



GOOD 
Test Portions

GUIDANCE ON OBTAINING
DEFENSIBLE TEST PORTIONS
(GOOD TEST PORTIONS)

Hot off the press!!



Hot off the press!!

Publication is imminent

GOOD Test Portions: Guidance On Obtaining Defensible Test Portions



GOOD 
Test Portions

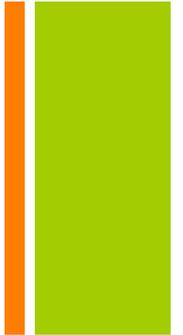
Laboratory Sampling Working Group
AAFCO, AFDO, and APHL
June 2018
<http://www.aafco.org/Publications/GOODTestPortions>



Background: *GOODSamples* –

Published Oct 2015 outlines a systematic approach to sampling

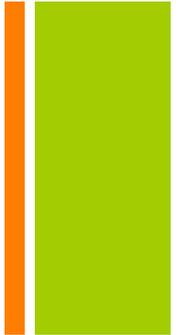
FREE download: <http://www.aafco.org/Publications/GOODSamples>



- Introduction
- Terms, Definitions, and Acronyms
- Management Support
- SQC Overview
- Material Properties
- Theory of Sampling
- Sample Correctness and Tools
- Evidentiary and Analyte Integrity
- Laboratory Considerations
- Quality Control
- Inference
- Data Assessment
- Resources



+ *GOODSamples* - Oct 2015



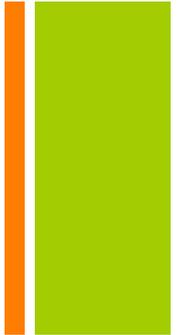
- Introduction
- Terms, Definitions, and Acronyms
- Management Support
- SQC Overview
- Material Properties
- Theory of Sampling
- Sample Correctness and Tools
- Evidentiary and Analyte Integrity
- **Laboratory Considerations***
- Quality Control
- Inference
- Data Assessment
- Resources



****GOODSamples* is prerequisite**



GOOD Test Portion Working Group Members

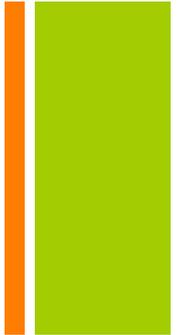


- Jo Marie Cook, FL Department of Ag & Consumer Services
- Heidi Hickes, MT Department of Agriculture
- Lawrence Novotny, SD State University, retired
- Aaron Price, Canadian Food Inspection Agency
- Chuck Ramsey, EnviroStat, Inc., Subject Matter Expert
- Yvonne Salfinger, AFDO & APHL
- Michele Swarbrick, MN Dept of Agriculture
- Nancy Thiex, AAFCO
- Sharon Webb, University of KY Regulatory Services





GOOD Test Portions - June 2018

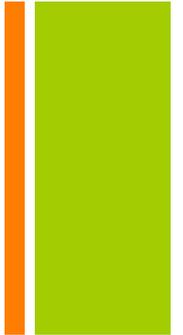


- Introduction
 - Definitions, and Acronyms
 - Expansion of GOODSamples Concepts for Laboratory Sampling
 - Laboratory Sampling
 - QA and QC
 - Laboratory Sampling Processes
 - Data Assessment and Inference
 - Training
 - Appendix – TOS Equations
 - References
- * **GOODSamples is prerequisite**





GOOD Test Portions - June 2018

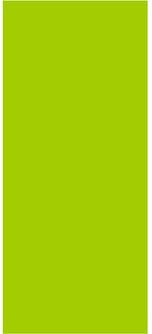


- Introduction
 - **Definitions, and Acronyms**
 - Expansion of GOODSamples Concepts for Laboratory Sampling
 - Laboratory Sampling
 - QA and QC
 - Laboratory Sampling Processes
 - Data Assessment and Inference
 - Training
 - Appendix – TOS Equations
 - References
- * **GOODSamples is prerequisite**





Definitions

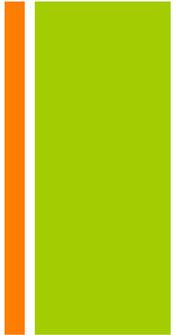


40-some terms

- **Laboratory Sampling:** All manipulations performed on the laboratory sample after receipt and acceptance through selection of the test portion.
- **Selection process:** The act of selecting a smaller mass or volume from a larger mass or volume. There are two types of selection processes: mass reduction and splitting.
- **Mass reduction:** Selection of a smaller mass or volume of material from a larger mass or volume.
- **Splitting:** The division of a mass or volume into two or more equal portions.
- **Nonselection process:** Manipulation of a sample (e.g. comminution, removal of extraneous material, removal of water), usually performed before a selection process (e.g. mass reduction) process.



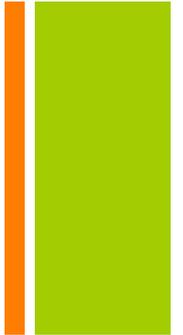
GOOD Test Portions - June 2018



- Introduction
 - Definitions, and Acronyms
 - **Expansion of GOODSamples Concepts for Laboratory Sampling**
 - Laboratory Sampling
 - QA and QC
 - Laboratory Sampling Processes
 - Data Assessment and Inference
 - Training
 - Appendix – TOS Equations
 - References
- * **GOODSamples is prerequisite**



Expansion of *GOODSamples* Concepts for Laboratory Sampling



- Sample Quality Criteria – laboratory’s unique role
- Material properties
 - Material Elements, Heterogeneity
- Total Sampling Error
 - Random Errors, Systematic Errors, Blunders
- Maintaining Evidentiary Integrity

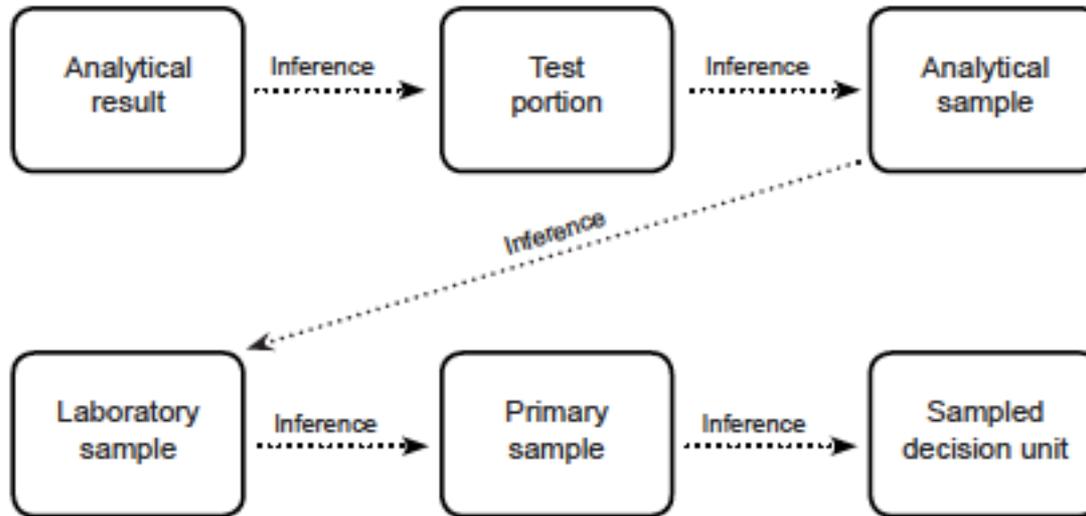
+ Sample Quality Criteria

Lab must be involved with program staff in SQC process; lab brings scientific expertise.

