MISSISSIPPI STATE UNIVERSITY
DIVISION OF AGRICULTURE, FORESTRY, AND VETERINARY MEDICINE

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CleanSEED PROJECT

MISSISSIPPI STATE UNIVERSITY | USDA National Institute of Food and Agriculture, U.S. Department of Agriculture

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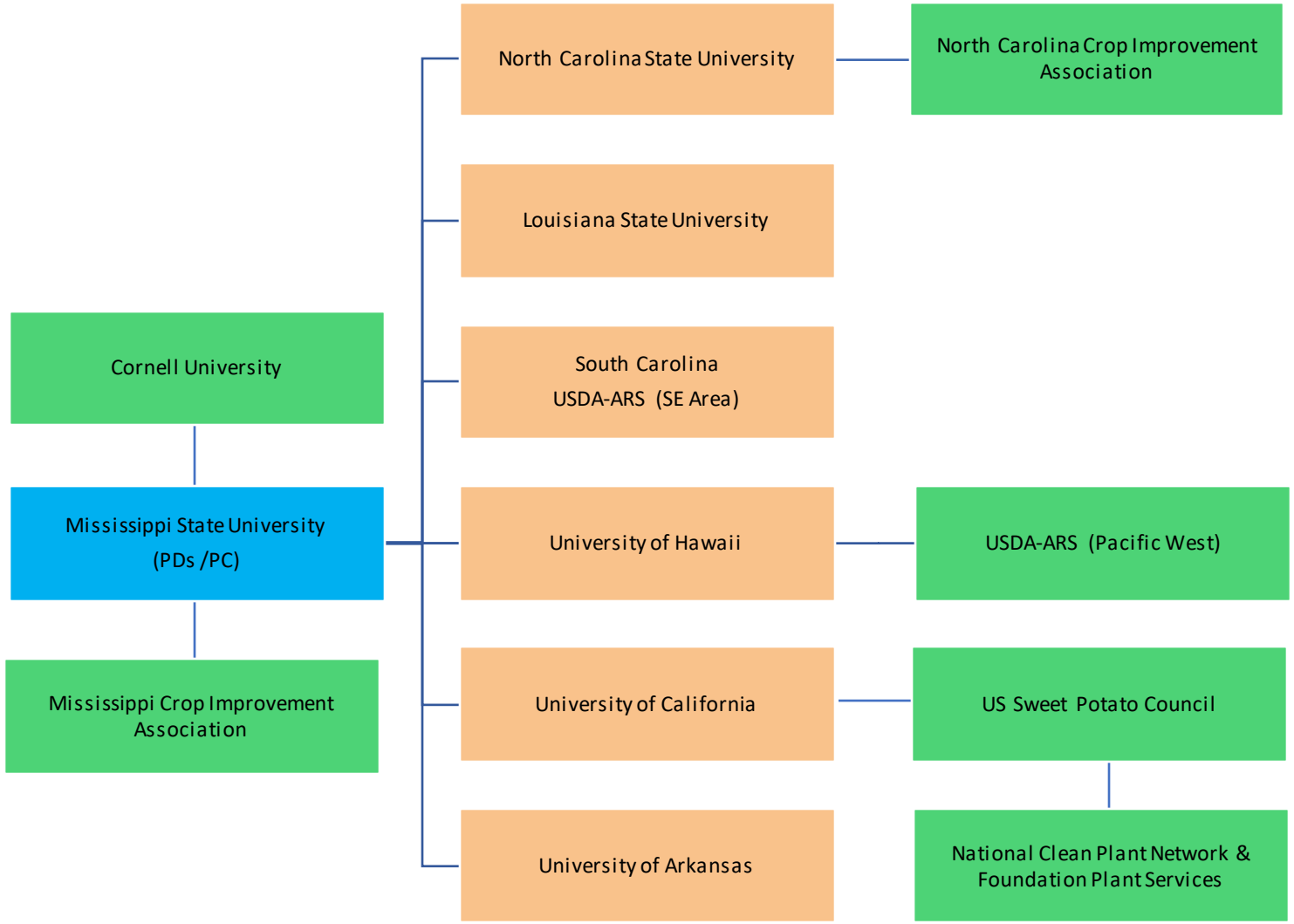
UNIVERSITY OF HAWAI'I MĀLAMALAMA 1907 UA MAU KE EA O KA 'ĀINA I KA PONO

NC STATE

A project to ensure the sustainability of U.S. sweetpotato seed programs.

