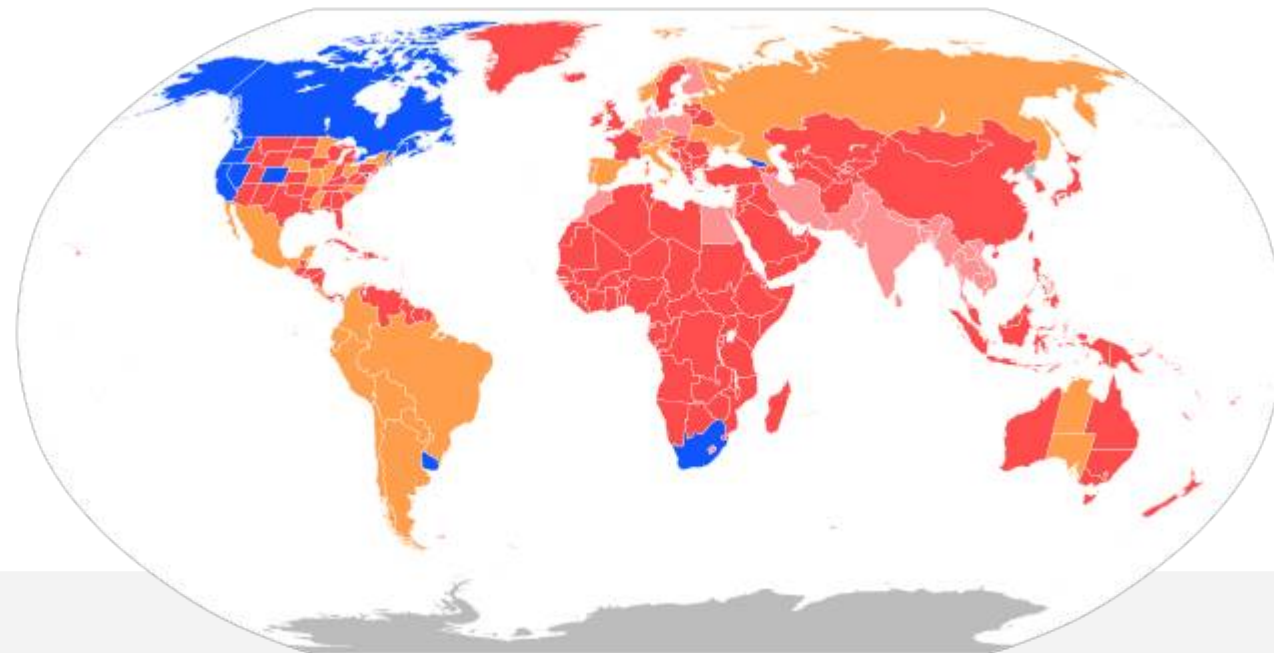


BEST PRACTICES (AND PITFALLS) OF CANNABIS CULTIVATION

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CANNABIS REGULATORY FRAMEWORKS

Seek to measure and control cannabis quality without addressing systemic issues related to root causes of variation in Standard Operating Procedures (SOP's).



By Jamesy0627144 - Created from BlankMap-World6-Subdivisions.svg and BlankMap-World6.svg,
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INTRO:

In order for Latin America to maximize its value for cannabis raw material and final product, strict control over cannabis root causes of variation are required.

WHAT IS THE PRODUCT MARKET?

✓ Medical?:



Variation = recall

✓ Recreational?:



Variation = celebration



CULTIVATION

OUTDOORS

- Sun intensity and duration
- Soil nutrients
- Soil moisture
- Air humidity
- Air temperature
- CO2 Level
- Biological / pests contaminants
- Herbicide / pesticide
- Other

INDOORS

- Controlled Light
- Controlled nutrients
- Controlled moisture
- Controlled air humidity
- Controlled air temp
- Controlled CO2 level
- Controlled biological / pests
- Controlled herbicide / pesticide
- Other

PROCESSING

DRIED FLOWER

- Harvest handling process
- Air Dry / Freeze Dry technology
- Dry / Cure process
- Duration
- Air humidity
- Air temperature
- Air quality
- Biological / pests control
- Product stability
- Other

OIL CONCENTRATE

- Harvest handling process
- Extraction technology
- Extraction process
- Solvent used
- Temperature / Pressure
- Wax Management
- Air quality
- Biological / pests control
- Product stability
- Other

