



MoniQA INTERNATIONAL CONFERENCE

Uncertainty from sampling – discussions within the Codex Alimentarius Commission

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SAMPLING IN CODEX – HISTORICAL PERSPECTIVE

1986: The principles for the establishment or selection of codex sampling procedures were first adopted by the Commission

These covered:

Sampling Plans for Commodity Defects (attribute based)

Sampling Plans for Net Contents

Sampling Plans for Compositional Criteria (variables with unknown standard deviation based)

Specific Sampling Plans for Health-related Properties



1988: Instructions on Codex sampling procedures

These covered:

Aspects of sampling and acceptance procedures

Types of sampling plans

Procedure to be followed by Codex Commodity
Committee when developing a sampling plan



Diagrammatic representation of possible Codex sampling plans

Description of and formulae to be used in acceptance sampling plans adopted by Codex

Net contents

Selection of values of mathematical parameters for the operation of Codex sampling plans



2004: General Guidelines on Sampling (published as CAC/GL 50-2004)

These covered:

Purpose of Codex guidelines on sampling

Main notions of sampling

The selection of sampling plans for single or isolated lots moving in international trade

The selection of sampling plans for a continuous series of lots from a single source

The selection of sampling plans for the inspection by variables of bulk materials: known standard deviation



GENERAL GUIDELINES ON SAMPLING CAC/GL 50-2004

SECTION I. PURPOSE OF CODEX GUIDELINES ON SAMPLING

1.1 PURPOSE

Sampling plans are required which ensure that fair and valid procedures are used when food is being controlled for compliance with a particular Codex commodity standard.



Since numerous, yet often complex, sampling plans are available it is the purpose of these guidelines to help those responsible for sampling to select sampling plans that are appropriate for statistical inspections under specifications laid down by Codex standards. No sampling plan can ensure that every item in a lot conforms.

These sampling plans are nevertheless useful for guaranteeing an acceptable quality level.

The guidelines contain the elementary principles of statistical control at reception, which complete the basic recommendations laid down in the Preamble.



1.3 USERS OF SAMPLING PLANS RECOMMENDED BY THE GUIDELINES

The sampling plans described in these Guidelines may be implemented either by Governmental food control authorities, or by professionals themselves (self-inspection performed by producers and/or traders). In the latter case, these Guidelines enable the governmental authorities to check the appropriateness of the sampling plans implemented by the professionals.

It is recommended that the different parties concerned with sampling come to an agreement on the implementation of the same sampling plan for the respective controls.



1.4 SCOPE OF THE GUIDELINES

The following sampling situations are covered for the control of only homogeneous goods:

- control of percentage of defective items by attributes or by variables, for goods in bulk or in individual items,
- control of a mean content.



These Guidelines do not cover the control of:

- non-homogeneous goods;
- for homogeneous goods, the cases where measurement error is not negligible compared to sampling error (see 2.4), as well as the control of a qualitative characteristic in a bulk material and;
- they do not deal with double, multiple and sequential sampling plans, deemed too complex in the frame of these Guidelines.



CODEX GUIDELINES ON MEASUREMENT UNCERTAINTY

(CAC/GL 54-2004)

Introduction

It is important and required by ISO/IEC 17025:1999 that analysts are aware of the uncertainty associated with each analytical result and estimates that uncertainty. The measurement uncertainty may be derived by a number of procedures. Food analysis laboratories are required, for Codex purposes, to be in control, use collaboratively tested or validated methods when available, and verify their application before taking them into routine use. Such Laboratories therefore have available to them a range of analytical data which can be used to estimate their measurement uncertainty.



These guidelines only apply to quantitative analysis.

