the lava rock in a loose consistency similar to what you similar to what you see with the Coir. This would solve the root zone aeration issues and allow for the media to wick the water up into the root zone. In order to utilize this spun rock media like I wanted to I was going to modify the Grodan Rockwool cubes to suit our purposes. But before I was going to experiment with any modifications to these compressed products I needed to know what was binding their material and what effects that binding material might have on our fish.

Another important consideration we faced in determining the best media for our purposes is how sustainable is it? Could that media be reused crop after crop or would it have to be replaced after a certain number of harvests? These are all important considerations since the Systems and Procedures as well as the Materials and Equipment being recommended must perform on an economic and environmental level for these 151 Farms to realize their full potential.

Let's Talk Recycling Spun Rock Media.

Before we went about trying to modify the Grodan Rockwool media to see if it could be used for our purposes we discovered a number of unfortunate things about their products that dissuaded us from using them.

The first thing we encountered was that the binding agent they use in the compression process for their blocks and cubes is proprietary. In other words there is no telling what is being used for that purpose. Without that information I'm going to risk putting their products into a system where our fish are potentially going to be exposed to chemical agents being released in the water.

The next thing we discovered about this media is that it is not truly sustainable. Unless the used media is returned to the manufacturer, where it will then be torn down and reconstituted for resale, it is not being reused at all. With a lack of reprocessing centers and the time, money and labor necessary to reprocess this media it comes as no surprise that most growers don't recycle this media. That means it ends up in our landfills leaching nutrients into our aquifers. As a media I like spun rock but these issues are unacceptable.

Growpito Saves Spun Rock Media

Just about when I was ready to give up on spun rock as a media for our buckets I got a phone call from one of my clients in Michigan who also grows in aquaponics and he was telling me about a spun rock media that he had been using with some success. When I told him the reasons that I had pretty much given up on spun rock as a media for our systems he told me to go online and check out another brand of spun rock media manufactured by a company based out of Kansas City, MO. That company is Growpito.

Prior to that phone call I must admit had never heard of Growpito before but from what was being described to me and from what I was able to see online I got increasingly interested in what this product could do for us. Here's why; when you see Growpito for the time the first thing you'll notice is it's fluffy. It's not compressed in any way. At first glance it looked like my aeration issues were solved and since it's in a raw unprocessed form it does not contain any binders. It's chemically inert and completely safe for fish.

The next thing I discovered is that this is a perpetual product. You buy Growpito just one time. You will use it over and over again without replacing it. I've been told of gardens that having been running the same Growpito for over 10 years and 40 harvests. After every harvest you will simply pH the product before using it again. Growpito does not build up salts and as it ages it actually gets better with each harvest.

Growpito Saves Spun Rock Media

After that initial phone call and having done some research on the Growpito product I was introduced to the owners David and Rene. These folks are not only really nice people but they were a wealth of information as well. I was now feeling much better about how we might incorporate their products as spun rock media into our Closed Loop Aquaponic System. Having now used their products as a replacement to our Coir/Soil mix I am happy to report that when using Growpito less is definitely more. Here's what I can also report;