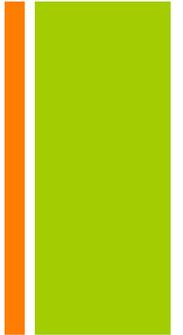
- What is the question?
 - What is analyte or characteristic of concern?
 - What is the concentration of concern?
 - How will inference be made?
- What is the decision unit?
- What is the desired confidence?

+ Applying *GOODSamples* in the Laboratory

- ▶ Sampling/inference pathway



+ Material Properties



- ▶ Finite vs Infinite elements. Comminution of a finite element material results in an infinite element material.
- ▶ Heterogeneity is the root cause of error in all sampling. Compositional and Distributional Heterogeneity (CH and DH).
- ▶ The magnitude and nature of CH and DH are unique to each material and dictate the sampling efforts. .

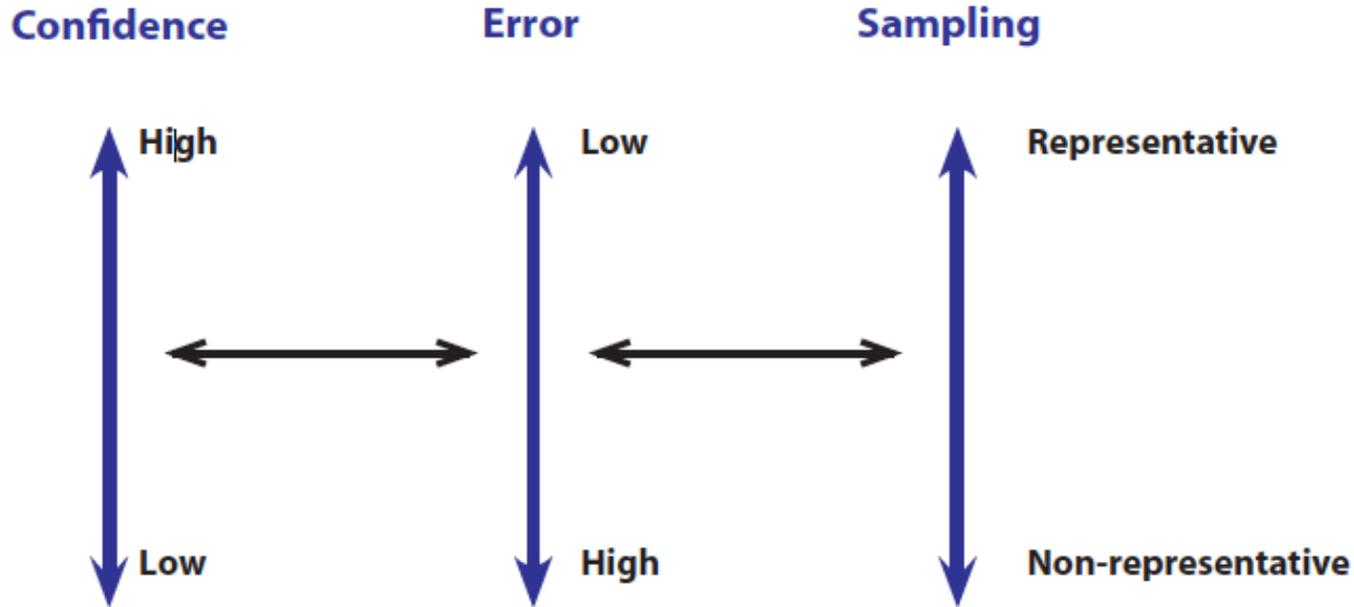
+ Material Properties

Heterogeneity

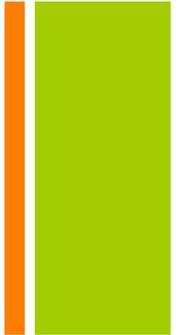


- Orange juice has many separate components with large distributional heterogeneity. The pulp falls quickly, the foam disperses slowly and volatiles escape rapidly.

+ TSE and relationship among confidence, error & representativeness



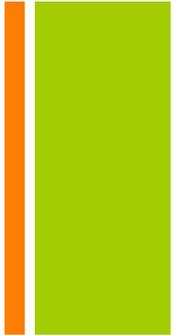
+ Evidentiary Integrity



Evidentiary Integrity: Evidence that samples have been properly collected, processed and stored in a manner to ensure that test result(s) can be traced to the decision unit and are a true representation of the decision unit (in legal terms, the identification and authentication of the evidence). Evidentiary integrity is demonstrated by documentation of trace-back (e.g., chain of custody forms); proper sampling procedures to ensure representivity (e.g., sample correctness); and processes to ensure analyte integrity is maintained.



