RESEARCHREPORT

ANIMAL SCIENCE — Nutritional Efficiency Consortium

Title: Development of equations to predict the metabolizable energy content of distillers dried grains with solubles (DDGS) samples from a wide variety of sources – **NPB #08-174**

Investigator: Michael Ellis[1]

Institutions: [1]University of Illinois; [2]The Maschhoffs, Carlyle, IL, [3]Pioneer Hi-Bred, Johnston, IA

Co-Investigators: Omarh Mendoza[1], Aaron Gaines[2], Matt Kocher[2], Tom Sauber[3], Daniel Jones[3];

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Industry Summary:

Distillers Dried Grains with Solubles (DDGS), a byproduct of ethanol production from corn that is becoming available in increasing quantities, is a potentially valuable ingredient for use in diets for swine. However, DDGS is very variable in composition both within and between sources (ethanol plants). This variability in nutritional value of DDGS reflects both variation in the composition of the corn going into the ethanol fermentation process and also variation in processing conditions. Economical use of any feed ingredient for pigs depends on accurate information being available on its nutrient composition and metabolizable energy (ME) content. In practice, the ME content of DDGS is generally estimated using prediction equations based on its chemical composition; however, published equations currently widely used by the industry give a range of ME values for the same sample of DDGS.

The objective of this study was to develop regression equations to predict the metabolizable energy (ME) content of DDGS based on chemical composition. The study used DDGS samples obtained from 17 sources (Midwestern ethanol plants) that were chosen to represent the variation in nutrient content currently available to the industry. The DDGS samples varied widely in particle size and those above a target particle size of 340 μm (15 of the 17 samples) were ground through a hammermill to a common particle size.

The DE and ME contents of the 18 experimental diets (a corn-based control and the 17 DDGS sample diets) were measured using a standard energy balance study involving 36 barrows housed individually in metabolism crates. The experimental diets were fed for a 7-day period which consisted of a 4-day adaptation period followed by a 3-day collection period during which total but separate collection of feces and urine was carried out. Gross energy of diets, feces and urine were determined by bomb calorimetry. Chemical composition (crude protein, crude fat, crude fiber, ADF, NDF, ash, and starch) of each DDGS sample was analyzed by two independent commercial laboratories. Equations to predict the ME content based on chemical composition and particle size after grinding

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were developed. To test for differences between laboratories, equations were developed based on the chemical analysis of each laboratory separately and for the average of the results of the two laboratories.

There was considerable variation in the energy content and chemical composition of the 17 DDGS samples. In addition, there were relatively large differences between the results of the chemical analysis for the two laboratories for a number of the chemical components, particularly, crude fat, ADF, NDF, and starch. The DE and ME values for the corn sample determined in the energy balance study (3,893 ± 71.4 and 3,813 ± 60.6 kcal ME/kg DM, respectively) were within the range of previously reported values for corn. The DE content of the DDGS samples, determined by the difference method, ranged from 3,663 to 4,107 (mean 3,954 ± 112.5) kcal/kg DM and the ME content from 3,381 to 3,876 (mean 3,700 ± 118.7) kcal/kg DM. Thus, the DDGS samples selected for use in this study represented a considerable range in nutrient and energy contents and provided a representative sample of the DDGS materials available to the industry. The prediction equations developed in this study should, therefore, apply to DDGS samples from ethanol plants in the Midwest that are currently supplying product to the swine industry.

In general, correlations between chemical composition components and the DE and ME content of DDGS were relatively weak and, also, differed between the two laboratories. For Laboratory 1, the strongest correlations with DE and ME were for ADF (-0.51 and -0.50, respectively). In contrast, the strongest correlations for DE and ME for Laboratory 2 were with crude fat (0.60 and 0.67, respectively) and crude fiber (-0.56 and -0.52, respectively). Equations to predict the ME of DDGS based on chemical components also differed between laboratories. Equations based on proximate analysis components (ash, crude protein, crude fat, and crude fiber), either individually or in any combination, were relatively poor predictors of ME content. Adding other components to the 4-variable equation based on proximate analysis components, particularly ADF, NDF, and GE, to create 6- or 7-variable equations improved the accuracy of prediction of the ME of DDGS. There was little increase in the accuracy of prediction for equations with more than 7 variables. Equations were developed for the chemical components other than proximate analysis; for these, the 3-variable equation that explained the greatest variation in the ME content of DDGS was based on ADF, NDF, and GE for both laboratories.

This study clearly highlighted the very large variation that is found in practice in the chemical composition and energy content of DGGS samples from different sources in the Midwest of the US. In addition, equations have been developed to predict the ME content of DDGS based on chemical composition. A critically important finding is that these equations differed between the two laboratories used for the chemical analysis. As in many situations, the choice of the most appropriate equation to use will be based on a balance between the accuracy of the equation compared to the costs of carrying out the chemical analyses. Equations based on all possible combinations of the chemical components determined in this study are presented in this report to allow individuals to choose the equation that is most appropriate for the particular situation. These prediction equations relate to ground DDGS samples with a particle size within the range 265 to 403. However, it is important that these equations are fully validated before widespread application can be recommended.

For Further Information contact:
Dr. Mike Ellis
1207 West Gregory Dr.
216 ASL
Urbana-Champaign, 61820
Office: 217.333-6455
mellis7@illinois.edu

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Scientific Abstract:

The objective of this study was to develop regression equations to predict the metabolizable energy (ME) content of DDGS based on its chemical composition. The study used DDGS samples obtained from 17 sources (ethanol plants) that were chosen to represent the variation in nutrient content currently available to the industry in the US. The mean particle size of the samples (as-received) was 665.8 ± 284.4 μm, with a range from 265 to 1557 μm. Consequently, 15 of the 17 samples were ground through a hammermill to a particle size of 344 ± 36 μm; 2 of the samples had relatively low initial particle sizes of 265 and 318 μm and were not ground.