The findings and conclusions in this CleanSEED Project update have not been formally disseminated by the U. S. Department of Agriculture and Should not be construed to represent any agency determination or policy.

Organizational Chart



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Specialty Crop Research Initiative

- Objective 1. Unify terminology and develop quality control standards for CFS production systems
- Objective 2. Develop BPs for efficient CFS production in both laboratory and greenhouse
- Objective 3. Develop new technological innovations to determine the presence of viruses, pest, diseases and evaluate BPs to minimize their source and reinfection rate.
- Objective 4. Conduct economic analysis and launch CleanSEED marketing campaign to increase awareness and adoption of CFS.

Objective 2. Develop BPs for efficient CFS production in both laboratory and greenhouse

- 2.1.1 Epigenetic effects of micropropagation techniques
- 2.1.2 Identify somatic mutations within ‘Beauregard’ maintained by NCPN-SP Centers and USDA, ARS sweetpotato repository.

Can intensive propagation introduce genetic changes which can result in distinct new varieties (orange flesh to white flesh, or off types). Understanding this variability will help identify control strategies to maintain valuable varieties “True to Type”.

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- 2.2.1. Maximize the number of clean plants (AR, MS, NC)
  - 3 varieties, 3 fertilizer rates
  - Lighting: HPS vs LED
  - Grow for 8 weeks in 72 cell trays: 2 trays per treatment
  - Data collected: vine nodes, lengths, fresh/dry weight, # of plants in tray
- 2.2.2. Conditions to harden plants for in-field survival (AR, MS, NC)
  - 3 varieties, 2 temperatures
  - 2 watering treatments, 2 storage treatments
  - Grow 6 weeks in trays
  - Data collected 2 WAT: Stand, vine node and length
  - Yield at harvest
- 2.2.3. Strategies to monitor virus levels for quality control of clean plant materials (AR, MS, NC)
  - Collect plant tissue from CFS grower greenhouses
  - Sampled monthly once plant material is introduced to greenhouses until transplanting in field

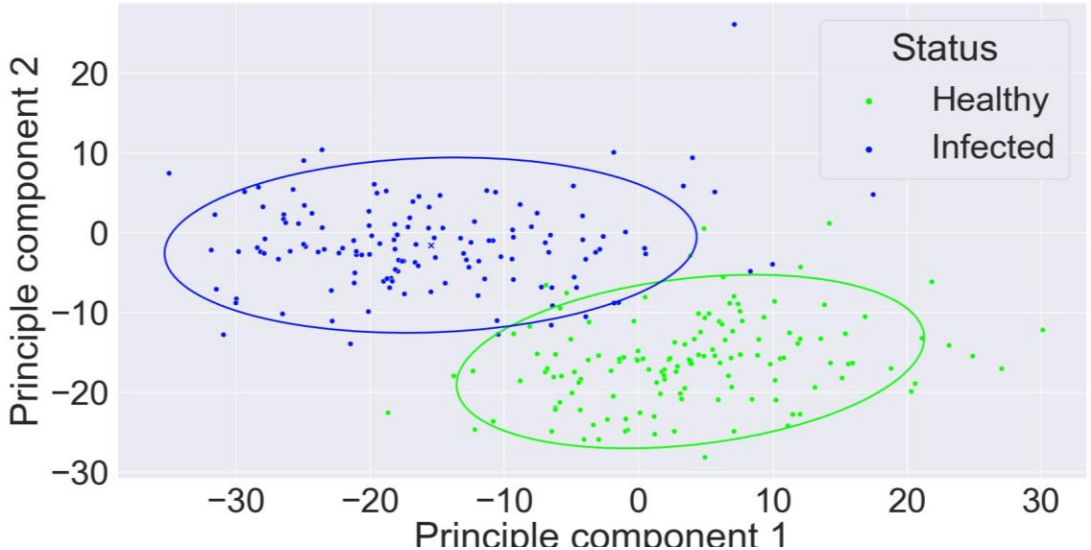
A "Quality Control" measure to determine when to test and how often (time and frequency)

- 2.2.4. Greenhouse: Strategies to monitor and manage insects (NC, MS, LA, HI, AR)

  - We monitored 6 seed production greenhouses (1 AR, 1 LA, 1 HI, 2 MS, 1 NC)
  - 8 wks of monitoring in NC, 4 wks in other locations
  - 20 yellow sticky cards per house per week
  - All cards sent to NC for insect ID
  - Variation in pest complexes among locations
  - Dominant pests were western flower thrips (NC), aphids (AR), and fungus gnats (MS)
  - We plan to repeat this study in 2024 and evaluate insecticide spray methods and products (NC)

Objective 3. Develop new technological innovations to identify the presence of viruses/pest/diseases on-site and develop BPs that minimize source and reinfection rate.