GOOD Test Portions - June 2018

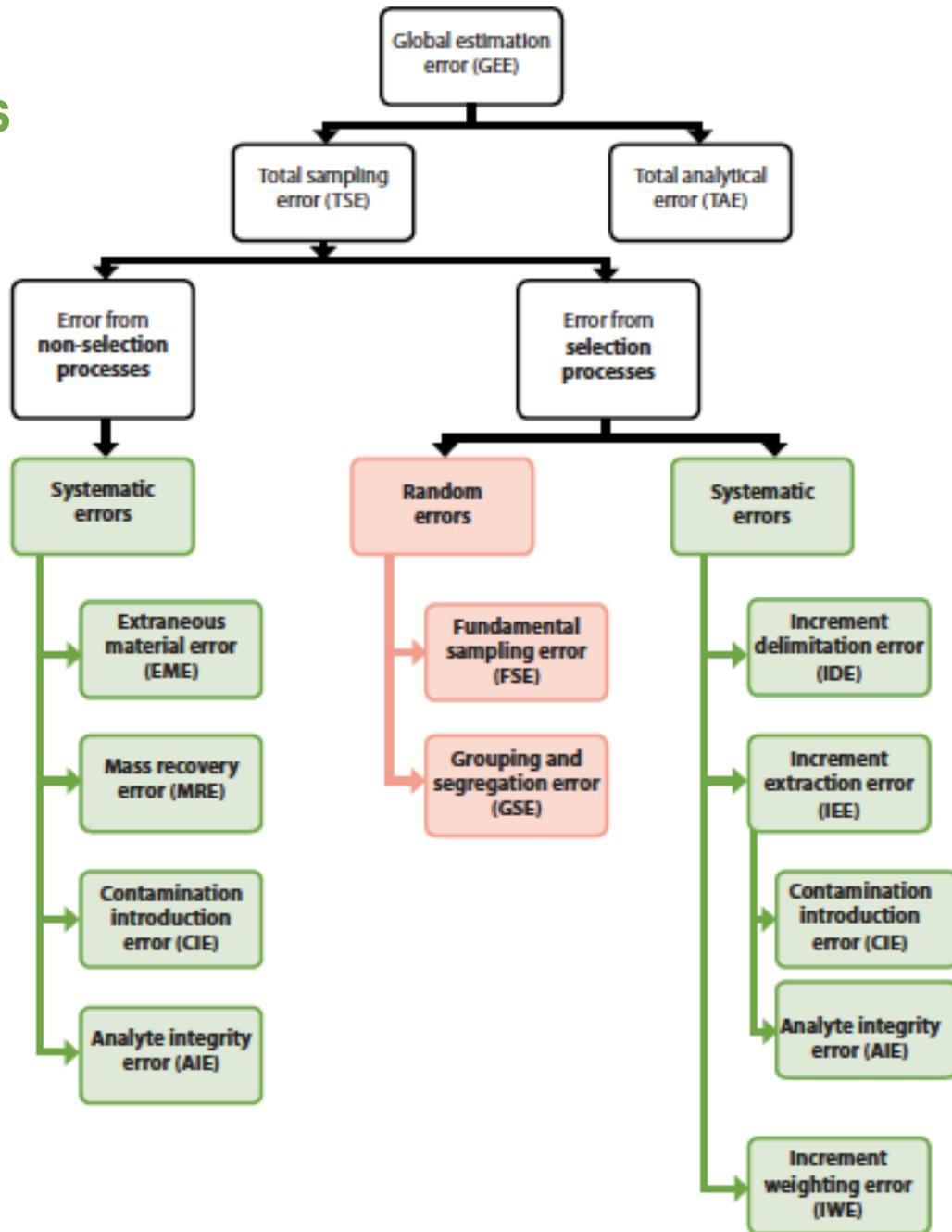


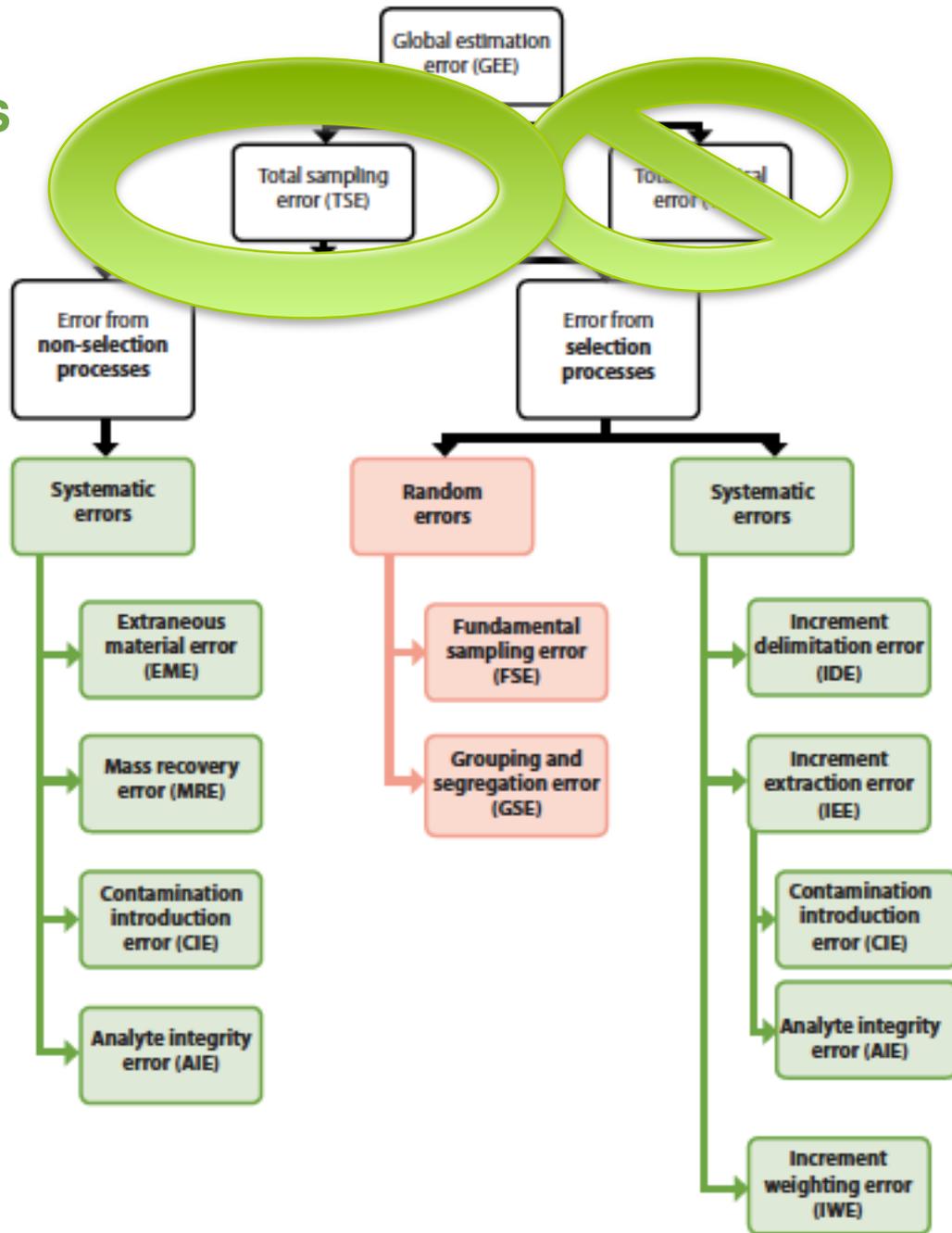
- Introduction
 - Definitions, and Acronyms
 - Expansion of GOODSamples Concepts for Laboratory Sampling
 - **Laboratory Sampling**
 - QA and QC
 - Laboratory Sampling Processes
 - Data Assessment and Inference
 - Training
 - Appendix – TOS Equations
 - References
- * **GOODSamples is prerequisite**

