



# Risk Based Sampling: Foundations for Precision Safeguarding

Marla J. Cazier-Mosley  
National Operations Manager  
USDA-APHIS-PPQ, Field Operations

NAPPO 2019  
Tucson, AZ

# Outline

- Current sampling at Plant Inspection Stations
- Building the foundation
- Review of challenges
- Making adjustments
- Next steps



# RBS calculator version 2 (V2)

**PPQ Plant Inspection Station Sample Size Calculator**

Plant Inspection Stn:

Origin:

PM Type:

Sample Unit:

Total plant quantity:

Remarks:

**Calculate**

# RBS calculator (V2)

Official rollout: **Sept. 30, 2018**



- Sampling adjusted based on risk ratings
- Risk ratings based on propagative material type & origin combinations (PM – Origin)
- Ratings derived from inspection data collected from PIS
- Four rating categories; plus tissue culture
- Operationally manageable & feasible

# Using V2 for sampling

- Determine PM type(s) in consignment
- Determine if PM type is singled, mingled or commingled
- Determine the Sample Unit(s) for best distribution
- Determine Origin
- Enter data into V2
- Calculate & identify the sample units to inspect
- Inspect 100%



# Using V2 for sampling

From wk	27	To Week	27
From Date	01/07/2018		01/07/2018
Airport	EWR		
AWB	114-97811630		

Total Boxes	15
Total URC	40,600
Total \$	4,341.24

Invoice	Value
3528529	108.00
3528530	557.84
3528531	487.08
3528532	48.04
3528534	303.16
3528535	291.40
3528536	95.00
3528537	379.00
3528538	370.24
3528539	1,676.99
3528540	24.50
<b>Total</b>	<b>4,341.24</b>

Description	Qty
ARTEMISIA DRACUNCULUS FRENCH TARRAGON	3,000
EUPHORBIA AMYGDALOIDES PURPUREA	2,000
LAVANDULA PINNATA	3,300
LAVANDULA ST. LIBELLE TM PURPLE	100
MENTHA A8HB1	100
MENTHA JESSICA'S SWEET PEAR	100
PENSTEMON BARBATUS RIDING HOOD PURPLE	1,000
ROSMARINUS OFF. FOX TAIL	3,200
ROSMARINUS OFF SPEEDY	100
ROSMARINUS OFFICINALIS ARP	3,800
ROSMARINUS OFFICINALIS BARBECUE	3,100
ROSMARINUS OFFICINALIS TUSCAN	3,500
ROSMARINUS OFFICINALIS UPRIGHT	9,900
SALVIA OFF. BERGGARTEN VARIEGATE	100
SANTOLINA CHAMAECYPARISSUS	500
THYMUS CITRIODORUS ARCHERS	400
THYMUS CITRIODORUS LEMONAD CASCATA	200
THYMUS PRAECOX CREEPING RED	5,600
THYMUS ROSE SCENT	200
THYMUS SPP. RUBY GLOW	200
THYMUS SPP. VARIEGATED COUNTRY	200
<b>Total</b>	<b>40,600</b>

## PPQ Plant Inspection Station S

Plant Inspection Stn: Linden PIS

Origin: Israel

PM Type: Unrooted Cutting

Sample Unit: 15

Total plant quantity: 40600

Remarks:

Main Menu frmPull\_Nbr

### Random Pull Numbers from Shipment

08/17/18 9:18am

Sample Units to Pull: 15 units of 'Unrooted Cutting' from Israel

Calculate

Required number for inspection: 8/17/2

Parameters:

- Sample Unit: enter the total number of boxes, b
- Total plant quantity: enter the total number of p
- Origin: select from the drop-down list
- PM type: select from the drop-down list

100 % inspection

# Risk Based Sampling:

*Statistically sound sampling which enables inspection activities to be directed according to level of risk.*

***Purpose:*** *To optimize the use of resources for inspection and potentially create incentives for lower risk importations.-*



