

Estimation of the Expanded Uncertainty (u-exp) for the Poultry ME Calculation

Introduction

Whereas expanded uncertainties can be estimated from ongoing IQC data generated for the individual tests, the uncertainty for energy equations cannot be obtained in the same way because the calculation requires the input of several uncertainties of the requisite proximate tests forming the basis of the relevant calculation.

Individual Uncertainties of the Input Tests

The uncertainties of the individual tests required to determine Poultry ME are as follows:

Test	Test number	Uncertainty (expanded to k=2)
Crude Protein	S1018	± 3.0%
Crude Fat (Oil B)	S1021	± 9.0%
Starch (Polarimetry)	S1028	± 3.5%
Total Sugar (Luff-Schoorl)	S1027	± 15.0%

Calculation –

The Poultry ME value (MJ/kg) is given by:

Poultry ME (MJ/kg) as received = $(0.1551 \times \text{CRPAR}) + (0.3431 \times \text{OAHAR}) + (0.1669 \times \text{STAAR}) + (0.1301 \times \text{SGRAR})$

The total of the individual factors in the equation is $0.1551 + 0.3431 + 0.1669 + 0.1301 = 0.7952$

The contribution of the individual elements of the calculation is therefore:

$[\{0.1551 / 0.7952\} \times u\text{-expCRPAR}] + [\{0.3431 / 0.7952\} \times u\text{-expOAHAR}] + [\{0.1669 / 0.7952\} \times u\text{-expSTAAR}] + [\{0.1301 / 0.7952\} \times u\text{-expSUGAR}]$

i.e. $[0.195 \times u\text{-expCRPAR}] + [0.431 \times u\text{-expOAHAR}] + [0.210 \times u\text{-expSTAAR}] + [0.164 \times u\text{-expSUGAR}]$

i.e. $[0.195 \times 3.0] + [0.431 \times 9.0] + [0.210 \times 3.5] + [0.164 \times 15.0]$

i.e. $[0.585] + [3.879] + [0.735] + [2.46]$

The uncertainty for Poultry ME (As Received) – Poultry MEAR can be calculated as the square root of the sum of the squares of the individual components, viz:

$$\text{Expanded uncertainty Poultry MEAR} = \sqrt{0.5852 + 2 + 3.8792 + 0.7352 + 2.462}$$

$$\text{i.e. } \sqrt{0.342 + 15.04 + 0.540 + 6.05} = \sqrt{21.97} = 4.7\%$$

Example

A Poultry ME result of 12.0 MJ/kg is reported on a sample of Broiler feed.

What is the range of reasonably attributable values associated with the result considering the estimated uncertainty expanded by a factor ($k=2$) to give an approximate 95% confidence interval?

The expanded uncertainty is estimated at $\pm 4.7\%$ so the range of values would be 11.4 MJ/kg to 12.6 MJ/kg.

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