The DE and ME contents of 18 experimental diets (a corn-based control and the 17 DDGS sample diets) were measured in a standard energy balance study carried out in metabolism crates. The corn-based control diet contained 89.5% corn supplemented with 8.0% sodium caseinate, 1.0% limestone, 0.65% dicalcium phosphate, and 0.85% minerals and vitamins; for the DDGS diets, 50.4% of the corn was replaced with the respective sample of DDGS. Barrows (17.2 ± 0.9 kg initial BW; n = 18) were used in an incomplete block design (block = adaptation/collection period) with the corn-based control diet and each of the DDGS diets being fed to a total of 36 and 8 pigs, respectively. Experimental diets were fed for 7 d consisting of a 4-day adaptation period followed by a 3-day collection period during which total collection of feces and urine was carried out. Gross energy of diets, feces, and urine were determined by bomb calorimetry. Chemical composition (crude protein, crude fat, crude fiber, ADF, NDF, ash, and starch) of each DDGS sample was analyzed by two independent commercial laboratories. Equations to predict the ME content based on chemical composition and particle size after grinding were developed using the R-square selection method of the PROC REG procedure of SAS. To test for differences between laboratories, equations were developed based on the chemical analysis of each laboratory separately and for the average of the results of the two laboratories.

There was considerable variation in the energy content and chemical composition of the 17 DDGS samples. For example, the mean GE content was 5311 ± 64.4 kcal/kg DM, with a range from 5,177 to 5,421 kcal/kg DM; equivalent values for chemical composition (average of the results of the two laboratories) were: Ash 4.45 ± 0.51 %, 3.50 to 5.59 %; Crude Protein 30.28 ± 1.28 %, 27.30 to 33.34 %; Crude Fat 11.65 ± 1.53 %, 8.72 to 14.63; Crude Fiber 7.52 ± 0.72 %, 5.87 to 8.87 %; ADF 12.52 ± 2.13 %, 9.12 to 17.90 %; NDF 34.57 ± 6.41, 25.30 to 43.51 %; Starch 4.74 ± 1.96, 1.63 to 9.08. There were relatively large differences between the results of the chemical analysis for the two laboratories for a number of the chemical components particularly crude fat (10.51 vs. 12.78 % for Laboratory 1 and 2, respectively), ADF (13.05 vs. 11.98 %, respectively), NDF (28.90 vs. 40.23 %, respectively), and starch (5.49 vs. 3.98 %, respectively).

The DE and ME values for corn determined in the energy balance study were 3,893 ± 71.4 and 3,813 ± 60.6 kcal ME/kg DM, respectively (Table 4). The DE content of the DDGS samples, determined by the difference method, ranged from 3,663 to 4,107 (mean 3,954 ±112.5) kcal/kg DM and the ME content from 3,381 to 3,876 (mean 3,700 ± 118.7) kcal/kg DM (Table 4).

In general, correlations between chemical composition and the DE and ME value of DDGS were relatively weak and differed between the two laboratories. For Laboratory 1, the strongest correlations with DE and ME were for ADF (-0.51 and -0.50, respectively). In contrast, the strongest correlations with DE and ME for Laboratory 2 were for crude fat (0.60 and 0.67, respectively) and crude fiber (-0.56 and -0.52, respectively). Equations to predict the ME of DDGS based on chemical components also differed between laboratories. Equations based on proximate analysis components (ash, crude protein, crude fat, and crude fiber), either individually or in any combination, were relatively poor predictors of ME content. For example R^2 values for the 4-variable equation including all proximate analysis components were 0.33 and 0.58 for Laboratory 1 and 2, respectively. Adding other chemical components to the 4-variable equation based on proximate analysis increased R^2 values. For example, the 7-variable equation that included ADF, NDF, and GE with the 4 proximate analysis components had R^2 of 0.78 and 0.80 for Laboratory 1 and 2, respectively. There was little increase in R^2 values from including additional variables beyond these 7. Equations were developed based on the chemical components other than proximate analysis. For these equations, there was little increase in R^2 values beyond the 3-variable equation which for Laboratory 1 included ADF, NDF, and GE for both laboratories (R^2 of 0.72 and 0.58 for Laboratory 1 and 2, respectively).

This study highlights the large variation that is found in practice in the nutrient composition and energy content of DDGS samples from different sources in the Midwest of the US. In addition, equations have been developed to predict the ME content of DDGS based on chemical composition. A critically important finding is that these equations differed between the two laboratories used for the chemical analysis. As in many situations, the

choice of the most appropriate equation to use will be based on a balance between the accuracy of the equation compared to the costs of carrying out the chemical analyses. Equations based on all possible combinations of the chemical components determined in this study are presented in this report to allow individuals to choose the equation that is most appropriate for the particular situation. These prediction equations relate to ground DDGS samples with a particle size within the range 265 to 403. However, further study is required to validate these equations before their widespread adoption can be recommended.

Introduction:

In the U.S., increases in the production of ethanol from corn has resulted in an increasing amount of the major co-product, Distiller's Dried Grains with Solubles (DDGS), becoming available for use in swine diets. Given the high feed costs currently being experienced by the swine industry, it is essential that all feed ingredients, including DDGS, are utilized as efficiently as possible in order to minimize production costs. The starting point for efficient use of any feed ingredient is an accurate estimate of the nutrient and metabolizable energy (ME) content for the pig. Gaines et al. (2007) reviewed published estimates of the ME content of DDGS and found that these were highly variable, both between sources (ethanol plants) and between different batches of DDGS from the same source. This variation in DDGS is not surprising given that corn also exhibits large batch to batch variation in ME content (Kim, 1999). However, there are other potential sources of variation that are specific to DDGS that could result in even greater variability in the ME content of this feedstuff. For example, it has long been recognized that ME and available amino acid content of DDGS from "old generation" ethanol plants (constructed prior to 1990) is substantially lower than that from "new generation" plants. This variation is most likely due to differences in processing techniques between plants and resultant differences in heat damage to DDGS which can damage proteins and result in Maillard reaction products that can tie up available carbohydrates (Gibson and Karges, 2006).