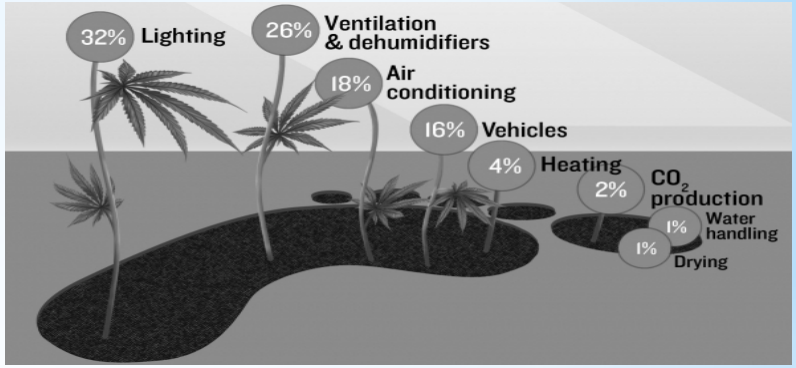
- When you first get Growpito you will need to charge it. This means you get it completely saturated in a tub of 5.5 pH water and really work the water into the media. Once saturated it's ready to be put into the buckets.
- Growpito has black sponge pellets in the mix which is where the beneficial bacteria lives once it has been added at initial planting.
- Growpito holds water exceptionally well. We went from summer watering of our outdoor plants once per day to once every 3-4 days. Our indoor cannabis plants get a top water of trace minerals from the dosing tank once every 5-6 days. Nutrient levels have been reduced from what was a 1.5EC to a 0.5 EC.
- The plants really are THRIVING with this media! There is no doubt in mind this not only due to the quality of the material but also due to the fluffy consistency of the media having improved the aeration levels in the buckets. Both the plants and I love it!

Root development in a 10" square pot

Happy Roots make Happy Fruits!

How will the Cost of Power and its Availability Impact the Commercial Cannabis Cultivator?

Cannabis is an energy intensive crop when grown indoors. According to a 2012 study conducted when medical cannabis was legal in California but recreational cannabis was still prohibited, indoor cannabis cultivation is responsible for about 3 percent of California's electricity consumption, which is equivalent to the electricity consumption of 1 million California homes.



On November 9, 2016, California voters approved Proposition 64, which legalized the recreational use of cannabis by adults. Given the electricity use attributable to cannabis cultivation as noted above, an increase in cannabis cultivation may be a significant driver of electricity consumption in California. Other states have experienced an increase in electricity demand after legalizing recreational cannabis. For example, half of load growth in Colorado is now attributable to new cannabis cultivation.

It is only within the last several years, in states where cannabis cultivation has been legal, that government agencies and utilities have had enough data generated to determine what regulations and standards need to be enacted to ensure that there is enough total power being generated to handle the expected load growth consistent with an expansion of indoor cannabis farming.

How will the Cost of Power and its Availability Impact the Commercial Cannabis Cultivator?

In an effort meet forecasted utility production levels, as well as clean energy goals, there will be an increase in programs that incentivize higher efficiency equipment, Automated Demand Response, off peak consumption, and renewable energy platforms such as onsite solar, wind and geothermal power generation.

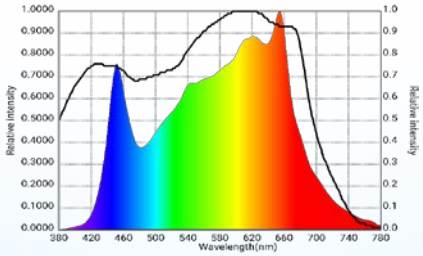
http://151controls.com

Customers will come to rely on smart hardware and Crop Integration Management (CIP) software that utilize Artificial Intelligence to help optimize crop production values on a repeatable basis. These CIP programs will also interface with the utilities to see "real time" utility rates, projected times to tier level increases based on current farm demand levels, grid loads and alarm conditions. Agronomists and CIP clients will also appreciate economic flexibility to monitor and adjust their new generation smart lighting and and HVAC equipment relative to crop conditions and utility costs.

With the new Smart or Time of Use Metering, utility grid managers will ensure compliance is being met with utility standards that will set limits on monthly kWhr allowances and a maximum allowable watts/sq-ft for that type of industry. Customers that exceed those thresholds will pay much higher rates for the power they use beyond those set limits.