PACK AND LABEL

MANUAL

- Packing process
- Duration
- Air / Biological / pests control
- Calibration of weight / quality
- Quality of Additives
- Product stability
- Packaging sterility
- Packer training / hygiene
- Other

AUTOMATED

- Packing process
- Equipment maintenance
- Equipment complexity
- Equipment operating perimeters
- Air / Biological / pests control
- Product stability
- Packaging sterility
- Packer training / hygiene
- Other

Lab Analysis – 17025 (2017)

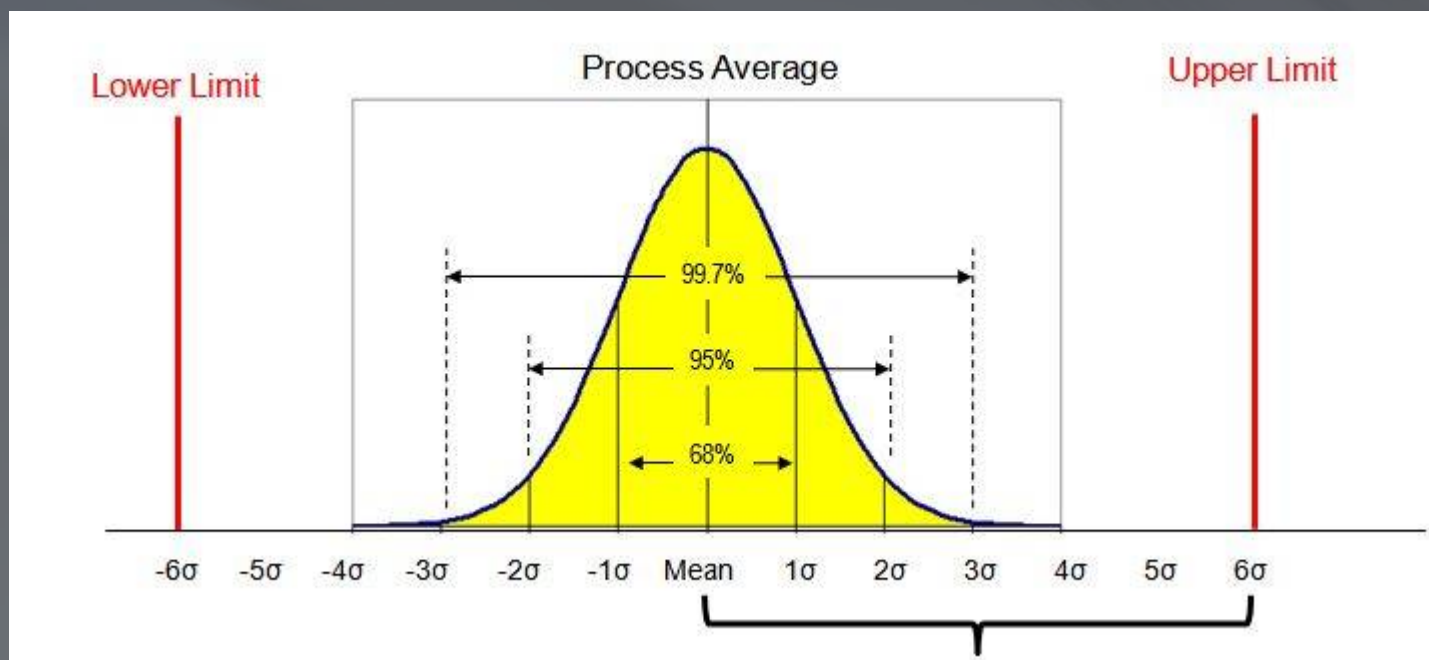
NON-ACCREDITED

- Apples to oranges lab methods
- Accuracy / precision
- Record keeping
- Non-conformance handling
- Calibration Handling
- Cross Contamination
- One over one review
- Lab shopping for results
- Other

ANALYSIS NOT CERTIFIED

- Cannabis is not wheat/oats/barley
- Lab equipment selection
- Method validation
- Method detection limits (MDL's)
- Equipment operating perimeters
- Operator experience
- Calibration standard selection
- Report verification
- Whistle blower procedure
- Other