Most quantitative analytical results take the form of
“ $a \pm 2u$ or $a \pm U$ ”

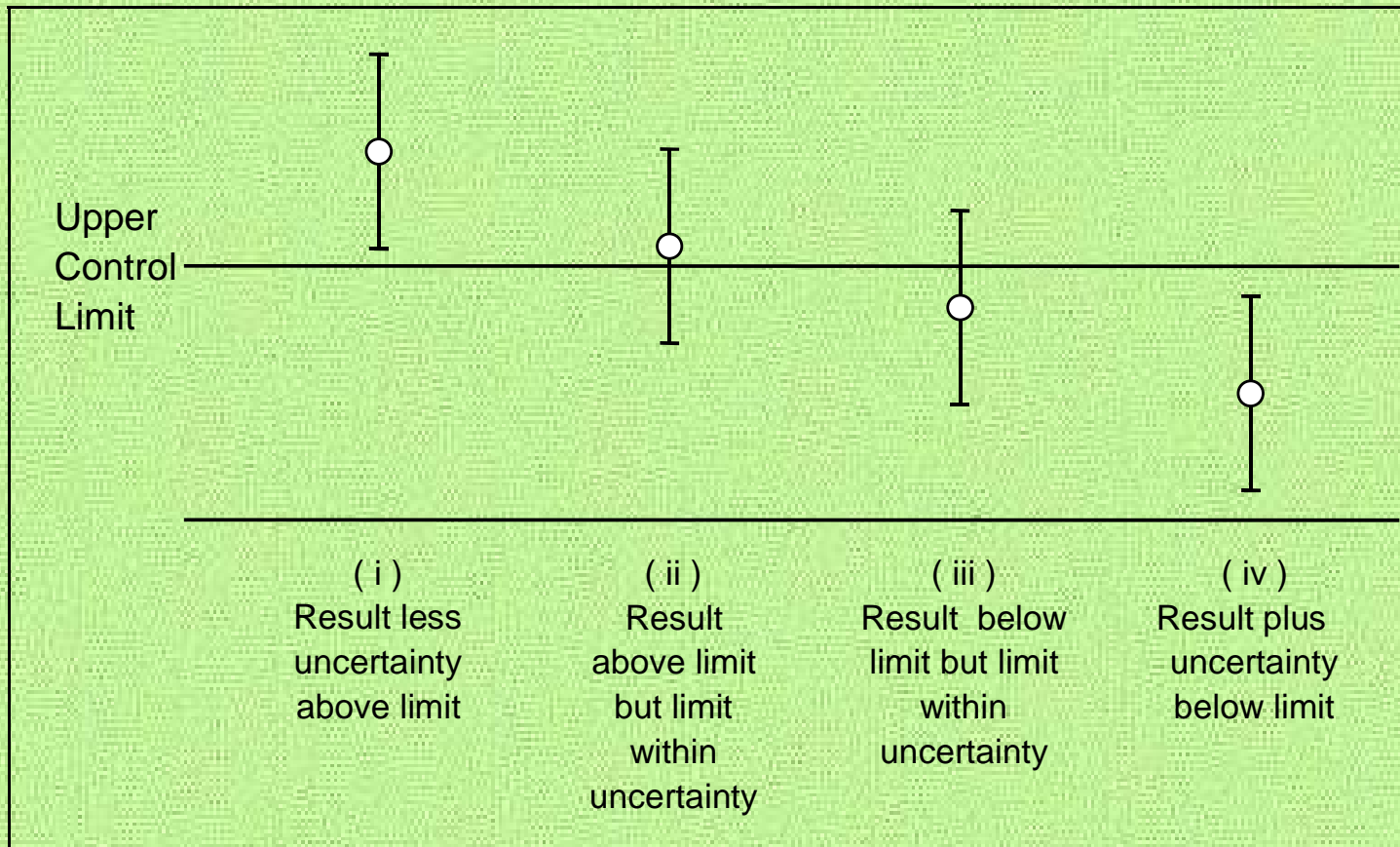
where “ a ” is the best estimate of the true value of the concentration of the measurand (the analytical result) and “ u ” is the standard uncertainty and “ U ” (equal to $2u$) is the expanded uncertainty. The range “ $a \pm 2u$ ” represents a 95% level of confidence where the true value would be found. The value of “ U ” or “ $2u$ ” is the value which is normally used and reported by analysts and is hereafter referred to as “measurement uncertainty” and may be estimated in a number of different ways.