# How did we get here?



# Building the foundation

- 2012: Initial discussions on RBS program development
- 2014: PPQ changes from percentage sampling to hypergeometric sampling at Plant Inspection Stations
  - *Standard rate of sampling*
  - *Statistically robust*
  - *Established a baseline of data*
  - *Increased consistency with the level of detection*
  - *Improvement over the old method*

# Building the foundation

- 2015: PPQ completes one year of conducting 100 percent of its PIS inspections using hypergeometric sampling
- 2017: PPQ analyzes data from hypergeometric sampling to determine pest action rates associated with propagative
- 2018: PPQ implements adjustments based on assigned ratings

# Building the Foundation: sampling design

## Percentage sampling

*(Previous method)*

- Fixed sample size
- Risk constant only when lot size is constant
- Not technically defensible

## Baseline sampling

*(Initial RBS method)*

- Sample size varies with lot size
- Fixed risk
- Technically defensible & transparent

## Risk-based sampling

*(Adjusted RBS)*

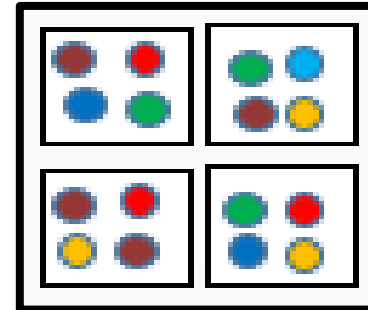
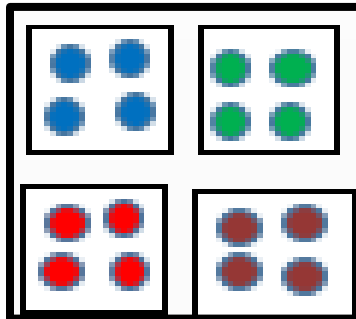
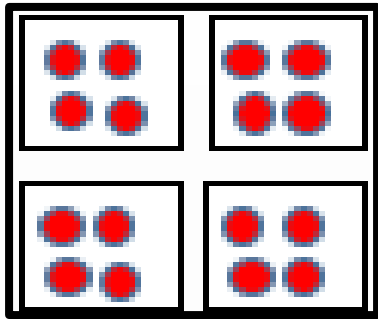
- Sample size varies with lot size and risk
- Fixed risk (assigned to data combination)
- Technically defensible & transparent

# Building the foundation: program design

- Support and collaboration
- RBS working group
  - Core: Coordination, communication, representation
  - PIS: Program development – propagative materials
  - CBP: Program development: -- ag cargo pathway
  - Analysis: Supporting with data and analysis
- Communication, training, feedback
- Problem-solving

# Review of challenges

- Cargo combinations



# Review of challenges

- Cargo combinations
- Packaging varies



# Review of challenges:

- Cargo combinations
- Packaging varies
- Lack of automated systems
- Resources are limited
- Facilities
- Operational feasibility





# Making adjustments

## *Propagative Material Types*

- Singled PM type – choose from drop down for entire consignment
- Mingled PM type – separate by PM type; choose from drop down for each
- Commingled PM type – choose \*Multiple PM types from drop down

PM Type:	<input type="text"/>
Sample Unit:	Budwood/Graftwood (scion)
Total plant quantity:	Bulb, Corm, Rhizome, Tuberos Stem
Remarks:	Meristem or Callus Tissue Culture (micropropagated/in vitro culture
	Root cutting, crown, or clump, Tuberos Root
	Rooted Cutting (including air layer)
	Rooted Plant (including grafted)
	Unrooted Cutting
	Unrooted Plant
	* Multiple PM types
<b>Calculate</b>	



# Making adjustments

## *Determine sample units*

- Units for sampling (not just a box)  
(i.e. bag, bunch, tray, stem, shelf)
- Smaller sample units, randomly distributed . . .
  - Fewer actual plant units inspected
  - More representative of entire consignment
  - Operationally feasible

Example: *What is the PM type(s)? Sample Unit?* .

