Designation: F 2340 – 04

Standard Specification for
Developing and Validating Prediction Equation(s) or Model(s) Used in Connection with Livestock, Meat, and Poultry Evaluation Device(s) or System(s) to Determine Value[1]

1. Scope

1.1 This specification covers methods to collect and analyze data, document the results, and make predictions by any objective method for any characteristic used to determine value in any species using livestock, meat, and poultry evaluation devices or systems.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.*

2. Terminology

2.1 *Definitions:*

2.1.1 *calibration data set*, *n*—data set used to develop the initial prediction equations; same as developmental or prediction data set.

2.1.2 *coefficient of determination*, *n*—percentage of variability in the response (dependent) variable that can be explained by the prediction equation.

$$R^2 = 1 - \frac{\sum(y - \hat{y})^2}{\sum(y - \overline{y})^2}$$

2.1.3 *evaluation device*, *n*—equipment designed to measure composition, or quality constituents used to determine value of live animals, carcasses, and individual cuts of meat.

2.1.4 *evaluation system*, *n*—device or group of devices used to measure and record composition, or quality constituents used to determine value of live animals, carcasses, and individual cuts of meat.

2.1.5 *independent third party*, *n*—unbiased person or entity that is a knowledgeable expert for the specific activity.

2.1.6 *root mean square error for calibration*, *n*—square root of the sum of squared residuals divided by $n_c - (k + 1)$, where

n_c is the sample size for the calibration data set, and k is the number of explanatory variables in the prediction equation.

$$\sqrt{\frac{\sum(y - \hat{y})^2}{n_c - (k + 1)}}$$

2.1.7 *root mean square error for validation*, *n*—square root of the sum of squared residuals divided by n_y, where n_y is the sample size for the validation data set.

$$\sqrt{\frac{\sum(y - \hat{y})^2}{n_v}}$$

2.1.8 *validation data set*, *n*—the data set used to test the predictive accuracy of the equations developed from the calibration data set.

2.1.9 *value, commerce*, *n*—measure of economic worth in commerce.

3. Significance and Use

3.1 The procedures in this specification are to be used by all parties interested in predicting composition or quality, or both, for the purpose of establishing value based upon device or system measurements. Whenever new prediction equations are established, or when a change is experienced that could affect the performance of existing equations, these procedures shall be used.

4. Procedure

4.1 *Experimental Design*:

4.1.1 *Define the Population for Development of a Prediction Equation*:

4.1.1.1 To establish the predictive ability and validity of an equation(s) using measures (independent variables) from an evaluation device or system, it is necessary to define the population on which the prediction model is intended to be used.

(1) The species on which measurements will be made must be defined.

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