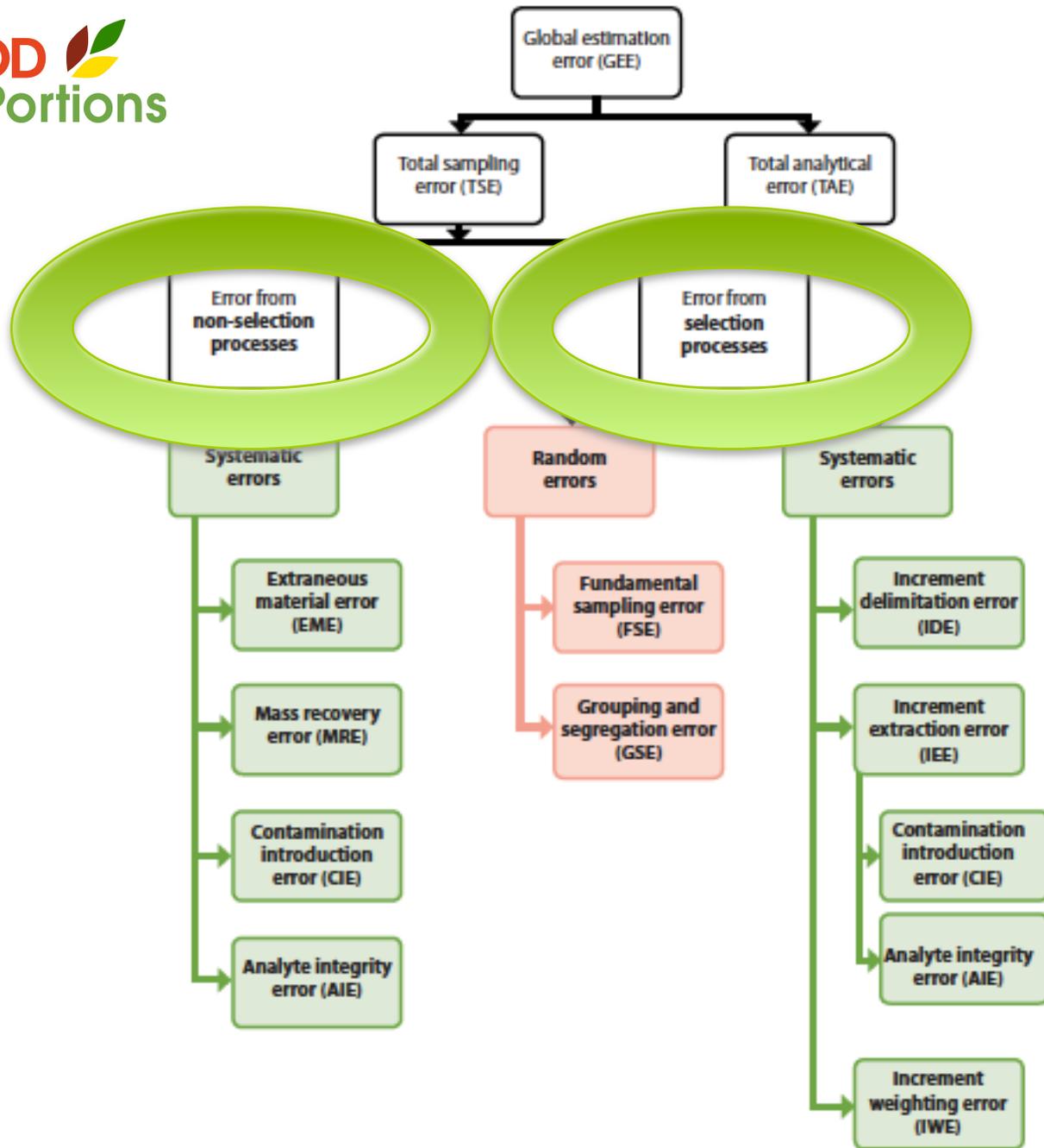


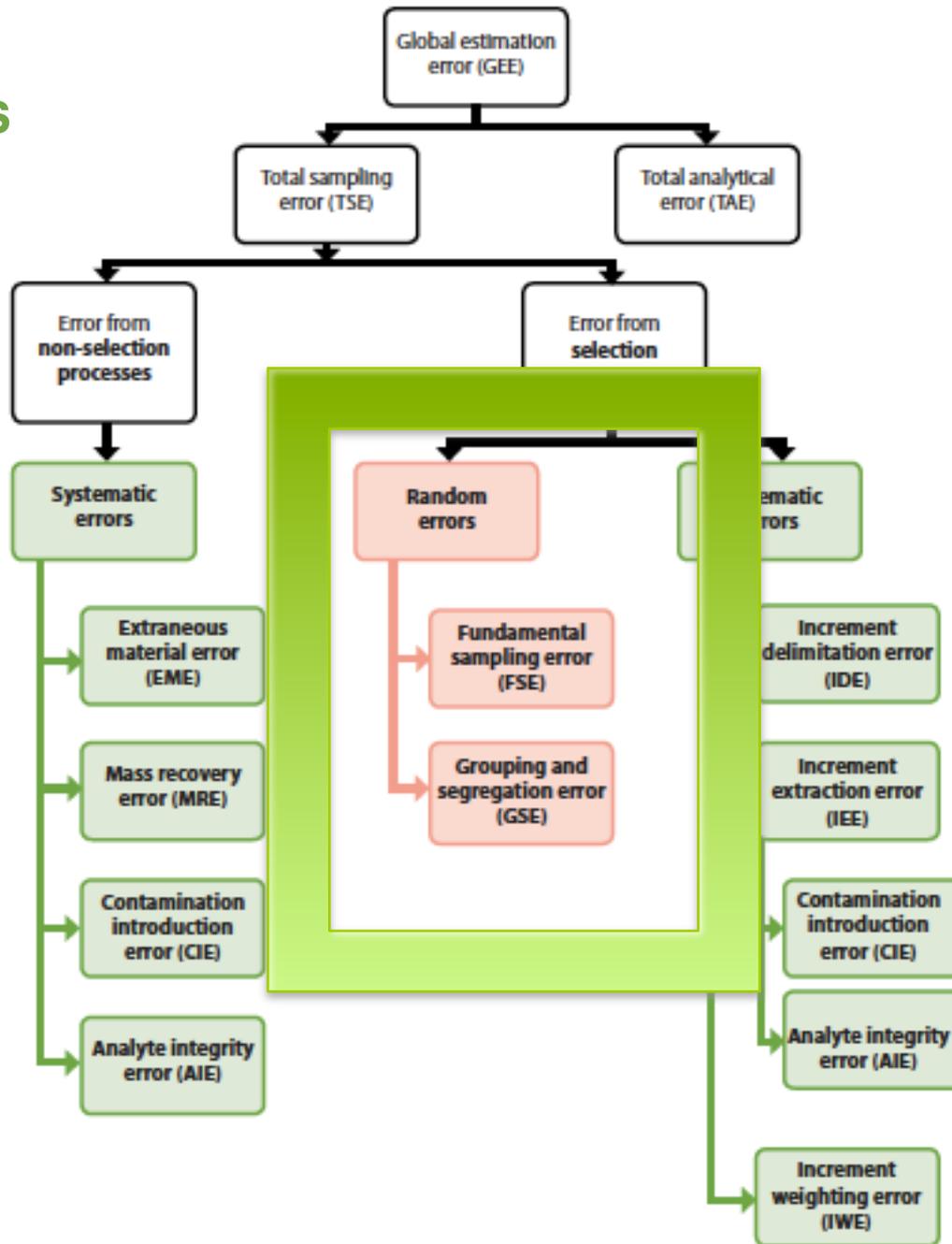
+ Laboratory Sampling

- Introduction
- Nonselection Errors
- Selection Errors
- Relationship of Error to Mass
- Relationship of Error to Increments
- Relationship of Error to Sample Correctness
- Nonselection Techniques and Equipment – next talk by Lawrence
- Selection Techniques and Equipment – next talk by Lawrence
- Safety Considerations

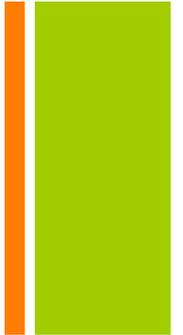