Published estimates of energy values for DDGS show wide variation. Relative to NRC (1998) values for the ME content of corn (3843 kcal/kg DM, respectively), ME values for "new generation" DDGS measured in digestibility studies range from 3,897 (Pedersen et al. (2007) to 3,940 (Allee et al., 2005) kcal/kg DM or from approximately 101 to 105% of the NRC value for corn. Spiehs et al. (2002) found that the ME value of "new generation" DDGS calculated from the equation of Noblet and Perez (1993) averaged approximately 98% of the ME content of corn with a range from approximately 88 to 107 %. Calculated ME values for "old generation" DDGS were only 92% of corn (Spiehs et al., 2002). In addition, some ethanol plants are removing a portion of the oil from DDGS and this practice is likely to increase the variability in ME content between sources.

Practically, variability in energy content between different batches of the same feedstuff can be accounted for by using prediction equations based on the chemical composition of each batch. However, there has been limited research to develop prediction equations specifically for DDGS. Equations that are currently available to predict the ME content of DDGS based on chemical composition (Noblet and Perez, 1993; Pedersen et al., 2007) give widely different values for the same sample resulting in confusion over the most appropriate equation to use. Over- or under-estimation of the energy value of DDGS is very costly for swine producers particularly given current high feed costs.

The project presented in this report is aimed to develop prediction equations that can be used with the range of materials currently available from Midwestern ethanol plants to accurately predict the ME content of DDGS. Such equations are needed to exploit the full nutritional and economic value of DDGS and to minimize the feed costs of producing swine.

Objectives:

The overall objective of this research project was to develop equations that accurately predict the ME value of DDGS samples from a wide variety of sources (ethanol plants).

This objective was accomplished via two sub-objectives as follows:

i. Directly measure the ME content using digestibility studies of samples of DDGS selected to represent the variation in terms of nutrient and energy content currently available in the Midwest.

ii. Develop regression equations that accurately predict the ME content of DDGS from the sources currently available in the Midwest using the energy values directly measured in the first sub-objective and based on chemical composition of the samples.

Materials and Methods:

Sub-objective i. Directly measure the ME content using digestibility studies of samples of DDGS selected to represent the diversity in terms of nutrient content currently available in the US.

This sub-objective was accomplished using a standard energy balance trial to determine ME values of a range of DDGS samples and of a corn-based control sample.

Materials Evaluated:

This study used a total of 17 samples of DDGS which were chosen to represent the variation in chemical composition and energy content that is commonly observed in commercial samples of DDGS from the major ethanol plants in the Midwest. A control sample of corn was also evaluated for comparison to DDGS giving a total of 18 samples for evaluation. Choice of DDGS samples was based on the database of DDGS composition of the University of Minnesota website (http://www.ddgs.umn.edu) to ensure that the samples selected covered the expected range of composition available to the commercial industry. Approximately 300 lb (136 kg) of each of the test materials was delivered to the Pioneer Livestock Nutrition Center (Pioneer Hi-Bred, 4780 NW 158th Ave., Polk City, IA 50226) four weeks before the start of the trial to allow sufficient time for diet preparation. Samples were obtained in June-July 2008 and the digestibility study was carried out in August to October 2008.

The geometric particle size of each DDGS sample was measured on receipt using a Rotap sieve shaker (model RX-29, W.S. Tyler Co, Cleveland, OH) and the results for the 17 samples as received are presented in Table 1. The mean particle size for all samples was 665.8 ± 284.4 μm with a range from 265 to 1557 μm. As particle size can have a major influence on the digestibility of nutrients in any feed ingredient, 15 of the 17 DDGS samples were ground using a hammer mill to a target particle size of 340 μm in an attempt to ensure that all samples had a similar particle size. The particle sizes of the ground samples was determined as described above and these are also presented in Table 1.

Experimental Design:

The study was carried out using an incomplete block design (block = group of 18 crates). A total of 18 different dietary treatments plus a corn control sample treatment were compared as follows:

Dietary treatment	Number of samples
DDGS - unprocessed (particle size as-received)	2
DDGS – ground to common particle size	15
Corn sample	1

A total of nine adaptation/collection periods each of seven days in duration were carried out. A minimum of one replication for each DDGS source and 4 for the corn control sample were included in each adaptation/collection period for a total of 8 and 36 replications for each DDGS source and the corn sample, respectively. Pigs were randomized to treatments for the nine adaptation/collection periods with the restriction that pigs received each of the dietary treatments only once.

Housing:

The facility consisted of two identical environmentally controlled rooms with 18 metabolism pens per room for a total of 36 pens. Pens (Thorpe Equipment Co., Thorpe, WI) 0.71m x 1.63m x 0.36m and were fitted with adjustable rear and top panels, a feeder (0.61m x 0.23m), and a nipple-type water drinker. Temperature in the rooms was maintained between 65° and 70° F and the rooms were ventilated at the rate of approximately 12 air changes per hour. The lighting was on between 0730 and 1600 hours each day.

Animals:

The same group of pigs was used throughout the study. A uniform set of 42 commercial barrows (18 for the study and 6 spares) of the same genetic background and with an average initial weight of 17.2 ± 0.9 kg were obtained from a herd with a high health status and transported to the Center for use in the study.

Experimental Diet Composition and Preparation:

All diets were formulated to supply sufficient nutrients to support normal pig growth. For the corn sample diet, corn (89.5% of the diet) was supplemented with casein, an indigestible marker, and minerals and vitamins (Table 2). Casein was used as the amino acid source because of its high digestibility and favorable amino acid balance. A commercially available vitamin/trace mineral premix was used. The test diets were produced by substituting 50.4% of the corn with one of the DDGS samples (Table 2). The dietary treatments were fed during both the adaptation and collection periods. Chromic oxide was included in the diet used for all feedings during the adaptation and collection periods with the exception of the first and last feedings of the collection period (0730 on Sunday and 0730 on Wednesday) when ferric oxide was included as the start and stop marker, respectively.