Impact Series LED Grow Lights

Our plants are being grown under energy efficient Impact Series Grow Lights. From rooted clones the plants will acclimate in the trailer for 5 days on an 18/6 vegetative lighting schedule. The lights are set to run at first a Low and than a High Veg setting. At day 6 we will put them into a 12/12 flowering schedule by switching the light over to its Flower setting which adds in the red diodes for broad PAR spectrum flowering. Unlike traditional HID grow lights, the Impact Series LED Grow Lights are more energy efficient, produce less heat, require no relamps and can be controlled via software that take advantage of utility programs deigned to lower your energy bills by up to 40% such as with Automated Demand Response programs. To learn more about the Impact Series LED Grow Lights go to; http://www.inda-gro.com/…/impact-series-model-no-151-740-le…



Impact Series LED Grow Lights with Attachment UV-Pontoons

As you look at the Impact LED Grow Lights in these images you'll also see that we are also running our attachment UV-Pontoon. The purposes of adding the UV-Pontoon is that when plants are exposed to the appropriate levels of UV-A/B spectrums it is has been proven to show increases in THC levels as well as plant and flower size while reducing times to harvest. UV light is also very effective at eliminating molds and mildew. Say goodbye to Powdery Mildew! To learn more about the UV-Pontoon go to; http://inda-gro.com/IG/sites/default/files/pdf/UVPontoon.pdf

UV-A/B is Proven to Increase Flowering Sizes and THC Levels

Day 26 from rooted clones Day 21 in Flower
20 plants under a single Impact Series LED
Grow Light with Attachment UV-Pontoon

Road Kill Skunk with No UV-A/B
Single stacked trichomes and
globular shaped

Road Kill Skunk with UV-A/B
Triple stacked trichomes and
sharper cut glass edges

Day 26 from rooted clones Day 21 in Flower
20 plants under a single Impact Series LED
Grow Light with Attachment UV-Pontoon

Let’s Talk Crop Quality and Yields Impact Series LED Grow Lights with Attachment UV-Pontoons

As to the YIELDS; first let's keep in mind that these are not ideal environmental conditions for these plants. This is a converted uninsulated tractor trailer that we use to conduct public tours of the farm. While the doors are normally closed when there are people touring the gardens there are increased opportunities for disease and pesticide infestation to occur. We are also not using supplemental CO2 which under these intensities really should be elevated from atmospheric levels of 350 PPM to at least 1000 PPM.

Nonetheless even with these less than ideal conditions each of these plants will still yield between 2-3 ounces per plant. When factored at low end this yields 40 oz (1120 grams or 2.5 lbs) under a single 740 watt light. When adding the UV-Pontoon attachment it increases the load per light by 80 watts which puts us at 820 watts at the wall. However the average weight we pull is closer to 3 oz per plant, or 60 oz (1680 grams) per light. Considering the total wattage per light @ 820 watts this would put the yields between 1.4 - 2.4 grams/watt or 56 - 84 grams/sq-ft. of organically grown flower. As with all our previously posted grows the final flower results will be posted once they are harvested and cured. We want the plants to help you decide if this approach is right for you.

Environmentally Responsible Sterilization and Disinfecting

Can you imagine a chemical compound that was so powerful you could dilute it 200 times more than bleach and still kill germs, bacteria and viruses at the same rate? What if this product were so safe that the FDA allowed it to be used directly on food?

Imagine a product strong enough to kill E. coli, MRSA, staph and Listeria but would not have any effect on your skin? A product that is not only environmentally superior to bleach or peroxide based disinfectants but outperforms them as well. That technology exists right now and that product is 99.9% pure Chlorine Dioxide (ClO_2).

What has historically made the widespread use of ClO_2 difficult to bring to market has been the equipment necessary to create it is both expensive and once created the lifespan of the chemical requires it to be used within 2 weeks of its creation.

Selective Micro Technologies (SMT) has solved those problems with their proprietary delivery system that allows the end user to simply add one of their ClO_2 micro-generation packets to regular tap water and within hours the generator has created the ClO_2 necessary to begin the disinfecting processes.

