### THE EMERALD CONFERENCE

Produced by MJBizScience



### Lean Cultivation:

Driving impact & profits at scale with plant-level data, AI and automation

Ian Seiferling, PhD CEO & Co-founder, Adaviv



#### What happened in 50 years? Lean Continuous Improvement



Poorly planned

- Job specialization
  - Tools on hand



#### Well planned and executed

- Coordination and communication
  - Technological improvements



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#### Lean Continuous Improvement has 3 core objectives:

Management system Technical system Mindsets and Behaviors

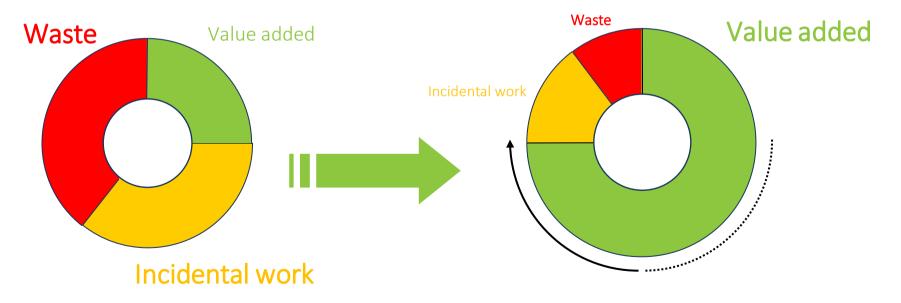
Drive value, operational efficiency + Build continuous improvement capability + Transform culture

What is Lean?





## We aim to continually focus on maximizing value-added tasks while optimizing waste and incidental time

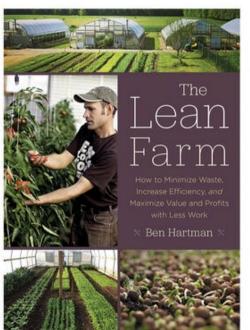


#### THE EMERALD From cars to plants Produced by MIBizScience

Lean is a tool for surviving and thriving in competitive, tough markets

Toyota - mass production efficiency in a low volume, high diversity environment





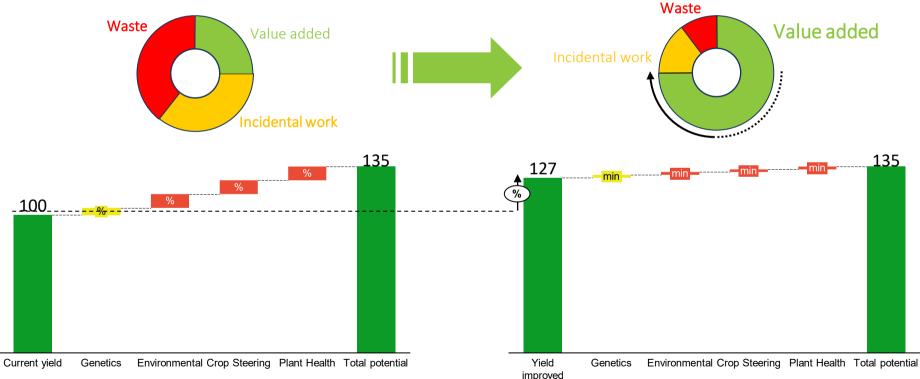
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### Lean Cultivation<sup>™</sup>

#### High variability represents the opportunity to minimize crop losses



Source: Team analysis

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### Lean Cultivation™

### **Continuous Improvement and \$Profitability**

- 1. Variability (g/ft<sup>2</sup>, quality) = Opportunity
- 2. Data = Understanding where opportunities lie
- 3. Al + Automation = Precision and Data at Scale
- 4. Simple data-driven insights across org.