Animal Care and Feeding:

The general condition of each pig was observed daily and any health related issues were recorded and addressed based on the recommendations of the attending veterinarian. During both the adaptation and the collection periods pigs were fed twice daily at 0730 and 1400. Each crate was checked immediately after feeding and any feed on the front screens or floor was added back to the feeder in order to minimize feed wastage. Water was available to the pigs on a restricted basis from 0730 to 0900 and 1400 to 1530 daily to minimize water wastage and variation in urine output.

Feeding Level:

The target daily feed intake was three times the maintenance ME requirement. The quantity of feed offered was calculated from the body weight at the start of each collection/adaptation period using the following assumptions:

Maintenance ME requirement = 106 kcal/$kg^{0.75}$ (NRC 1998)

Corn ME:GE ratio = 0.88

ME content of casein = 3535 kcal/kg, 9% moisture basis (NRC 1998)

Based on these assumptions, the amount of feed offered daily was calculated using the following equation:

Daily feed offered, kg = (BW, $kg^{0.75}$ x 106 kcal/$kg^{0.75}$)/[Test material in diet (%) x GE of test material x GE x (100 - moisture content of test material) x 0.88] + [casein in diet (%) x 3535 kcal/kg]

Where BW = body weight (kg) and GE = gross energy (kcal/kg)

Adaptation/Collection Period:

A total of nine weeks were required to complete the experiment, consisting of 9 adaptation/collection periods. Each adaptation/collection period consisted of four days of adaptation and three days of fecal and urine collection. Throughout both periods, animals were fed twice daily at 0730 and 1400. The adaptation period began on Wednesday at the 1600 feeding while the collection period began on Sunday at the 0730 feeding and ended on Wednesday after the 0730 feeding. The adaptation period for the subsequent period began on Wednesday with the 1600 feeding. Chromic oxide was used to enhance fecal color uniformity and was added to the diet for all feedings with the exception of those at the start and end of the collection period. Ferric oxide was used as a start/stop marker for fecal collection and was added to the diet on Sunday 0730 and Wednesday 0730. Pigs received a different dietary treatment for each adaptation/collection period such that by the end of the experimental period there were a total of 8 and 36 replications for the DDGS and corn treatments, respectively.

Fecal Collection Procedures:

The objective was to quantitatively and separately collect all feces and urine resulting from the digestion and metabolism of the test diet consumed during the 3-day collection period. Fecal collection began upon visual appearance of the start marker (approximately 12 to 24 hours after feeding the marker at 0730 on Sunday). From Sunday 1600 through Tuesday 1600, the test diet with chromic oxide but without ferric oxide was offered. On Wednesday 0730 ferric oxide (0.30%) was again added to the test diet and fecal collection continued until the stop marker appeared (feces containing the stop marker were not collected). Feces were collected twice daily during the collection period and were dried immediately after collection in a forced air oven where they were kept for 7 days at 62ºC.

Urine Collection Procedures:

Urine collection was carried out from 0930 on the first day (Sunday) to 1030 of the last day (Wednesday) of each collection period. Urine collection vessels containing 10 ml of 6N HCl were placed under each metabolism pen. The pH of the urine in the collection vessels was checked daily and maintained between 1.5 and 2.5 by the addition of 6N HCl as needed. At the end of each collection period, urine was diluted to achieve a total weight of 5 kg by adding water, and the pH was adjusted to between 2 to 3 by addition of 6N HCl. The diluted urine sample was then thoroughly mixed and a 250 ml sub-sample was collected into a plastic bottle, frozen, and submitted to the laboratory for analysis.

Data Collection and Handling:

All data were collected and managed using a proprietary data system that eliminated manual data entry, which minimized potential errors due to transcription of data, and reduced time required for data collection.

Sample Preparation and Analysis:

Feces: The dried feces samples from each pig for the collection period were weighed, composited, and placed into a re-sealable bag which was labeled with the pig number and test sample identification. The composite fecal sample was ground in a Wiley mill through a 6 mm screen. A 30 g sub-sample was taken and ground in a Knifetech grinder. Dry matter was determined by drying the sub-sample at 135ºC for 2 hours (procedure 930.15; AOAC, 2005).

Urine: The 250 ml sub-sample of the urine collected from each pig was taken, frozen, and submitted to the laboratory for analysis.

Analytical Procedures:

Dry Matter and Gross Energy and Chemical Composition Determination: Approximately 50 g of each of the test diets was ground using a Knifetech Model 1095 sample mill. Dry matter was determined in duplicate for each sample by drying in an oven at 135ºC for 2 hours (procedure 930.15; AOAC, 2005). The dry matter content of the diets was used to calculate the dry matter intake of the pigs. Energy content of the corn, DDGS, experimental diets, feces, and urine samples was determined in the laboratories of Pioneer Hi-Bred using bomb calorimetry (Parr Instruments, Moline, IL) with the analysis being carried out in duplicate. Urine samples were placed onto Solka-Floc® and dried to produce a mixture with 16 to 18% urine by weight which was subjected to bomb calorimetry determination. Samples of corn, DDGS, and diets were also analyzed for crude protein, ash, ether extract, starch, crude fiber, ADF, and NDF.

The chemical analyses were carried out at two independent widely-used commercial laboratories to test for between laboratory variation in the results of the analyses. Details of the analytical methodology used by the two laboratories are presented in Table 3.