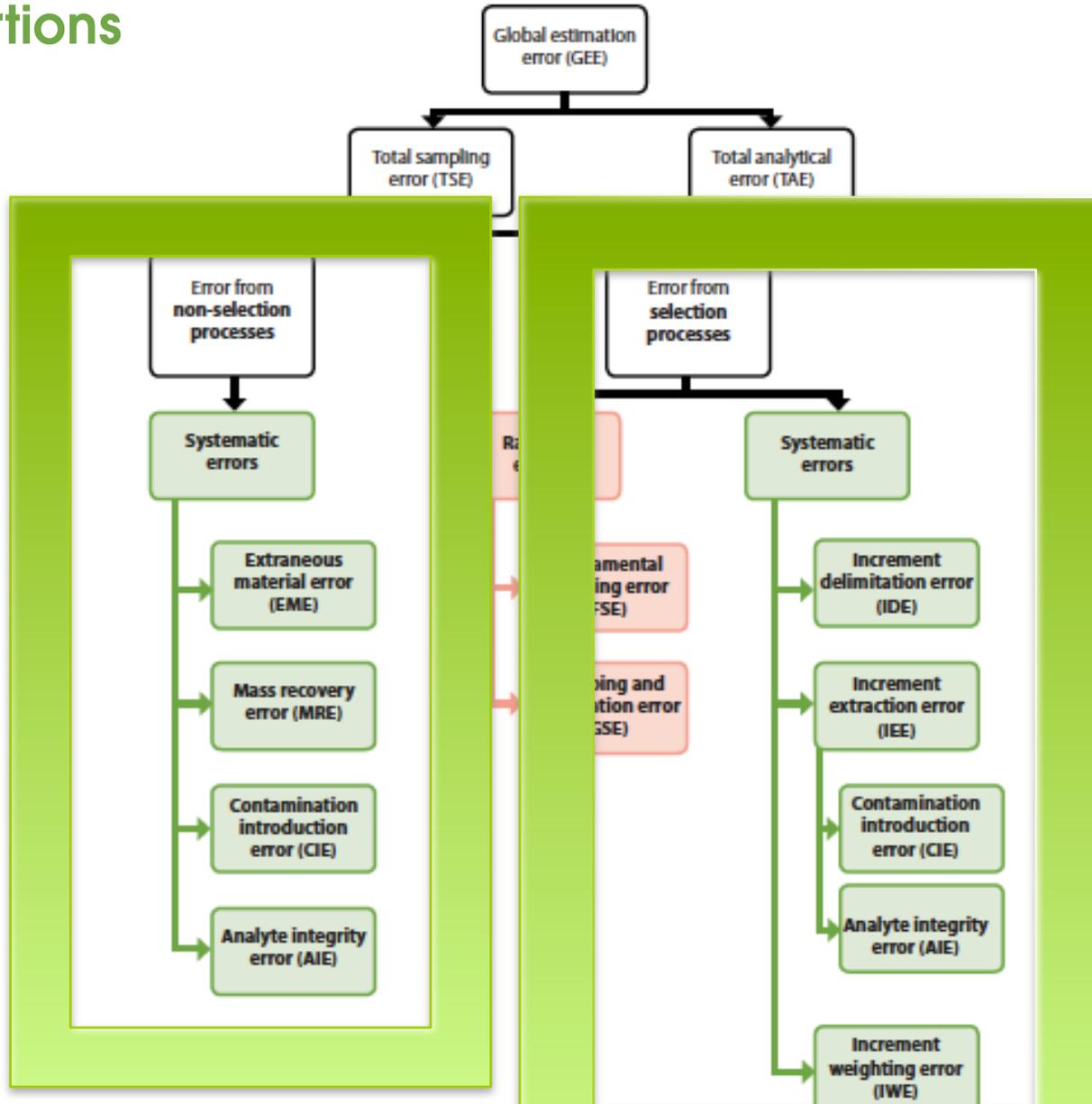




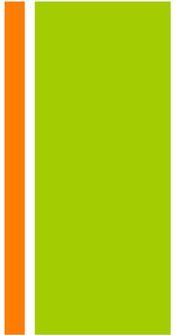
+ RANDOM ERRORS



- Fundamental Sampling Error (FSE)
 - Function of particle size, mass and CH
- Grouping and Segregation Error (GSE)
 - Function of number of increments and DH
- Relationships
 - Relationship of error to mass
 - Relationship of error to increments
 - Relationship of error to sample correctness

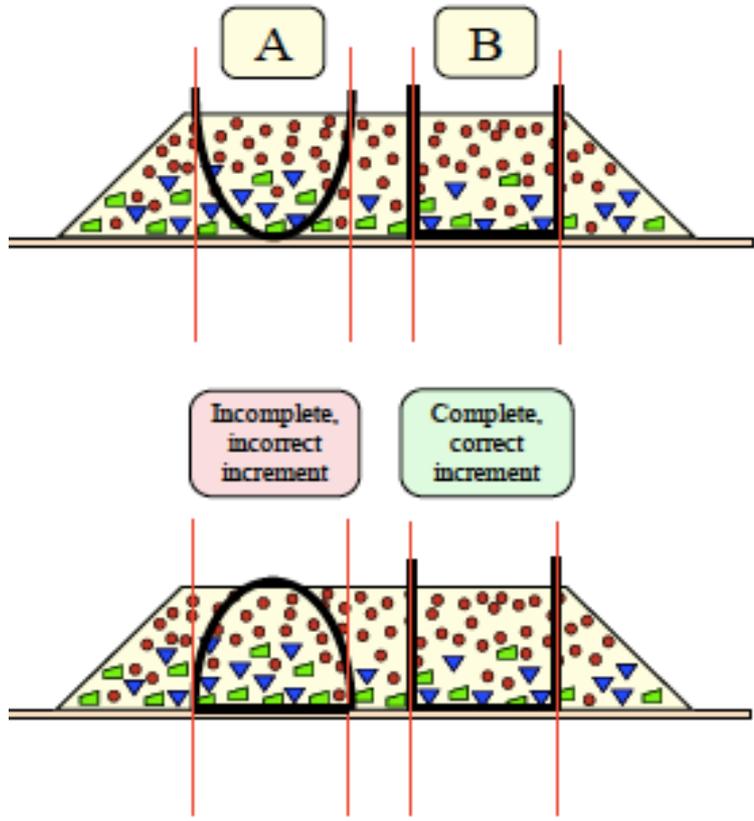


+ Systematic Errors (Bias)