Terminology

The international definition for Measurement Uncertainty is:
"Parameter, associated with the result of a measurement, that characterises the dispersion of the values that could reasonably be attributed to the measurand"

That is now taken to include sampling uncertainty





CODEX COMMITTEE ON METHODS OF ANALYSIS AND SAMPLING

29th Session, Budapest, Hungary, 10-14 March 2008

**GUIDANCE ON MEASUREMENT UNCERTAINTY AND
UNCERTAINTY OF SAMPLING**

GUIDANCE ON UNCERTAINTY FROM SAMPLING

(Paper CX/MAS 29/9- Add 1.)



INTRODUCTION

PUBLICATION OF SAMPLING UNCERTAINTY

GUIDES SINCE PREVIOUS SESSION of CCMAS

1. EURACHEM/EUROLAB/CITAC/Nordtest *Guide on the Estimation of Measurement Uncertainty Arising from Sampling*
2. Nordtest handbook for sampling planners on sampling quality assurance and uncertainty estimation *Uncertainty from sampling*



www.eurachem.org/guides/UfS_2007.pdf

www.nordicinnovation.net/nordtestfiler/tr604.pdf



SAMPLING IN CODEX

BACKGROUND

METHODS FOR ESTIMATING SAMPLING UNCERTAINTY

The duplicate method



A sampling protocol (detailing, how many samples, how to sample, sample mass etc.) is a prerequisite for all food surveys, assessments etc. The duplicate method requires a second (duplicate) sample to be taken for 10% (or a minimum of 8) of the total number of sampling targets. This second 'duplicate' sample should be taken to represent the ambiguity in interpreting the protocol, what this means is perhaps better explained using the examples.



The duplicate samples are then each subject to independent physical preparation (i.e. they are not combined). Two analytical test portions are drawn from each of the duplicate 'prepared' samples.

The procedures given in the Nordtest Guide are reproduced as Annex in the Codex paper. A range of sampling exercises that span from grower level to retail sampling using one of the procedures given in Annex I were described in the CCMAS paper.



RECOMMENDATIONS IN THE CODEX PAPER

It is recommended that the Committee:

- Notes the publication of the EURACHEM/EUROLAB/CITAC/Nordtest Guide on the “Estimation of Measurement Uncertainty Arising from Sampling” and the Nordtest handbook.



- discusses the issue of uncertainty and sampling and decides whether it should develop recommendations in the area in the same way that it already has for [Analytical] Measurement Uncertainty. In particular, it should discuss what is the likely magnitude of sampling uncertainties likely to be encountered in routine compliance assessments.



- discusses whether sampling uncertainty should be taken into account when a lot is assessed for compliance with a Codex specification.
- whether it should prepare Guidance for Codex Committee Committees on sampling uncertainty.



OUTCOME

The Committee recognised that at this stage it was premature to undertake new work but that this question should be kept under consideration and therefore agreed that the Delegation of the United Kingdom, with the assistance of an electronic working group, would revise the discussion paper for consideration by the next session.

Countries now addressing the issue internally.



THREE EXAMPLES FROM THE FOOD SECTOR FOR MEASUREMENT UNCERTAINTY ESTIMATES



Example 1 – Nitrate concentration in glasshouse lettuce

All values given in mg kg⁻¹

Mean: 4346

Standard deviation of analysis : 167.2

Standard deviation of sampling : 448.0



Example 2 – infant wet meals (retail survey)

All values given in $\mu\text{g kg}^{-1}$

Mean: 7.7

Standard deviation of analysis : 1.754

Standard deviation of sampling : 0.689



Example 3 – Moisture in wholesale butter (offered for EU subsidy)

All values given in g 100g⁻¹

Mean: 15.75

Standard deviation of analysis : 0.041

Standard deviation of sampling : 0.219