Calculations:

All concentrations used in the calculations were expressed on a dry matter (DM) basis. The following calculations were used:

Dry matter digestibility, % = [(DM intake - DM in feces)/DM intake] x 100

Energy digestibility, % = [(Energy intake - Energy in feces)/Energy intake] x 100

Energy metabolizability, % = [(Energy intake - Energy in feces - Energy in urine)/Energy intake] x 100

By subtracting the DE and ME contributed by the corn to the corn-DDGS diets, the DE and ME contributed by each source of DDGS was calculated by difference.

Sub-objective ii. Develop equations that accurately predict the ME content of DDGS from the sources currently available in the US using the ME values directly measured in the first sub-objective and based on chemical composition of the samples.

The data collected in the study carried out to address *Sub-objective i.* described above were used to develop equations to predict the ME content of DDGS samples.

Data validation:

Data were checked for outliers (defined as any data point ± 3 SD from the grand mean); outliers were removed from the data set prior to statistical analysis.

Statistical analysis:

Energy balance data were analyzed using the PROC MIXED procedure of SAS (Littell et al., 1996; SAS Inst. Inc., Cary, NC.). Prior to analysis, the homogeneity of each variable was verified using the PROC UNIVARIATE procedure of SAS. The effect of DDGS sample on daily energy balance was evaluated using PROC MIXED of SAS with the model including the fixed effects of DDGS and the value for the corn sample for each specific variable as a covariate, and the random effects of collection period, room nested within collection period, and pig nested within room. The LSMEANS procedure was used to estimate mean values, and the PDIFF option used to separate means.

Equations to predict the ME content of DDGS based on chemical components (crude protein, crude fat, ash, crude fiber, ADF, NDF, starch, and GE) and particle size were developed using the PROC REG® procedures of SAS (Littell et al., 1996; SAS Inst. Inc., Cary, NC.) and the R-square model selection option. Models were developed for the dependent variable (ME content of DDGS). The choice of equations was made using the R^2 and C(p) statistic (as described by Mallows, 1973) with the equation giving the highest R^2 and the C(p) value closest to the number of parameters in the model being chosen.

Results:

Analyzed composition of the DDGS samples and experimental diets:

Descriptive statistics for the analyzed composition of all of the DDGS samples evaluated in the study are presented in Table 4, with the analyzed composition of the 17 samples for the analysis carried out by Laboratory 1, Laboratory 2, and combined analysis (the average of the results for the two laboratories) being presented in Table 5.

Overall mean values for ash, crude protein, and crude fiber content of the 17 samples were relatively similar for the analyses carried out by the two laboratories (Table 4). However, for the other chemical components (i.e., crude fat, ADF, NDF, and starch) there were relatively large differences between the mean values from the two laboratories. For example, the value for NDF showed a between laboratory difference of 11.3 percentage units and the value for starch content was 38% greater for Laboratory 1 compared to Laboratory 2. In addition, the variation in composition between the 17 samples was also different between laboratories for a number of the chemical components. This is illustrated by both the standard deviation and coefficient of variation (Table 4) and the range in values between samples observed for the two laboratories for a number of the components (Tables 5). For example, the standard deviation of crude fat content measured by Laboratory 2 was 20% greater than that for Laboratory 1 (Table 4) and the between-laboratory range in crude fat levels for the 17 DDGS samples from Laboratory 1 was from 8.7% to 11.5% (Table 5) and for Laboratory 2 was from 9.5 to 14.6% (Table 5b).

The determination of the energy values of the DDGS samples was based on analyses carried out by a different laboratory than the two laboratories used for the chemical analysis. Descriptive statistics for GE, DE, and ME are also presented in Table 4. The mean GE content of the 17 DDGS samples was 5311 kcal/kg. However, there was considerable variation between the DDGS samples for GE content (Table 5) with the lowest value being for DDGS sample 1 (5,177 kcal/kg DM) and the highest value being for DDGS sample 3 (5,421 kcal/kg DM). Mean values for DE and ME were 3,954 ± 112.5 and 3,700 ± 118.7 kcal/kg DM with ranges from 3,663 to 4,107 and from 3,381 to 3,876 kcal/kg DM, respectively. The DE and ME values for corn determined in the energy balance study were 3,893 ± 71.4 and 3,813 ± 60.6 kcal ME/kg DM, respectively (Table 7).

The objective for the selection of the DDGS samples to use in this project was to provide samples that represented the variation in nutrient composition likely to be found between commercial samples in the US. The considerable range in nutrient composition and energy content observed between the 17 DDGS samples used in the study clearly demonstrates that this selection process was successful and that these were appropriate samples to use

to develop prediction equations that would apply to DDGS material representative of that available to the swine industry in the Midwest.

Digestibility Study:

The nutrient composition of the experimental diets for the corn control sample and 17 DDGS samples evaluated in the digestibility study are presented in Tables 6 for the analysis carried out by Laboratory 1 and 2. The variation in nutrient content between the diets (Table 6) reflected the variation observed between the nutrient composition of the DDGS samples (Table 5).

The daily energy balance for the experimental diets containing the corn and 17 DDGS samples is presented in Table 7. The digestibility and metabolizability of energy averaged across the DDGS sample experimental diets was 79.5% and 75.9%, respectively, with ranges from 77.4% to 81.4%, and 73.4% to 77.7%, respectively (Table 7).

The digestible and metabolizable energy contents of both the experimental diets and the DDGS samples (calculated by difference based on the corn control sample) are also presented in Table 7. The range in DE values for the 17 DDGS samples was from 3,663 to 4,107 kcal/kg, and the range in ME values was from 3,381 to 3,876 kcal/kg. These results illustrate that the 17 DDGS samples used in the study represented a considerable range in energy content and again indicate that these were appropriate samples to use to develop equations to predict the ME content of DDGS.

