MEAT GRADING INSTRUMENT MONITORING PROCEDURES

1. Purpose

The U.S. Department of Agriculture (USDA), Agricultural Marketing Service (AMS), Livestock and Poultry (L&P) Program, Standards and Specifications Division (SSD) has implemented a program to monitor performance of instruments used in the official assignment of grades or factors that are utilized as a means of commerce. Applicants who choose to utilize the instruments as a tool to assist USDA, Quality Assessment Division (QAD) graders or who utilize the instruments to provide factors will be required to adhere to procedures outlined in this document.

The performance requirements outlined in this document were established after consultation with an Industry Working Group that was convened by the L&P Program and the American Meat Science Association (AMSA). The Industry Working group was comprised of representatives of USDA, AMSA, the National Cattlemen's Beef Association (NCBA), beef processing companies, technology providers, and academia.

2. Scope

The intent of this document is to provide a framework for evaluation of instruments in the production setting. The framework will consist of a tier style evaluation. The frequency of evaluation will change at each tier level.

3. Daily – Data Submission and Reporting

3.1 Applicant Responsibility

3.1.1 The applicant will utilize the universal touchscreen design for AMS grader touchscreens

3.1.2 Each workday, the applicant shall provide data on quality numbers, volume, and overrides generated by the universal touchscreens to AMS through AMS's secure website for downloading data (put in website link here)

3.2 AMS Responsibility

3.2.1 AMS will provide passwords to each applicant for submission of data into the AMS website

3.2.2 AMS will monitor volume and override data

4 Weekly - Variance Report

4.1 Applicant Responsibility

4.1.1 On a weekly basis, the applicants will submit a variance report to AMS of their instrument quality grade call versus the final USDA grade applied.

4.1.2 The variance report must be submitted to AMS no later than 3 business days from the last day of the production week. (See Addendum A for example of Variance Report)

4.2 AMS Responsibility

4.2.1 AMS will evaluate variance reports.

5 Monthly – Software Validation

5.1 Applicant Responsibility

5.1.1 Upon receiving the known images from AMS, the applicant will process it through the instrument's software to generate predicted values.

5.1.2 The plant will provide AMS with the predicted values within 1 hour of receipt of the known images.

5.1.3 The applicant must allow USDA grading staff to visually verify the software processing and generation of predicted values

5.1.4 If AMS notifies the plant that its predicted values do not match the known values, it must move to traditional grading.

A. The plant cannot switch to another instrument.

5.1.5 The plant will remain traditionally grading until it can prove that the software running in its system has not been altered in any manner from that which was originally approved.

5.2 AMS Responsibility

5.2.1 Maintain a database of a minimum of 400 known images.

5.2.2 Provide a minimum of 20 randomly selected images to the plant on a bi-weekly basis.

A. AMS may provide images in addition to this bi-weekly basis if concerns

with a specific software exist

5.2.3 Upon receipt of the prediction output from the plant, AMS will evaluate the predictions against the known values.

5.2.4 If predicted values do not match known values, AMS will notify the plant that it will have to move to traditional grading until it can show that the software has not been altered from that which was approved.

6 Monthly – Internal Side by Side Testing

6.1 Applicant Responsibility

6.1.1 On a monthly basis, the plant will evaluate its instruments (all working instruments including backup and re-grade instruments) against each other

6.1.2 The plant will conduct tests which consist of 200 sides or 8% (ie., 5000 hd/day = 400 side test) of the daily grading whichever is larger.

a. If a plant has 3 or more instruments to be tested, each pairing of instruments will be tested

i. For example, on a three-instrument plant the tests will consist of:

1. Instrument A x Instrument B
2. Instrument A x Instrument C
3. Instrument B x Instrument C

6.1.3 No more than 70% of the images utilized in the testing shall come from the same side (i.e., left side and right side)

6.1.4 Operators involved in the testing shall swap halfway through the test to ensure operator placement error is nullified.

6.1.5 After the plant has conducted its testing, the plant will submit its data points to SSD within one week of collection. Utilizing this data, SSD will generate a R^2 value and a standard deviation of the residuals (RSD) value. The RSD should be less than 20 and the R^2 value shall be greater than 0.95.

6.1.6 SSD will notify the facility of the results, through email, once the data analysis is completed.

6.1.7 If the instruments do not meet the requirements set above, the plant will schedule a servicing of the instruments within 2 weeks of testing.

6.1.8 Instruments will be allowed to stay in production until servicing provided the servicing occurs within the two weeks from determination of test results.

6.1.9 Small plants (less than 500 hd/day) will be eligible for a variance.

6.2 AMS Responsibility

6.2.1 AMS will monitor receipt of results and data plots to ensure testing is occurring monthly.

6.2.2 If a plant needs to schedule maintenance of a group of instruments, AMS will review servicing paperwork at the end of the month to ensure that the maintenance has occurred.

7 Tier V – Annual External Side by Side Testing

7.1 Applicant Responsibility

7.1.1 The applicant will ensure that the instrument identified by AMS is being utilized in the main grading area, on the day of testing.

7.1.2 The applicant will instruct its instrument operator to rotate with the AMS operator when requested by AMS

7.1.3 The applicant will provide AMS with images and data within 24 hours of submission of carcass identifiers by AMS personnel

7.1.4 The applicant will remove the instrument from service, if requested by AMS, for failing to meet the requirements set forth in this document.