- New systematic error terms introduced
- Systematic errors are impossible to estimate (unlike analytical bias errors).
- Causes of errors and practices to control errors are discussed.

+ Increment Delimitation Error



flat spatula



rounded scoop



square scoop



bias toward small particles

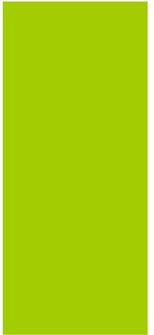


bias toward large particles



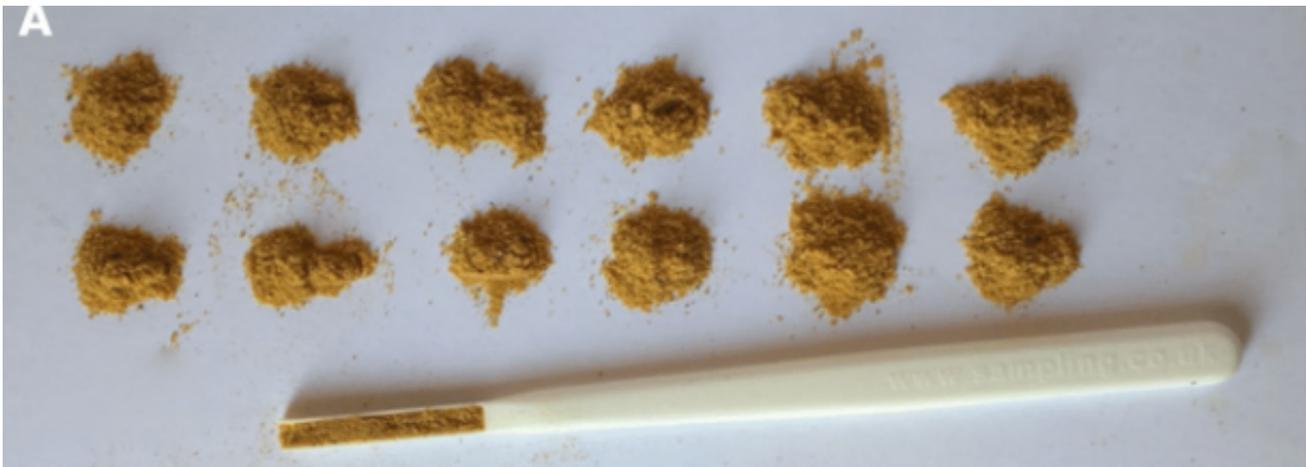
no bias toward any particles

+ Increment Weighting Error



What is wrong here?

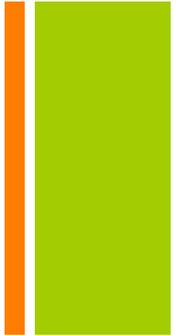
Poor tool choice,
< increments,
> IWE



What is correct here?

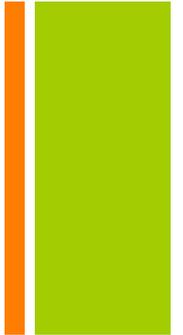
Good tool choice,
> increments,
< IWE

+ Blunders



- Mistakes or accidents in the lab
- Data integrity is lost
- Blunders cannot be incorporated into a global estimation error (GSE) calculation, and must be prevented/eliminated or the procedure must be repeated

+ Sample Correctness



- Sample correctness is control of IDE and IEE
 - IDE occurs when all elements of a material do not have an equiprobable chance of being selected (function of tool design)
 - IEE occurs when all elements have an equal probability of being selection, but the correctly delimited elements do not become part of the increment (function of tool usage)
- Discussed for different states of materials – not different for food, feed, soil, fertilizer, water. Same principles apply and vary by different material properties.



States of Materials

Liquid

- No visible particulates
- Spreads



Slurry

- Visible particulates
- Spreads



Semi-solid

- Moves like a liquid or solid
- Stacks



Solid

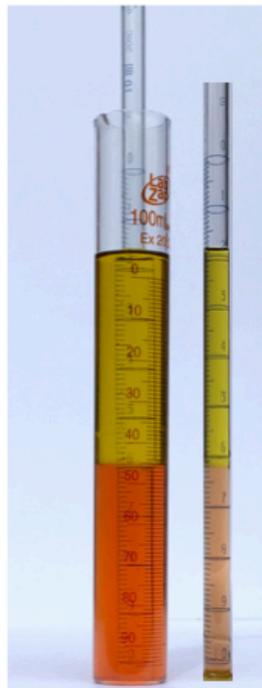
- Moves like a solid
- Stacks



+ Increment Delimitation Error - Liquids



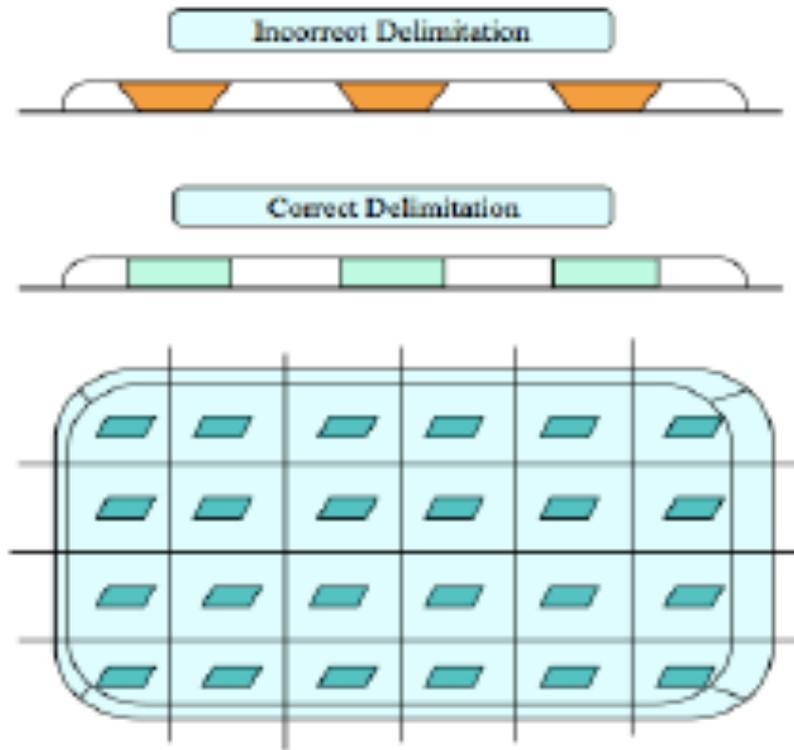
Correct delimitation:
Volumes
proportionately
represented