Environmentally Responsible Sterilization and Disinfecting

SMT offers a pure CLO_2 solution is unique in that is not only extremely effective at removing dangerous pathogens, molds, microbes and viruses which threaten our health and our plant production capabilities but does so in an environmentally safe and responsible manner. Once applied to the surface the product it will sterilize and disinfect the effected surface area and then off-gas so that no measurable residual evidence of the ClO_2 can be detected.

SMT ClO_2 micro-generation packets are rated and registered by many local and state environmental agencies as a safe non-toxic product. When applied at the proper concentration levels they are 2.5X more effective at disinfecting surfaces than Bleach or Chlorine based products and do so at much lower concentration levels. Consider this disinfectant comparison whereby a test was performed to achieve a 5-log reduction (99.999% kill) of Staphylococcus aureus (Staph) in 60 seconds. This chart shows the concentrations necessary to complete this goal. Notice how powerful Selectrocide is at much lower concentrations.

Disinfectant	Concentration (PPM)
Bleach	1,000
"Stabilized" Chlorine Dioxide	1,200
Iodophur	440
Peroxide	68,000
Glutaraldehyde-Phenol	1,200
Acid Glutaraldehyde	2,200
Acidified Quat	1,200
Phenolic	380
Peracetic Acid	400
SELECTROCIDE®	5

Environmentally Responsible Sterilization and Disinfecting

Just Add Water and watch the SMT Micro-Generator start to work!

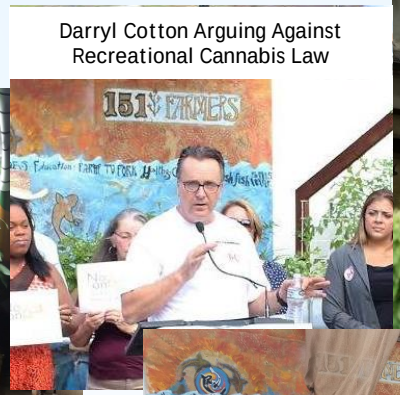
In Process Conversion of CLO2 Gas

Fully Converted CLO2 Solution.

Thank You All For Your Interest in Helping Us Make a Difference!

Eva and Elijah with our baby chicks

Security Chickens!

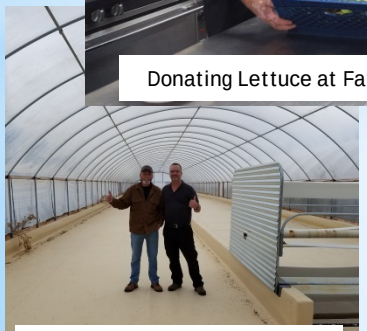


Darryl Cotton Arguing Against Recreational Cannabis Law

Coach Casey Inspecting the Casey Cut

Donating Lettuce at Father Joes

Unprocessed, Locally Grown Food and Meds



These Hoop Houses are used to grow algae and are perfect for an aquaponic flood and drain system for commercial cannabis cultivation.

Bee Farming!

Fish Grown Hops are AMAZING! Did you Know Hops are the Cousin Plant to Cannabis!

Fresh Tilapia Represents a Co-Culitvation Opportunity at our 151 Farms

Additional Resources

151 Farmers will always be on the leading edge when it comes to crops and technologies that can improve their farms and those communities they serve. Here are some additional resource links that you may also find of interest as you learn more about these farms, the technologies that are employed and the benefits of organically grown plants for our food and medicines.

1.0) Economies of Scale in Commercial Cannabis Cultivation
https://daggacouple.co.za/wp-content/uploads/2014/07/Economies_Scale_Production_Cannabis_Oct-22-20131.pdf

1.1) How Much Revenue can Taxes on Cannabis Generate?
https://lcb.wa.gov/publications/Marijuana/BOTEC%20reports/8b_Tax_revenue_under_different_scenarios-%20Final.pdf

1.2) The State of Legal Marijuana Markets 4th Edition
http://mjardin.com/wp-content/uploads/2016/05/Executive-Summary-State-of-Legal-Marijuana-Markets-4th-Edition-1.pdf