7.1.4.1 The applicant will have the instrument serviced prior to utilizing it, if it is removed due to a failure.

7.2 AMS Responsibility

7.2.1 On an annual basis, AMS will evaluate a facility's instrument in a side-by-side test.

7.2.2 Identification of the instrument to be tested.

7.2.2.1 AMS will notify intent of schedule for testing a minimum of one week prior to testing.

7.2.2.2 AMS will randomly select one instrument utilized at a facility for testing.

7.2.2.3 AMS will provide the facility with the identifier of the instrument subject to testing, one business day prior to the scheduled test date.

7.2.3 Testing of the instrument.

7.2.3.1 AMS will collect images of 300 carcass sides

7.2.3.2 No more than 70% of the images shall come from one side (i.e., left side and right side).

7.2.3.3 Operators will collect 50 sides and then alternate to the other side, until a minimum of 300 images are collected

7.2.3.4 The AMS operator will rotate with the plant operator when able

7.2.3.5 After AMS has conducted its testing, it will plot its data points. Utilizing this data plot, the AMS will generate a R^2 value and a standard deviation of the residuals (RSD) value. The RSD should be less than 20 and the R^2 value shall be greater than 0.95.

7.2.3.6 AMS may request ribeye area, fat thickness, and final yield grade data for the carcasses imaged. The data may be used for evaluation of the instruments. The data may be provided to the USDA AMS Packers and Stockyards Division for verification of adherence to its requirements upon request.

7.2.3.7 If the instrument does not meet the requirements set above, the instrument will be removed from service until the applicant has it serviced

7.2.3.8 Small plants (less than 500 hd/day) will be eligible for a variance in the number of carcasses collected.

8 Annual - Instrument to Expert Testing

8.1 Applicant Responsibility

8.1.1 The applicant will ensure that the instrument identified by AMS is being utilized in the main grading area, on the day of testing.

8.1.2 The applicant will provide AMS with images and data within 24 hours of submission of carcass identifiers by AMS personnel

8.1.3 The applicant will remove the instrument from service, if requested by AMS, for failing to meet the requirements set forth in this document.

8.1.3.1 The applicant will have the instrument serviced prior to returning it to service, if it is removed due to a failure.

8.2 AMS Responsibility

8.2.1 On an annual basis, AMS will evaluate a facility's instrument in an expert to instrument test.

8.2.2 Identification of the instrument to be tested.

8.2.2.1 AMS will notify intent of schedule for testing a minimum of one week prior to testing.

8.2.2.2 AMS will randomly select one instrument utilized at a facility for testing.

8.2.2.3 AMS will provide the facility with the identifier of the instrument subject to testing, one business day prior to the scheduled test date.

8.2.3 Testing of the instrument.

MARBLING

8.2.3.1 AMS will provide a 3-member panel from its "Gold Standard Team"

8.2.3.2 AMS will collect marbling scores of 300 carcass sides for marbling prediction accuracy

8.2.3.3 No more than 70% of the images shall come from one side (i.e., left side and right side).

8.2.3.4 Experts will collect marbling scores on 50 sides and then alternate to the other side, until a minimum of 300 images are collected

8.2.3.5 AMS will provide the facility with a list of carcass identifiers from the carcasses utilized in the testing

8.2.3.6 After AMS has conducted its testing, it will plot its data points.

8.2.3.7 AMS will generate a mean expert marbling score by averaging the scores of the experts for a carcass. If a single expert marbling score is greater than 30 marbling units from the generated mean expert marbling score, the carcass will be thrown out of the data set.

8.2.3.8 Utilizing this data plot, AMS will generate a R^2 value, a mean and a standard deviation of the residuals (RSD) value. The mean of the RSD shall be 0 ± 40 marbling units, the standard deviation of the residuals shall ≤ 45 marbling units, and the R^2 value shall be greater than 0.90.

8.2.3.9 If the instrument does not meet the requirements set above, the instrument will be removed from service until the applicant has it serviced

8.2.3.10 Small plants (less than 500 hd/day) will be eligible for a variance in the number of carcasses collected.

REA and Yield Grade

8.2.3.11 AMS will collect rib eye are and yield grade factors on 10 carcasses.

8.2.3.12 Both sides (i.e., left side or right side) of each carcass will be measured.

8.2.3.13 AMS experts will independently measure ribeye area, measure fat thickness, and determine an overall final yield grade for each carcass side. (Experts will not generate a yield grade for the whole carcass using the “high side” method.)

8.2.3.14 AMS will provide the facility with a list of the carcasses utilized in testing.

8.2.3.15 After AMS has conducted its testing, it will plot its data points.

8.2.3.16 AMS will generate a Mean Expert Score (for ribeye area, fat thickness, and final yield grade) for each carcass side.

8.2.3.17 Utilizing this data plot, AMS will generate a mean and standard deviation of the residuals (RSD) for ribeye area, fat thickness, and final yield grade for each carcass side. The standard deviation of the RSD of ribeye area shall not exceed 0.80 square inches. 95% of the ribeye area observations shall be within 0.75 square inches of the mean ribeye area determined by the experts. 95% of the predicted fat thickness observations within 0.1 inches of the mean expert fat thickness score. The average of the residuals for fat thickness shall equal 0 ± 0.5 inches. 95% of the predicted final yield grades within 0.3 yield grade units of the mean expert final yield grade. The residual standard deviation (RSD) shall not exceed 0.25 yield grade units.

8.2.3.18 If the instrument does not meet the requirements set above, the instrument will be removed from service until the applicant has it serviced.

9 Miscellaneous

The instrument manufacturer must allow LP personnel access to the unencrypted software coding for an instrument immediately upon request by LP. Immediate view of a specific instrument's coding will be required (no generalized coding will be accepted.)

This standard is subject to revision at any time by the L&P Program.

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