- 3.1.1 Develop spectral signatures to use in identifying symptomless infected plants in the field (MS, SC)
  - *Hyper spectral imaging to identify spectral signatures of viruses in the greenhouse*
  - *Signatures can be used to identify infected plants in large-scale field production*



Big Island in Hawaii
(March 14, 2023)

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- 3.2.1 Determine unrecognized pathogens that should be included in sweetpotato clean seed testing (AR, CA, HI, LA, MS NC, SC)
- 3.2.2 Develop sensitive real-time RT-PCR methods for viruses and nematodes (Collaborative effort with CIP, USDA-APHIS, UC Davis)
- 3.2.3 Develop a sensitive, specific test for rapid field-based detection of sweetpotato viruses (HI, LA, MS, NC, SC)

- 3.3.1 Weed survey and management to reduce sweetpotato virus inoculum (AR, CA, HI, LA, MS)

Identify weed species that can be a host and source of virus inoculum in areas of sweetpotato production (also field boarder, ditches, and adjacent fields). Then evaluate herbicides for control and screen for sweetpotato varietal tolerance.

- 3.4.1 Reducing reinfection with virus vector management (CA, LA, MS, NC)
  - *Virus and insect (target aphids) distributions in certified fields at grower locations. Insect type and population (sticky paper and pan traps)*
  - *Barrier / border crop to minimize reinfection rate of certified plants-clean seed*

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- 3.4.1 Reducing reinfection with virus vector management (LA, MS)
  - *JMS Stylet Oil alters aphid feeding behavior and in doing so, reduces aphid transmission of SPFM virus*

Sweet potato feathery mottle virus transmission from *Ipomoea hederacea* to *I. nil* 'Scarlet O'Hara' by *Aphis gossypii* following 30 sec acquisition probes

Treatment	Transmission (%)
Control (no stylet oil)	54.4 ± 9.1 a
Test plant w/2% stylet oil	2.2 ± 1.1 b
Inoculum plant w/2% stylet oil	7.8 ± 4.8 b
Both test plant and inoculum plant w/2% stylet oil	0.0 + 0.0 c

Note: n = 90 for each acquisition source (3 independent experiments with 30 plants each).

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Image of generation study at grower location on June 28, 2023.

Objective 4. Conduct economic analysis and launch CleanSEED marketing campaign to increase awareness and adoption of CFS

- 4.1.1 On-farm demonstrations and small-plot research studies of CFS performance and economics (AR, CA, HI, LA, MS)
- 4.1.2 Economic cost benefit analysis for using clean seed

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- 4.2.1 Field days, producer workshops, and stakeholder engagement
- 4.2.2 Project integration with USSC website
- 4.2.3 Present progress, economics findings, and recommendations to stakeholders through diverse platforms
- 4.2.4 Conduct surveys to gauge changes in perception and use of CFS
- 4.2.5 Publish Journey of CleanSEED video
- 4.2.6 Distribution of CleanSEED production manual