TO MANY ROOT CAUSES TO COUNT = POOR QUALITY



6 Σ = 6 defects per million products

5 Σ = 230 defects per million products

4 Σ = 6,210 defects per million products

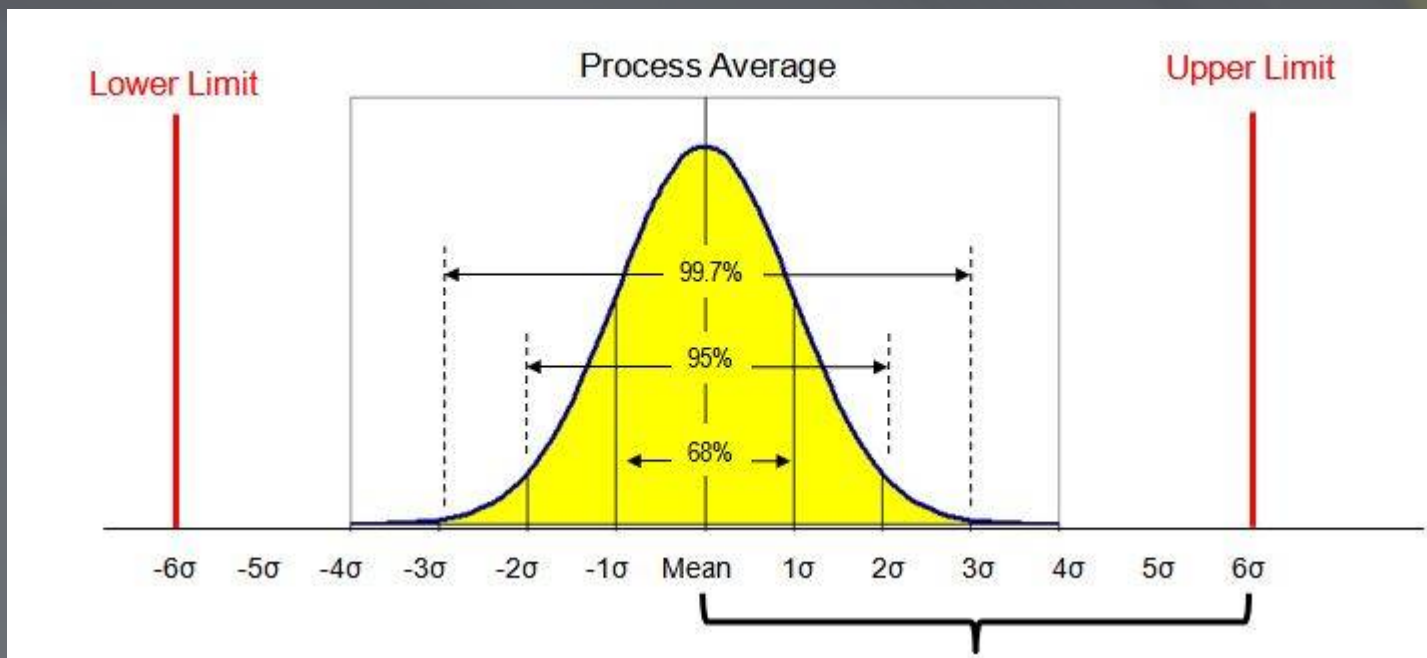
3 Σ = 66,300 defects per million products

2 Σ = 308,000 defects per million products

1 Σ = 690,000 defects per million products

You cannot manage what you do not measure!

AVERAGE CANNABIS $\Sigma = 2.2 = 242,000$ DEFECTS PER MILLION



6 $\Sigma = 6$ defects per million products

5 $\Sigma = 230$ defects per million products

4 $\Sigma = 6,210$ defects per million products

3 $\Sigma = 66,300$ defects per million products

2 $\Sigma = 308,000$ defects per million products

1 $\Sigma = 690,000$ defects per million products

And what we are measuring is only part of the story!

FIRST PASS vs. SECOND PASS YIELDS

FIRST PASS

- ✓ Loss of crop not recorded
- ✓ Sample used not representative
- ✓ Absence of method validation study
- ✓ Lack of tracking diversion

SECOND PASS

- ✓ Solution is dilution
- ✓ Use of sterilization tech fails to adequately record product variation
- ✓ Sample frequency
- ✓ Sample homogeneity

When taken together in addition to existing $\Sigma = ??? >2.1!$

ACCEPTABLE RANGE OF VARIATION?