# Smart tech beats yield of China's strawberry farmers

- AI Tech team 196% + strawberries than traditional growers.
- +75% ROI gain







### Lean Cultivation™ + Plant Empowerment

With the right technology and quality data, we can monitor plants and people and continuously improve

### Data & Process Documentation:

- Photosynthetic efficiency
- Canopy density, Flowers/plant
- Growth rates
- Infection rate-pest, sensitivity
- Leaf temperature
- Gas exchange ( $CO_2 O_2$ )

**KPIs:** 

- Dry flower/ft<sup>2</sup> (volume); and % of Flower-A (avg \$price)
- #issues, % infected plants
- THC %
- Task hours, quality, timeliness
- Cost/plant

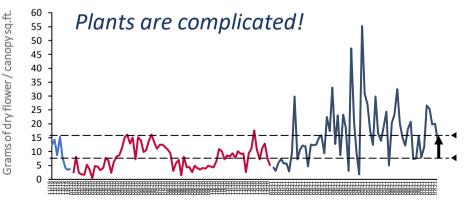


### Lean Cultivation<sup>™</sup>

#### The Consistency Challenge

### **\$1.3B lost annually to pathogens** (12% of average harvest)

### How do we scale cultivation excellence while hitting cost/gram goals?





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### Lean Cultivation™

# We start by quantifying opportunities – deep dive, analytics with Metrc, waste, genetics, inputs, labor data

Levers of yield and quality improvement opportunities (avg. vs top quintile g / sq.ft.)





### Lean Cultivation Case Study

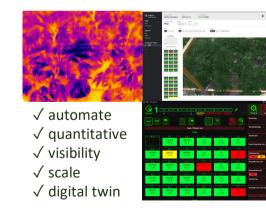
IPM Smart Workflow – Automate-enhance scouting, upskill team, improve SOPs, reduce reaction time & prevent losses







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#### $\checkmark$ identify waste

 $\checkmark$  rapid response, horizontal communication

 $\checkmark$  maximize time on value-add

 $\checkmark$  strain-level insights - continual improvement

 $\checkmark$  operational excellence – plant-quality



### Lean Cultivation Case Study

#### IPM Smart Workflow – Botrytis Case Study: How fast can we detect, react and minimize the impact?



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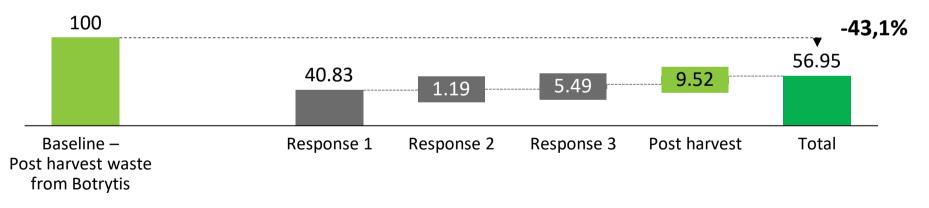


### Lean Cultivation Case Study

#### IPM Smart Workflow – Botrytis Case Study: 1 Issue - \$400K/yr gains

Early results: **10x** reduction in post-harvest losses from Botrytis, **45%** reduction in losses

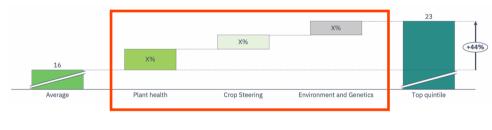
% of wet yield lost due to Botrytis, 2021





### Lean Cultivation

### Quality plant-level data and integration Uncovers key insights and trends





- Hotspots/microclimates monitor, adapt (fans), facility upgrades
- Susceptible Strains (PM, HpLVd) better planning, selection, phenohunting
- **Treatments** targeted, timely, min. over-spray
- Issues (РМ) spread FAST React, communicate rapidly



### Lean Cultivation & Al

Al is powerful but does not create value on its own or with flip of a switch!

- only 55% of institutions believe automation program has been successful.
- 50% say harder to implement than expected.



#### "Garbage in, garbage out"



Your analysis is as good as your data.