Correlations between DDGS Energy Content and Nutrient Composition:

The correlations between the nutrient and energy contents of the DDGS samples for the analyses carried out by Laboratory 1, Laboratory 2, and the average values for the two laboratories are presented in Table 8. The analysis of energy contents was carried out by a single laboratory different to those used for the chemical analysis. For both laboratories and for the combined data, most of the correlations between individual nutrients were low, not statistically significant ($P > 0.05$). In addition, the statistically significant correlations ($P < 0.05$) differed between laboratories. For Laboratory 1, ADF was negatively correlated with crude fat (-0.60) and NDF was negatively correlated with starch (-0.72). For Laboratory 2, the only significant correlations between nutrients were between ADF and crude protein (0.54), and between crude fiber and starch (-0.57). For the combined laboratory data, ADF was positively correlated with crude protein (0.47) and NDF (0.54) but negatively correlated with crude fat (-0.56) and NDF was negatively correlated with starch (-0.57).

The GE content of the DDGS samples was moderately correlated with DE and ME content (both correlations were 0.53), however, the correlation between DE and ME content was very strong (0.98). For both laboratories and the combined data, most nutrients showed relatively weak correlations with GE, DE, and ME content of DDGS (Table 8). The exceptions for Laboratory 1 were for ash and NDF that were correlated with GE (-0.71 and 0.50, respectively) and ADF that was negatively correlated with DE and ME (-0.51 and -0.50, respectively). For Laboratory 2 (Table 8), crude fat was positively correlated with GE, DE, and ME (0.58, 0.60, and 0.67, respectively) and crude fiber was negatively correlated with DE and ME (-0.56 and -0.52, respectively). For the combined laboratory data (Table 8), statistically significant correlations were for ash and NDF with GE (-0.68 and 0.48, respectively) and for crude fat with GE, DE, and ME (0.52, 0.49, and 0.54, respectively). The correlations between particle size (after grinding) and DE and ME were extremely low (-0.05 and -0.01, respectively for both laboratories; Table 8) and not significant ($P > 0.05$). The objective of grinding the DDGS samples was to remove any effect of particle size per se on DE and ME values and the lack of any correlation between particle size and DE and ME suggests that this objective was successfully accomplished.

The results of the correlation analysis are interesting and highlight an extremely important point which is that the chemical components that individually explained the greatest proportion of variation in the energy contents of DDGS differed between the two laboratories. In the case of Laboratory 1, only the ADF content of the sample was correlated with DE and ME content with this component explaining 26 and 25% of the variation in DE and ME of the DDGS samples, respectively. However, for Laboratory 2, both the crude fat and the crude fiber content explained a significant amount of the variation in DE and ME content between DDGS samples, accounting for between approximately 27% and 45% of this variation.

Regression Equations to Predict the ME Content of DDGS from Chemical Composition:

It should be borne in mind that the prediction equations presented in this report relate to ground DDGS samples with a particle size within the range 265 to 403. A total of 9 variables (ash, crude protein, crude fiber, crude fat, ADF, NDF, starch, GE, and particle size) could potentially be included in a regression equation to predict the ME content of DDGS. In addition, the 9 variables were available for the separate and combined analysis results for the two laboratories. Consequently, a large number of regression equations to predict ME content were generated, ranging from single to 9-variable equations, involving all possible combinations of the 9 variables and for the separate and combined laboratory analyses. For reference purposes, all of these equations are presented in Appendix Tables 1 through 9; a selection of the more important equations are presented and discussed in the body of the report.

Selected equations were initially chosen on the basis of the chemical composition information most commonly available commercially, which in many situations would start with the results of proximate analysis (ash, crude protein, crude fat, and crude fiber). In some situations, some or all of the additional components analyzed in this study (i. e., ADF, NDF, starch, GE, and particle size) may be available. Consequently, all possible prediction equations based on proximate analysis without or with the additional analytical components are presented in Tables 11a, 11b, and 11c for Laboratory 1, Laboratory 2, and the combined laboratory data, respectively. In addition, all possible prediction equations based only on the 5 additional analytical components are presented in Tables 12a, 12b, and 12c for Laboratory 1, Laboratory 2, and the combined laboratories. Also, the equations with from 1 to 9 variables with the greatest R^2 value selected from Tables 11a, 11b, and 11c are presented in Table 9. Similarly, the equations with from 1 to 5 variables with the greatest R^2 value selected from Tables 12a, 12b, and 12c are presented in Table 10.

A number of statistics were computed for all equations including the coefficient of determination (R^2), the C(p) value, and the residual standard deviation (RSD). The coefficient of determination represents the proportion of variation in the predicted variable (i.e., the ME content of the DDGS sample) explained by the regression equation (i.e., the variables included in the equation). Thus, the R^2 statistic can be used within a study to select the most appropriate equation, with the one giving the highest R^2 generally being the equation of choice. Therefore, in this report the comparison of equations will focus on discussion of the R^2 values with the other statistics being presented for reference.

Laboratory Effects on Prediction Equations:

There was considerable variation between laboratories both in terms of the components of proximate analysis that had the strongest relationship (highest R^2 value) with ME content and, also, for the actual parameters in the regression equations to estimate ME content. For example, the two-variable equation with the highest R^2 values based on proximate analysis components was based on ash and crude fat for Laboratory 1 (Equation number 5; Table 9) but included crude fat and crude fiber for Laboratory 2 (Equation 51; Table 9). There are numerous other examples of differences between the two laboratories used in this study for the regression relationships between chemical components of DDGS and the ME content. This has major implications for the use of equations to predict the ME content of DDGS, and perhaps other ingredients, based on chemical components because it implies that such equations are specific to the laboratory that carries out the chemical analysis. In other words, these findings suggest that prediction equations need to be developed for individual laboratories and the results of the chemical analysis carried out by one laboratory should not be used to estimate ME content based on an equation developed for another laboratory.

An obvious reason for differences between laboratories in the relationship between chemical components and ME of DDGS relates to the different methodology used for the chemical analysis (Table 3). Because of the major practical implications of this result it is important that further research is carried out to validate this finding ideally involving a greater number of laboratories than used in the present study, and to establish the reason(s) for this variation between laboratories.