1.3) Energy Consumption for Indoor Commercial Cannabis Cultivation Facilities
http://www.inda-gro.com/IG/sites/default/files/pdf/cannabis-carbon-footprint.pdf

1.4) California Energy Commission Report on Tracking Renewable Energy Goals
http://www.energy.ca.gov/renewables/tracking_progress/documents/renewable.pdf

1.5) Illegal Cannabis Farmers Steal an Estimated $100M a Year in Power to Support Their Grow Operations
http://www.utilitydive.com/news/this-is-the-grid-this-is-the-grid-on-legalized-marijuana-any-questions/233103/

1.6) The High Cost of Growing Cannabis and the Lack of Sustainable Standards
http://www.confluence-denver.com/features/sustainable_cannabis_071614.aspx

1.7) How Time of Use Metering and Peak Demand Standards will Impact the Regulated Commercial Cannabis Cultivator
https://www.esource.com/TAS-F-18/CannabisCultivation

1.8) A New Way of "Seeing" Supplemental Greenhouse Lighting Systems
http://www.inda-gro.com/IG/sites/default/files/pdf/Rosebud-New-Way-Plant-Lighting.pdf

1.9) Breaking Ground with Inda-Gro
http://www.cashinbis.com/inda-gro-induction-grow-lighting/

Additional Resources

151 Farmers will always be on the leading edge when it comes to crops and technologies that can improve their farms and those communities they serve. Here are some additional resource links that you may also find of interest as you learn more about these farms, the technologies that are employed and the benefits of organically grown plants for our food and medicines.

2.0) Measuring Plant Light with Technical Comparisons
http://www.inda-gro.com/IG/sites/default/files/pdf/plant-lighting-resource/1-Measuring%20Plant%20Light%20with%20Technical%20Comparisons.pdf

2.1) Determining Optimum CO_2 Values Based on Ambient Indoor Lighting Conditions
http://www.inda-gro.com/IG/sites/default/files/pdf/Aquaponic%20Elements%20Tea%20Bag%20Flyer.pdf

2.2) Increasing Trace Elements for Fruiting and Flowering Plants in a Closed Loop Aquaponic System
http://www.inda-gro.com/IG/sites/default/files/pdf/Aquaponic%20Elements%20Tea%20Bag%20Flyer.pdf

2.3) Understanding Plant Lighting: The Difference between PPF and PPFD
http://www.inda-gro.com/IG/sites/default/files/pdf/plant-lighting-resource/2-Understanding%20PPF%20and%20PPFD.pdf

2.4) Understanding Daily Light Integrals as it relates to Determining How Much Light Your Plants Need Each Day
http://www.inda-gro.com/IG/sites/default/files/pdf/plant-lighting-resource/4-Plant%20Light%20Management%20-%20The%20Importance%20of%20DLI,%20uMoles%20and%20Moles.pdf

2.5) A Technical Introduction to Chlorine Dioxide as a Versatile, High Value Sterilant for the BioPharmaceutical Industry
https://www.selectivemicro.com/reference-materials/bioprocess_chlorine-dioxide.pdf

2.6) The Real Dangers of Household Cleaning Products
https://www.selectivemicro.com/insights-general-disinfection/146-the-real-dangers-of-household-cleaning-products

2.7) Chlorine Dioxide Slideshow
https://www.slideshare.net/SelectiveMicroTech/smt-surfacedecontamination?ref

2.8) Decontaminating Irrigation Line using Chlorine Dioxide
https://www.youtube.com/watch?v=zXNpU6itXcc

2.9) Purdue University Study Showing a List of Bacteria and Viruses that CLO_2 Killed in Independent Laboratory Testing
https://www.selectivemicro.com/images/product-pdfs/SC_12G_Tech_Bulletin.pdf

Additional Resources

151 Farmers will always be on the leading edge when it comes to crops and technologies that can improve their farms and those communities they serve. Here are some additional resource links that you may also find of interest as you learn more about these farms, the technologies that are employed and the benefits of organically grown plants for our food and medicines.