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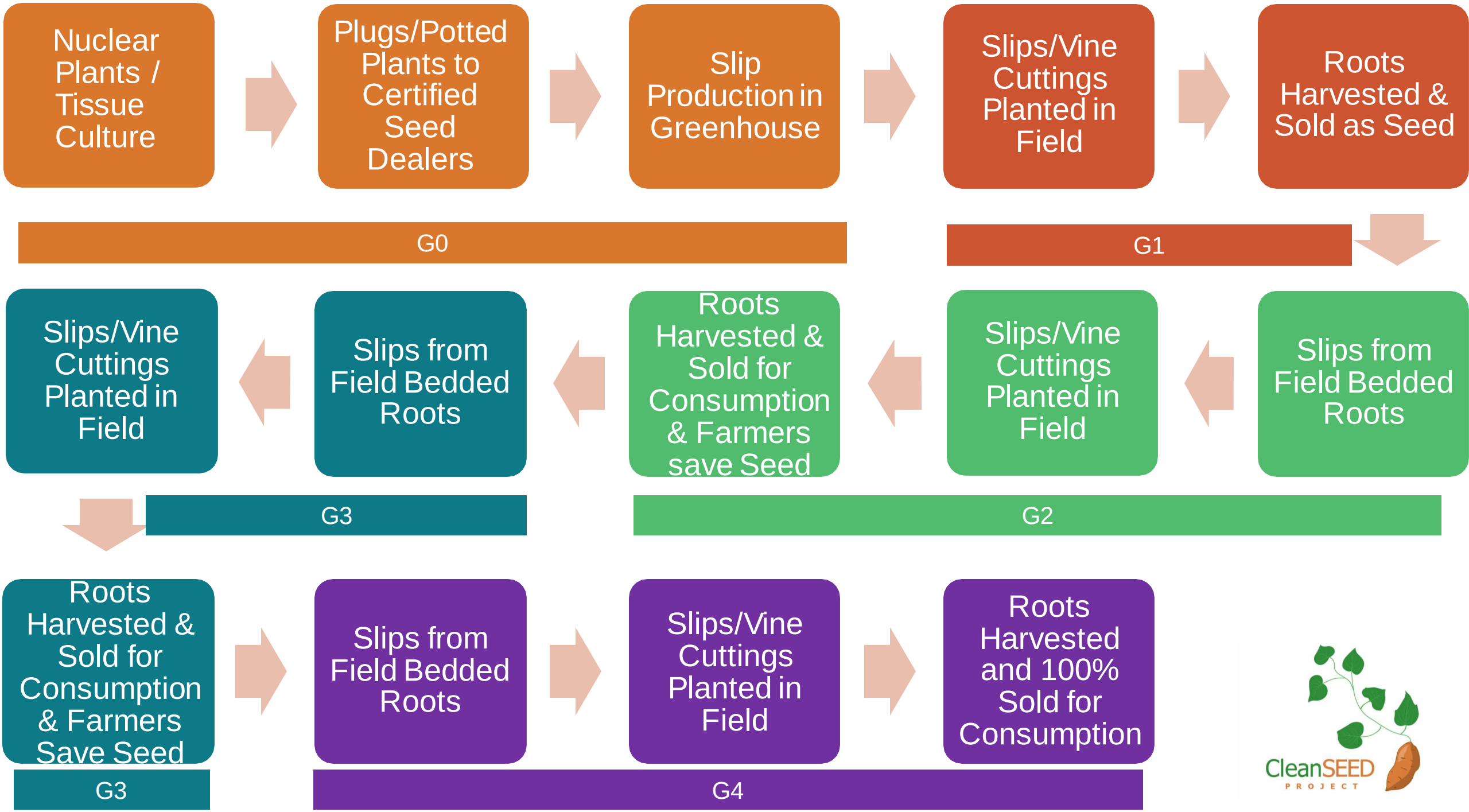
What is CleanSEED?

CleanSEED refers to foundation seed roots or plants produced from virus-tested plant material in a laboratory and sourced from a National Clean Plant Center (G0 plant material).

CleanSEED has been tested and found to be free of the following:

- Sweetpotato feathery mottle virus (SPFMV)
- Sweetpotato Virus C (SPVC)
- Sweetpotato Virus G (SPVG)
- Sweetpotato Virus 2 (SPV2)
- Sweetpotato Leaf Curl Virus (SPLCV)
- Sweetpotato Chlorotic Leaf


Nuclear Plants / Tissue Culture
Plugs/Potted Plants to Certified Seed Dealers
Slip Production in Greenhouse
Slips/Vine Cuttings Planted in Field
Roots Harvested & Sold as Seed
G0
G1
Slips/Vine Cuttings Planted in Field
Slips from Field Bedded Roots
Roots Harvested & Sold for Consumption & Farmers save Seed
Slips/Vine Cuttings Planted in Field
Slips from Field Bedded Roots
G3
G2
Roots Harvested & Sold for Consumption & Farmers Save Seed
Slips from Field Bedded Roots
Slips/Vine Cuttings Planted in Field
Roots Harvested and 100% Sold for Consumption
G3
G4
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Please take a minute for the survey!

Acknowledgements

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