Prediction Equations Based on Proximate Analysis:

Individual components of proximate analysis were relatively poor predictors of ME content (Table 9) with the best predictor being ash for Laboratory 1 ($R^2 = 0.20$; Equation number 1), and crude fat for both Laboratory 2 ($R^2 = 0.44$; Equation number 47) and also the combined analysis for the two laboratories ($R^2 = 0.29$; Equation number 93). In addition, including more than one component of proximate analysis in the regression equation resulted in

relatively small increases in R^2 values compared to the single-variable equations (Table 9). Including all four proximate analysis components in the prediction equation resulted in relatively low R^2 values [0.33 (Equation number 15), 0.58 (Equation number 61), and 0.43 (Equation number 107) for Laboratory 1 and 2, and the combined laboratories, respectively, suggesting that the proximate analysis components are relatively poor predictors of the ME content of DDGS.

Including other variables in the equation along with proximate analysis components increased R^2 values, with the magnitude of the increase decreasing as the number of variables in the equation increased. Thus, for Laboratory 1 the best five-variable equation (proximate analysis plus NDF; Equation number 16 had an R^2 value of 0.62 compared to 0.33 (Equation 15) for the 4-variable equation (Table 9). Adding additional variables to create six-variable and seven-variable equations increased R^2 to 0.74 (Equation number 21) and 0.78 (Equation number 31), respectively (Table 9).

Interestingly, for both laboratories and the combined data the seven-variable equation that had the highest R^2 value included proximate analysis and ADF, NDF, and GE (Equations number 31, 77, and 123; Table 9). There was little increase in R^2 values from including more than 7 variables in the equation.

Prediction equations based on ADF, NDF, starch, GE, and particle size:

Selected equations based on analytical components other than proximate analysis are presented in Table 10. Gross energy, which was analyzed by a different laboratory than the two used for analysis of chemical composition, had the strongest relationship with ME content (Equation number 139). However, the equation based on GE was not a good predictor of ME, having an R^2 value of only 0.28 (Table 10). Two-variable equations to predict ME included NDF and GE for Laboratories 1 and 2, and the combined laboratories, (Table 10) with R^2 values of 0.67, 0.54, and 0.64, respectively (Equation numbers 144, 175, and 206, respectively). There was little increase in R^2 values from including more than 2 variables in the equations based on the other analytical components (Table 10).

Discussion:

In many situations, the choice of the most appropriate equation to use to predict the ME content of DDGS, as with the choice of other prediction equations, is likely to be based on a compromise between the accuracy of the equation compared to the cost of the analyses. On balance, the results of the current study suggest that if proximate analysis is available the best equation, in terms of accuracy, would be based on proximate analysis and ADF, NDF, and GE. This equation gave similar R^2 values for the two laboratories (0.78 and 0.80, respectively) and the analyses involved are routinely carried out on feed samples in many situations. It should be emphasized that even though these two equations gave very similar R^2 values for the two laboratories, the parameters in the regression equations were considerably different for the two laboratories (Table 9). Simpler equations that would involve fewer analyses to be carried out have also been presented in this report. For example, in situations where proximate analysis is not available, two-variable equations based on NDF and GE were relatively accurate predictors of the ME content of DDGS having R^2 values of 0.67 and 0.54 for Laboratories 1 and 2, respectively.

It should also be borne in mind, particularly given the difference between laboratories observed, that the equations developed in this study and presented in this report have not been validated. A thorough validation of these equations based on a different set of DDGS samples other than those used in the current study and, also, using a wider range of laboratories to carry out the analysis, is an essential further step in the process before the widespread use of the equations presented here could be recommended.

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Table 1. Geometric mean particle size[1] of the DDGS samples as received and after grinding.

	Mean particle size, μm	
Sample number	*As received*	*Ground*
DDGS-01	1017	403
DDGS-02	740	393
DDGS-03	497	337
DDGS-04	637	354
DDGS-05	578	360
DDGS-06	534	300
DDGS-07	753	361
DDGS-08	566	307
DDGS-09	1557	351
DDGS-10	731	387
DDGS-11[2]	318	318
DDGS-12	669	353
DDGS-13	620	321
DDGS-14[2]	265	265
DDGS-15	597	347
DDGS-16	586	296
DDGS-17	653	285
All samples:		
Mean	665.8	337.5
Standard deviation	284.4	39.0

[1]The geometric mean particle size for each sample was determined using a Rotap sieve shaker (model RX-29, W.S. Tyler Co, Cleveland, OH).
[2]Particle size as received was below the target and samples were not ground.

Table 2. Ingredient composition of the experimental diets (as-fed)

Ingredient, (%)	*Corn*	*Corn-DDGS*
Corn	89.50	39.10
DDGS	-	50.40
Sodium caseinate[1] + indigestible marker[2]	8.0	8.0
Limestone	1.0	1.0
Dicalcium phosphate	0.65	0.65
Salt	0.40	0.40
Vitamin/trace mineral suplemment	0.45	0.45

[1]Sodium caseinate (88.7% crude protein, 9% moisture, 3,535 kcal ME/kg; NRC, 1998)

[2]Indigestible marker = chromic oxide was used to enhance uniformity of fecal color and was mixed with the sodium caseinate to achieve a concentration of 1.25% (0.568 kg of chromic oxide were added per 45.35 kg of casein). When the casein/chromic oxide mixture was included in the experimental diet at 8.0%, the final concentration of chromic oxide was 0.10%. Ferric oxide was used as a start/stop marker and was mixed with the sodium caseinate to achieve a concentration of 3.75% (1.7 kg of ferric oxide were added per 45.35 kg of casein). When the casein/ferric oxide mixture was included in the experimental diet at 8.0%, the final concentration of ferric oxide was 0.30%

[3]Dicalcium phosphate – 18.5% phosphorus; 22% calcium

[4]The vitamin/trace mineral supplement contained a minimum of the following: vitamin A, IU/lb, 300,000; vitamin D3, IU/lb, 90,000; vitamin E, IU/lb, 2,000; menadione, mg/lb, 200; riboflavin, mg/lb, 250; niacin, mg/lb, 1,600; d-pantothenic acid, mg/lb, 1,000; choline, mg/lb, 20,000; vitamin B12, mg/lb, 1.5.