"Yes sir, you can absolutely trust those numbers"

### Lean Cultivation & Al

#### Faster AI and Data-driven adaption creates large gains for front-runners

- **Distinctive insights** (uncover factors to predict performance)
- Processing time reduced

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THE EMERALD

- Increased flexibility and scalability
- Improved quality towards 100% QC from greater traceability
- Increased savings and productivity (20%+ labor)

Impact of Fourth Industrial Revolution use cases on select KPIs in lighthouse factories

	KPI improvements	Impact range observed
	Factory output increase	• • • •
	Productivity increase	••• • • • • <u>5-160%</u>
D Productivity	OEE increase	****
	Quality cost reduction	<u>→→→→</u> -→ → → → → → → → → → → → → → → → →
	Product cost reduction	5-40% ★★★ + - ★ - ★
	Energy efficiency	•••• <u>2-50%</u> _ •
	Inventory reduction	+ + + + + + + − +
of Agility	Lead time reduction	← 10-90% →
	Time to market reduction	<u>→</u> <u>-30-90%</u> →
	Change-over shortening	+ + <sup>30-70%</sup> +
遵 Customization	Lot size reduction	• <b>50-90%</b> •

Source: World Economic Forum and McKinsey & Company lighthouse site analysis

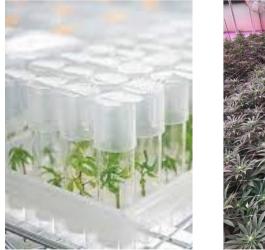


### Lean Cultivation™ + Plant Empowerment

#### Man Vs. Machine Man + Machine

Together we can formulate Profitable growing practices that use data-driven approaches to ensure plant balances are optimized.

- 1. Identify areas of waste.
- 2. Make a cultivation plan.
- 3. Implement it consistently.
- 4. Monitor with data.
- 5. Analyze, improve, scale.





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### Lean Cultivation : Drive impact & profits at scale with plant-level data, AI and automation

### Cultivators have to navigate fragmented market:

- Understand the so-what of pitches how moves to actions and continuous gains?
- Does what claims reliable, accurate, scalable, easy, one-time or repeatable, cannabis-specific?
- What's real value of the data, KPIs and metrics if not tied to your operational improvement then why need it? Ready to adopt?





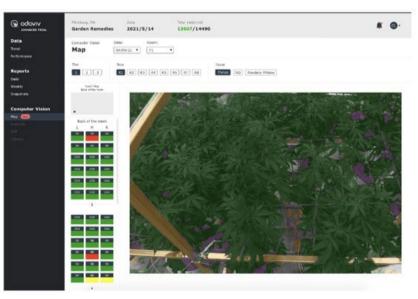
### Appendix / Backup

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### Lean Cultivation

#### IPM Smart Workflow – PM and HpLVd Case Study Sensing Technologies, Plant-level Data and Continual Improvement on SOPs can transform an operation, boost yields while saving on costs

Issues detected and tracked:	
Viral anomalies (hplvd)	
Fusarium	
Phytium	
Botrytis	
Leaf/flower Burns	
Chlorosis	
Tray leaks	
Mechanical damage	



#### **THE EMERALD** CONFERENCE Produced by MJBizScience

### Adaviv



#### Ian Seiferling

CEO & Co-founder PhD Env. Science & Biology





Julian Ortiz

COO & Co-founder MBA 19, M.A. Economics



McKinsey & Company



#### Moe Vazifeh

CTO & Co-founder PhD Physics







### Alejandra Abril

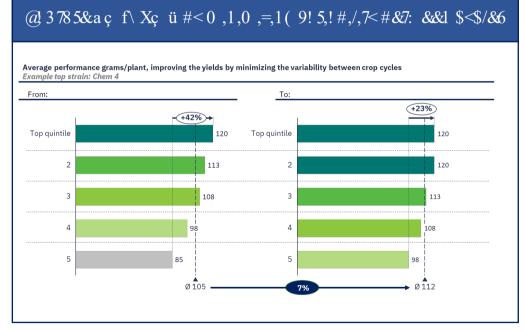
Plant Scientist PhD Plant Mol. & Cellular Biology

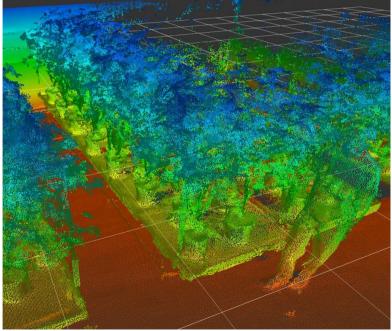




### Lean Cultivation<sup>™</sup>

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### We want to hear from you!

# Scan the QR code below to provide your feedback on the presentation.