3.0) Hugh Hempel, Why I changed my mind about medicinal cannabis
https://www.youtube.com/watch?v=3N8QMeIsX2c

3.1) Dr. Raphael Mechoulam, Cannabinoid System in Neuroprotection
https://www.youtube.com/watch?v=c8EdQHWhAT8

3.2) Dr. Andrew Katelaris in Nimbin, The Medical Cannabis Workshop, Part 1
https://www.youtube.com/watch?v=Y0m2IjE9Vus

3.3) Dr. Andrew Katelaris in Nimbin, The Medical Cannabis Workshop, part 2
https://www.youtube.com/watch?v=zX3Dad9-7oI

3.4) Ketogenic Diet in Neuromuscular and Neurodegenerative Diseases
https://www.hindawi.com/journals/bmri/2014/474296/

3.5) Dr. Paul Alan Cox, Secrets to Alzheimer's, ALS and Parkinson's Disease
https://www.youtube.com/watch?v=7jWi6WQQ9wo

3.6) Dr. Mary T. Newport, Unconventional But Effective Therapy for Alzheimer's Treatment
https://www.youtube.com/watch?v=Dvh3JhsrQ0w

3.7) Dr.Ethan Russo Cannabinoid Formulations and Prescription – Natural Plant Cannabis Synergy
https://www.youtube.com/watch?v=aFgHhxE3JMc

3.8) Dr. Christopher Shade, Phytocannabinoids from Hemp: Delivery Systems, Usage, and Mechanism in Neuroinflammatory Disorders
https://www.youtube.com/watch?v=fCFSdmRuqQ4

3.9) Dr. Judy A. Mikovitzm, Can Cannabis Cure Autism? We don't know, but it's a question worth asking.
https://www.youtube.com/watch?v=NKkZEL6qfGk

3.10) Dr. Jeff Bradstreet, Understanding the Endocannabinoid System in Autism & Its Implications for Therapeutics
https://www.youtube.com/watch?v=s8CbIvd8p4Q

Additional Resources

151 Farmers will always be on the leading edge when it comes to crops and technologies that can improve their farms and those communities they serve. Here are some additional resource links that you may also find of interest as you learn more about these farms, the technologies that are employed and the benefits of organically grown plants for our food and medicines.

4.0) A Cannabis Manifesto
http://151farmers.org/2016/10/21/a-cannabis-manifesto/

4.1) Relief, Repair and Prevention. Why Cannabis is Not a Recreation Drug
http://151farmers.org/2016/10/29/why-cannabis-is-not-a-recreational-drug/

4.2) A Proposal for Transitioning Unlicensed Cannabis Farmers into a Licensed and Regulated System
http://151farmers.org/2017/10/24/why-all-cannabis-growers-are-going-to-want-the-new-cal-canna-seal/

4.3) Steep Hill Labs, 84% of all Cannabis Tests Positive for Pesticides
https://www.prnewswire.com/news-releases/steep-hill-launches-new-high-detection-cannabis-pesticide-testing-in-california-300347811.html

4.4) Gravel Miners win $100M Settlement
http://www.sacbee.com/news/local/article139972108.html

4.5) Joe Rogan, Excellent Interview on the Benefits of CBD Oil
https://www.youtube.com/watch?v=OBtKwCKL-Tc

4.6) Josh Stanley, Charlottes Web and the surprising story of medical marijuana and pediatric epilepsy
https://www.youtube.com/watch?v=ciQ4ErmhO7g

4.7) Advanced Short Path Distillation Techniques
http://summit-research.tech/fractional-distillation/advanced-short-path-distillation-techniques

4.8) UCSD Center for Medicinal Cannabis Research
http://www.cmcr.ucsd.edu/