Incorrect delimitation:
Volumes
disproportionately
represented

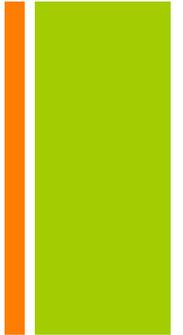


+ Incorrect and Correct Delimitation – Solids using a 2-D Slab Cake





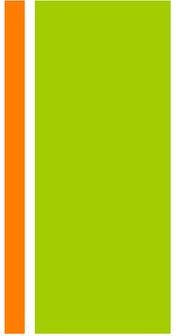
GOOD Test Portions - June 2018



- Introduction
 - Definitions, and Acronyms
 - Expansion of GOODSamples Concepts for Laboratory Sampling
 - Laboratory Sampling
 - **QA and QC**
 - Laboratory Sampling Processes
 - Data Assessment and Inference
 - Training
 - Appendix – TOS Equations
 - References
- * **GOODSamples is prerequisite**



+ Quality Assurance and Quality Control

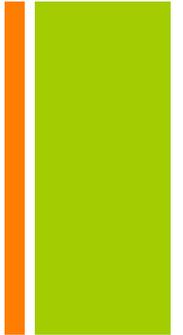


- Quality Assurance
 - Validation of a Laboratory Sampling Protocol
 - Verification of Laboratory Sampling Protocol
- Quality Control
 - Random Error
 - Systematic Error

Will be subject of presentation a bit later this morning .



GOOD Test Portions - June 2018

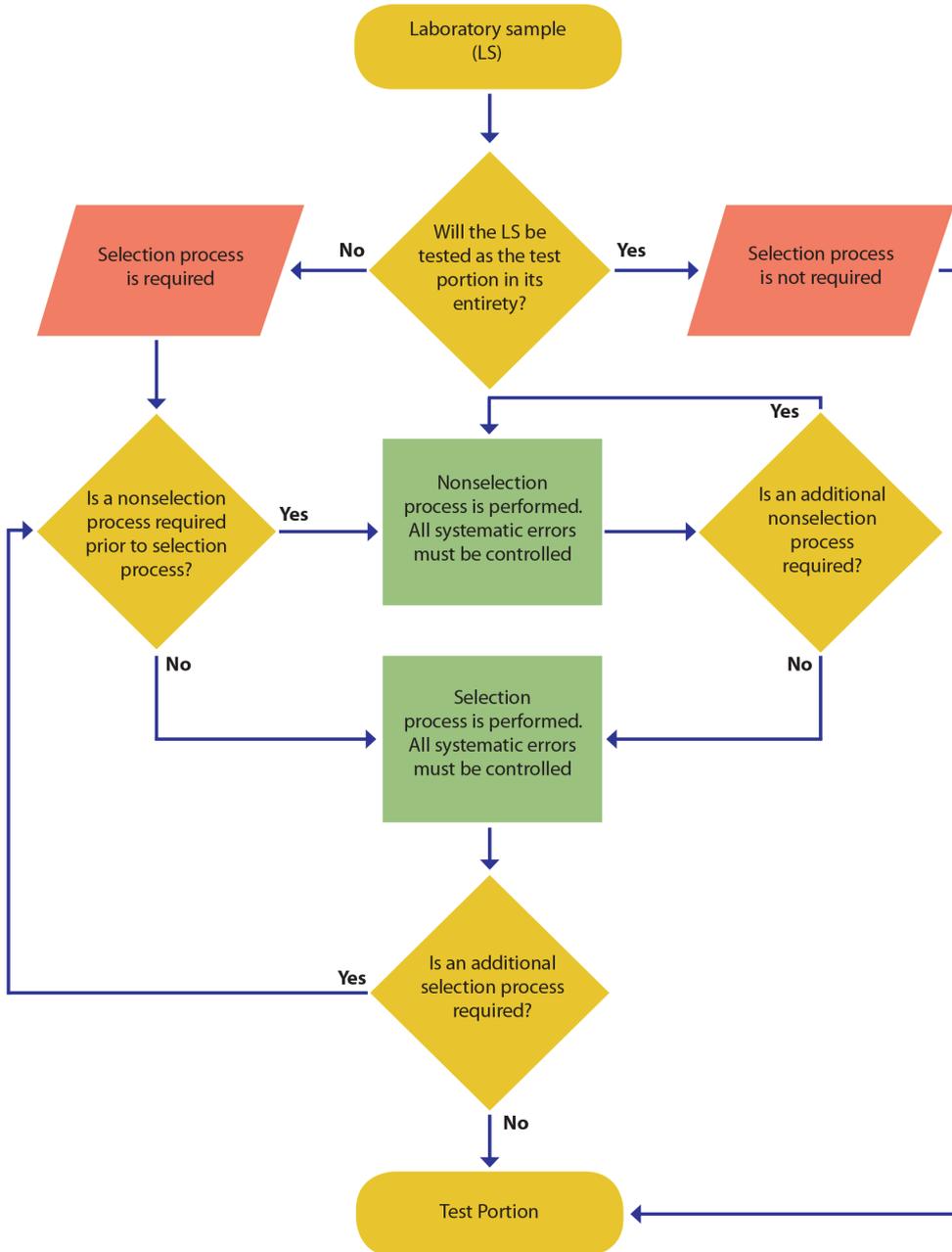


- Introduction
 - Definitions, and Acronyms
 - Expansion of GOODSamples Concepts for Laboratory Sampling
 - Laboratory Sampling
 - QA and QC
 - **Laboratory Sampling Processes**
 - Data Assessment and Inference
 - Training
 - Appendix – TOS Equations
 - References
- * **GOODSamples is prerequisite**

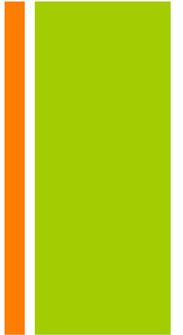




LABORATORY WORKFLOW



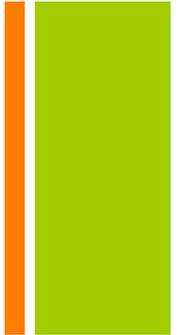
+ Laboratory Sampling Processes



- Special Considerations for Selection of the Test Portion
 - Select an appropriate number of proportionate/equal increments at random. Never take 1 increment unless the material is a single-phase liquid.
 - Do not attempt to obtain an exact weight.
 - Avoid IWE when selecting increments.
 - Ensure the correct tool is used to avoid bias toward one particle size.
 - Do not scale down test portion mass without validating impact on the variance of FSE.