MEDICAL GRADE

$$\Sigma = 4-5$$

CONSUMER GRADE

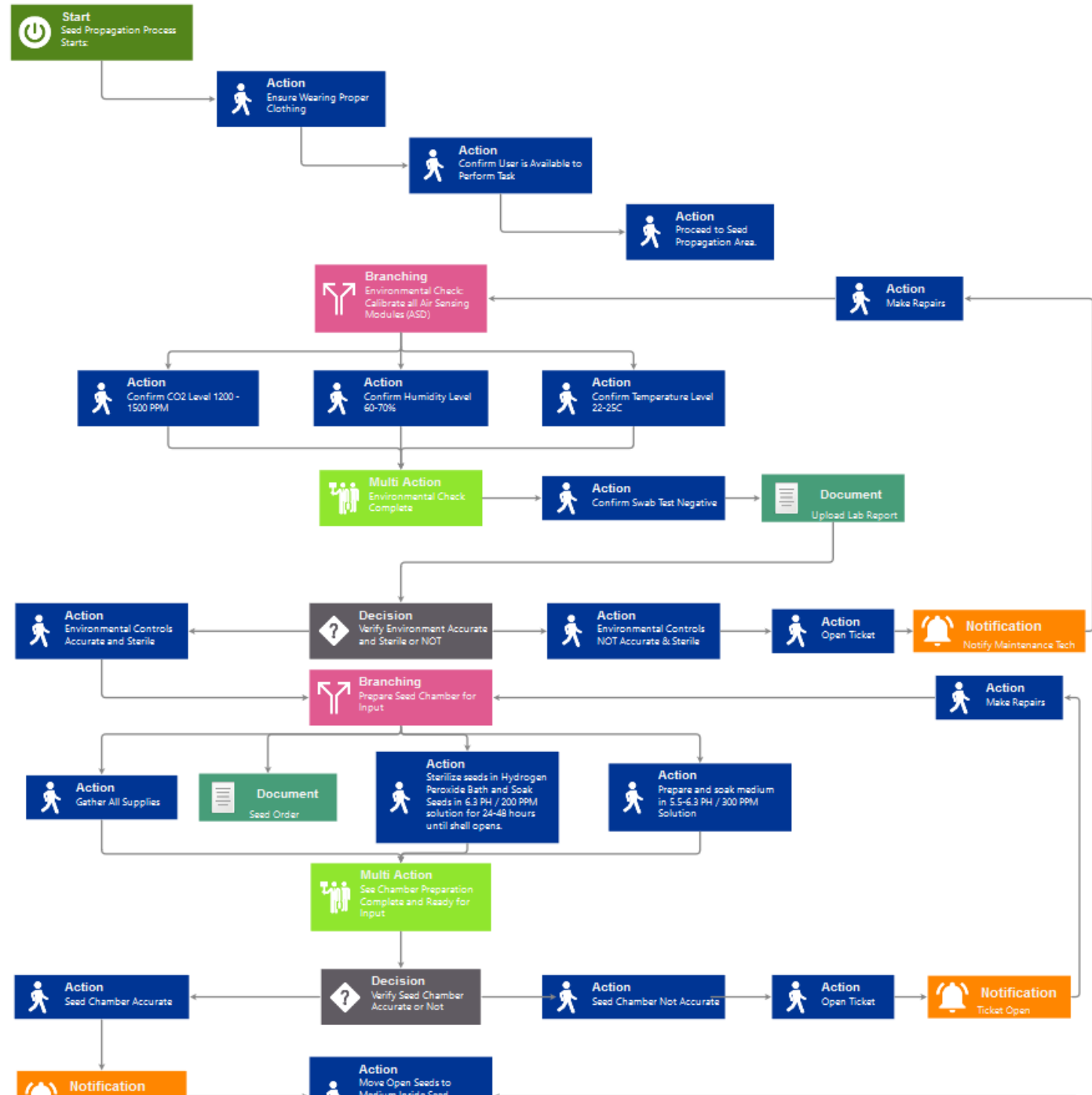
$$\Sigma = 2-3$$

A BETTER WAY TO MEASURE /
MANAGE IS POSSIBLE

Sprout AI + ETCH
Aeroponics biotrace



#1B: Propagation From Seed REV Completed



SOP'S NECESSARY FOR MANAGING CANNABIS

- ✓ With too many potential root causes of variation requires a REPSS approach:
 - ✓ Repeatability (able to flex to new conditions)
 - ✓ Economic (both for Regulator and LP)
 - ✓ Practical (simple to implement and comply)
 - ✓ Safe and Secure (manages diversion and quality)
- ✓ SOPs must be part of the actual ERP+C itself:
 - ✓ only way to accurately record variation
 - ✓ best way to manage correcting action
 - ✓ only reliable way to manage version control!

REMEMBER TO WEAR SUNSCREEN!

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