Comodity	Plants	Inspectional Unit No Bags / boxes	Packed In box Number
ACHILLEA	2350	47	23
AGASTACHE	500	10	23
AJUGA	750	15	23
AMSONIA	900	18	23
ARMERIA	11600	232	23 24 25
ARTEMISIA	12850	257	25 26 27
BUDOLEIA	450	9	25
CAMPANELA	2100	42	28
CARYOPTERIS	250	5	28
COREOPSIS	3350	45	29 28
DELOSPERMA	2100	42	25 29
ERODIUM	900	18	30
ELIPATORIUM	450	9	29

TOTAL ESQUEJES TOTAL CUTTINGS	DESCRIPCION / DES UNROOTED CUTTING
2,350	ACHILLEA
500	AGASTACHE
750	AJUGA
900	AMSONIA
11,600	ARMERIA

1.) Sample Unit = boxes

2.) Sample Unit = baggies

VIOLA	300	6	43
<b>TOTAL</b>	<b>182250</b>	<b>3645</b>	
<b>TOTAL BOXES</b>	<b>34</b>		

# Example: Calculator

Plant Inspection Stn:	Miami PIS
Origin:	Colombia
PM Type:	Unrooted Cutting
Sample Unit:	34
Total plant quantity:	182250
Remarks:	

**Calculate**

Required number for inspection:

Random Pull Number	
09/06/18 10:49am	
Sample Units to Pull	34 u
2	
4	
7	
22	
24	
27	
32	

**Using boxes = 7**

**average plants per box = 5360**

**Inspection = 37,522 cuttings**

Plant Inspection Stn:	Miami PIS
Origin:	Colombia
PM Type:	Unrooted Cutting
Sample Unit:	3645
Total plant quantity:	182250
Remarks:	

**Calculate**

Required number for inspection:

Random Pull Numbers from	
09/06/18 10:45am	
Sample Units to Pull	3645 units of
526	
1,245	
1,429	
1,826	
2,150	
2,474	
2,629	
2,851	

**Using baggies = 8**

**Inspection = 856 cuttings**

**\* Representative sample & distribution throughout consignment**

Example: 18 boxes, 1000 plants in each box; 4 baggies per box

Sample Unit	# of S.U.	# Plant Units	RBS V2 output (2 scenarios)	
			Rooted plants from El Salvador (poor compliance)	Unrooted cuttings from El Salvador (high compliance)
Boxes	18	18000	14 (14000 rooted plants)	7 (7000 cuttings)
Baggie or tray	72	18000	23 (5750 rooted plants)	8 (2000 cuttings)