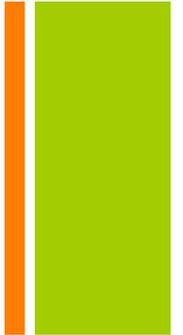
GOOD Test Portions - June 2018



- Introduction
 - Definitions, and Acronyms
 - Expansion of GOODSamples Concepts for Laboratory Sampling
 - Laboratory Sampling
 - QA and QC
 - Laboratory Sampling Processes
 - **Data Assessment and Inference**
 - Training
 - Appendix – TOS Equations
 - References
- * **GOODSamples is prerequisite**



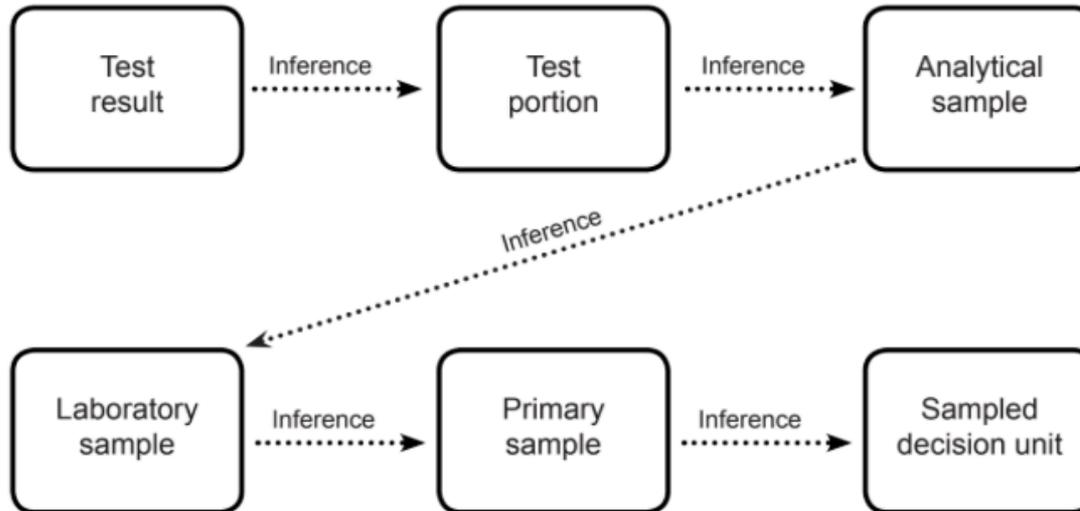
+ Data Assessment and Inference



- Data Assessment
- Assessing documentation, QC, and global estimation error
 - Quality Control and GEE
 - Inference

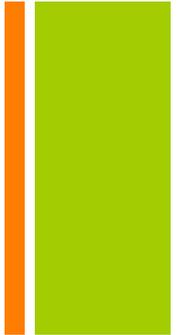
+ Inference

- ▶ Sampling/inference pathway





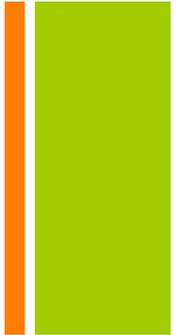
GOOD Test Portions - June 2018



- Introduction
 - Definitions, and Acronyms
 - Expansion of GOODSamples Concepts for Laboratory Sampling
 - Laboratory Sampling
 - QA and QC
 - Laboratory Sampling Processes
 - Data Assessment and Inference
 - **Training**
 - Appendix – TOS Equations
 - References
- * **GOODSamples is prerequisite**

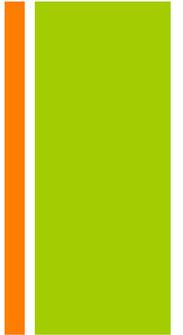


+ Training



- Appropriate PPE and appropriate safety practices
- SQC
- TOS
- Material properties
- Causes and control of systematic errors
- Causes and control of random errors

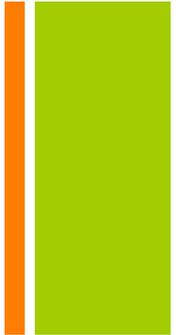
+ Training



- Choice, use and maintenance of:
 - Comminution tools and equipment
 - Splitting tools and equipment
 - Mass reduction tools and equipment
- Maintaining analyte integrity
- Maintaining evidentiary integrity
- QA/QC
- Data assessment



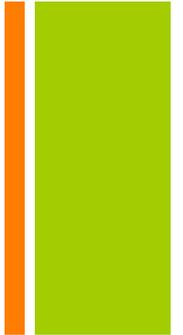
GOOD Test Portions - June 2018



- Introduction
 - Definitions, and Acronyms
 - Expansion of GOODSamples Concepts for Laboratory Sampling
 - Laboratory Sampling
 - QA and QC
 - Laboratory Sampling Processes
 - Data Assessment and Inference
 - Training
 - **Appendix – TOS Equations**
 - References
- * **GOODSamples is prerequisite**

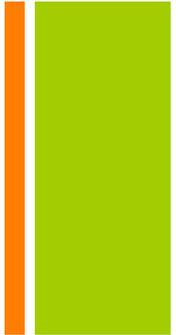
+ Appendix A

- TOS Equations!!
- Example Calculations





GOOD Test Portions - June 2018

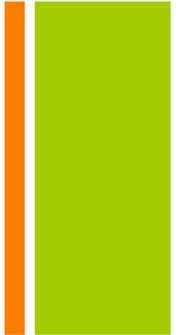


- Introduction
 - Definitions, and Acronyms
 - Expansion of GOODSamples Concepts for Laboratory Sampling
 - Laboratory Sampling
 - QA and QC
 - Laboratory Sampling Processes
 - Data Assessment and Inference
 - Training
 - Appendix – TOS Equations
 - **References**
- * ***GOODSamples is prerequisite***

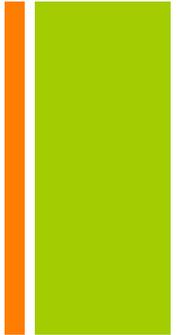


+ References

- Cited works



+ Snapshots



This is brief overview of what is presented in GOOD Test Portions

Currently available for free download at:

<https://www.aafco.org/Publications/GOODTestPortions>



QUESTIONS?



THANK YOU!

Laboratory Sampling Working Group