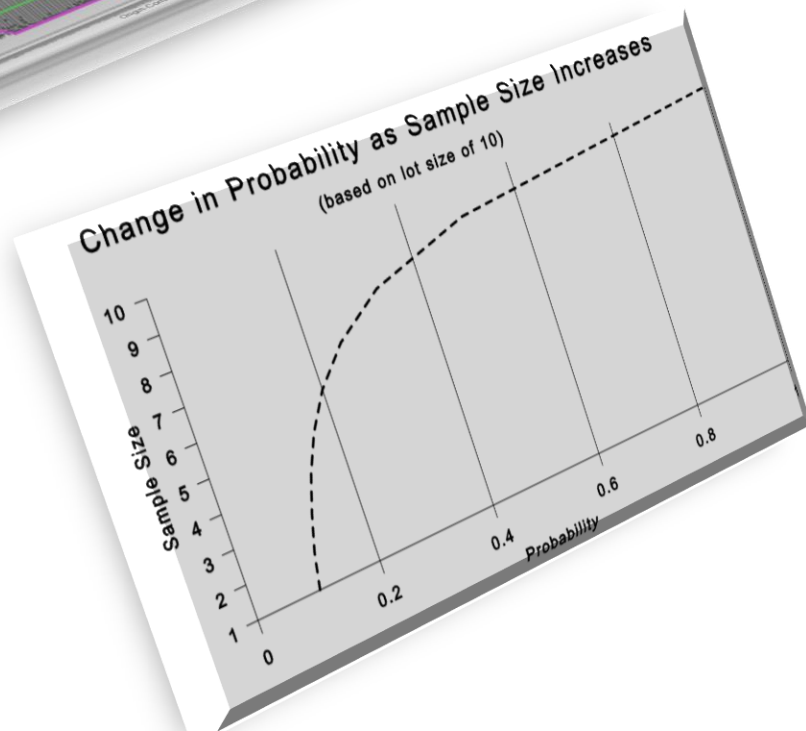
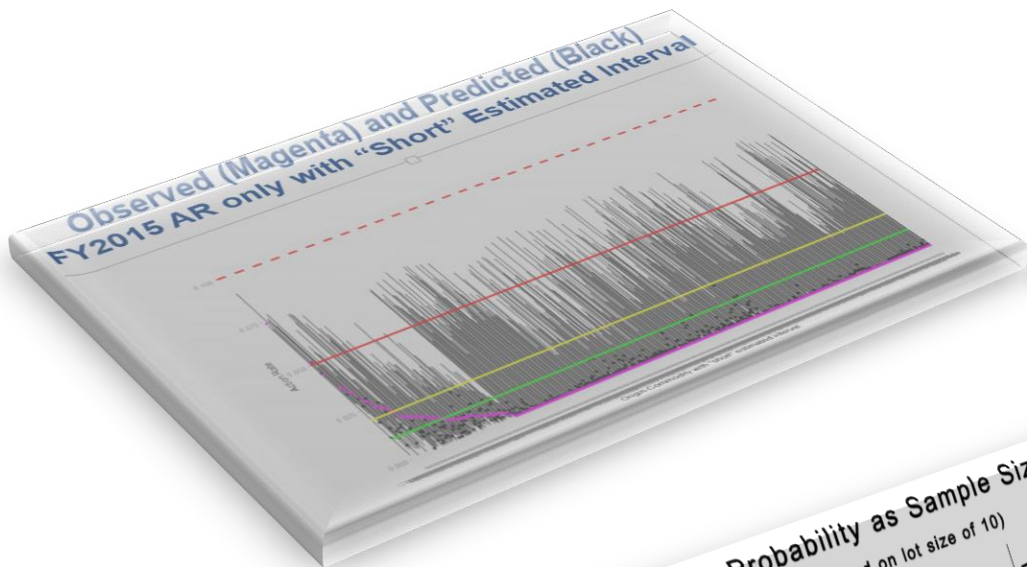
Example: 20 towers; 900 plants each tower  
 120 shelves; 150 plants each shelf

Sample Unit	# of S.U.	# Plant Units	RBS V2 output (2 scenarios)	
			Rooted plants from El Salvador (poor compliance)	Unrooted cuttings from El Salvador (high compliance)
Boxes	18	18000	14 (14000 rooted plants)	7 (7000 cuttings)
Baggie or tray	72	18000	23 (5750 rooted plants)	8 (2000 cuttings)
<b>Tower (tower)</b>	<b>20</b>	<b>18000</b>	<b>15 towers (13,500 plants)</b>	<b>7 shelves (6300 cuttings)</b>
<b>Tower (by shelf)</b>	<b>120</b>	<b>18000</b>	<b>25 shelves (3750 plants)</b>	<b>8 shelves (1200 cuttings)</b>

## Next Steps:

- Quarterly review of data with analysis team
- Adjustments in intensity as needed
- Address challenges with cargo situations
- Pursue feasibility for potential reduced frequency options

# Next steps . . .





Thank you