Table 3. Reference methods for chemical analysis of DDGS samples and experimental diets used by two laboratories.

Analysis	*Laboratory 1*	*Laboratory 2*
Moisture (dry matter)	Modified AOAC Official Method 935.29, 2000 Moisture in malt gravimetric method (forced air convection over, 3 hr at 105°C)	AOAC Official Method 934.01, 2006 Loss on drying for feeds (vacuum oven 95-100^{o} C)
Ash	AOAC Official Method 942.05, 2006 Muffle furnace at 600° for 2 hours.	AOAC Official Method 942.05, 2006
Crude protein	AOAC Official Method 990.03, 2002 Protein (Crude) in animal feed, combustion method LECO	AOAC Official Method 984.13 (A-D), 2006 Kjeldahl
Crude fat	AOAC Official Method 945.16, 2005 Oil in cereal adjuncts, petroleum ether extraction method using a tecator soxtec 1043 extractor.	AOAC Official Method 920.39 (A), 2006 Ether Extraction
Crude fiber	Ankom Filter bag procedures.	AOAC Official Method 978.10, 2006
Acid detergent fiber	Ankom Filter bag procedures.	AOAC Official Method 973.18 (A-D), 2006.
Neutral detergent fiber	Ankom Filter bag procedures.	JAOAC 56, 1352-1356, 1973.
Total Starch	AOAC 996.11, 2003 AACC 76-11 YSI Application Number 319	Base method:AACC, Approved Methods, no. 76-13. Modified: Sigma (St. Louis, MO) Starch Assay Kit, Product Code STA-20.

Table 4. Descriptive statistics for analyzed composition of DDGS samples for the analysis of Laboratory 1 and 2 and the combined analysis[1] (dry matter basis).

Component	Laboratory	Mean	Standard deviation	Coefficient of variation, %	Minimum	Maximum
Dry matter	1	90.10	2.21	2.45	85.19	93.19
	2	91.56	1.39	1.51	88.83	93.85
	combined	90.83	1.96	2.16	85.19	93.85
Ash	1	4.49	0.54	11.94	3.57	5.59
	2	4.40	0.50	11.29	3.50	5.36
	combined	4.45	0.51	11.49	3.50	5.59
Crude protein	1	30.39	1.22	4.03	27.80	32.20
	2	30.16	1.37	4.53	27.30	33.34
	combined	30.28	1.28	4.24	27.30	33.34
Crude fat	1	10.51	0.80	7.61	8.72	11.50
	2	12.78	1.20	9.40	9.46	14.63
	combined	11.65	1.53	13.15	8.72	14.63
Crude fiber	1	7.79	0.84	10.73	5.87	8.87
	2	7.24	0.45	6.18	6.62	8.13
	combined	7.52	0.72	9.56	5.87	8.87
ADF	1	13.05	2.19	16.79	9.82	17.90
	2	11.98	1.99	16.60	9.12	16.70
	combined	12.52	2.13	17.03	9.12	17.90
Neutral detergent fiber	1	28.90	2.68	9.29	25.30	33.50
	2	40.23	3.04	7.56	32.41	43.51
	combined	34.57	6.41	18.53	25.30	43.51
Starch	1	5.49	1.85	33.76	2.45	9.01
	2	3.98	1.82	45.60	1.63	9.08
	combined	4.74	1.96	41.42	1.63	9.08
DDGS Energy content, (kcal/kg)						
Gross energy		5311	64.4	1.2	5177	5421
Digestible energy		3954	112.5	2.8	3663	4107
Metabolizable energy		3700	118.7	3.2	3381	3876
Corn Energy content, (kcal/kg)						
Gross energy		4455				
Digestible energy		3893	71.4	1.8	3716	4042
Metabolizable energy		3813	60.6	1.6	3649	3943

[1] Combined analysis = average of results from the two commercial laboratories

Table 5. Analyzed composition of the 17 samples of DDGS for Laboratory 1, 2, and combined (dry matter basis).

	DDGS sample																
Item	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*
Laboratory 1																	
Dry matter, %	85.19	87.91	87.71	90.80	89.61	91.50	90.09	93.19	87.68	89.06	91.75	91.30	92.59	93.14	88.28	90.94	90.88
Ash, %	5.10	4.37	3.57	4.20	4.53	4.01	4.35	3.73	4.01	4.81	4.54	4.46	4.50	5.42	4.43	4.68	5.59
Crude protein, %	29.60	29.60	29.70	31.00	31.70	32.20	29.50	31.70	31.10	27.80	28.90	29.80	32.00	29.40	31.30	30.60	30.80
Crude fat, %	9.52	11.40	10.30	10.90	10.30	8.72	10.80	10.60	9.10	9.99	10.90	11.50	11.20	10.70	11.50	10.70	10.50
Crude fiber, %	8.32	7.96	8.36	6.61	7.79	8.39	7.98	6.32	8.38	8.00	8.62	5.87	8.09	7.08	8.87	7.76	8.07
ADF, %	17.90	13.60	15.60	13.10	14.20	14.40	10.50	13.00	15.60	12.20	10.20	12.40	10.50	9.82	11.40	14.20	13.20
NDF, %	29.40	30.10	33.50	28.50	31.70	26.40	27.80	31.40	26.90	25.90	27.20	26.70	25.80	25.30	31.60	33.30	29.80
Starch, %	4.57	4.33	2.45	5.80	3.56	4.81	5.29	6.03	9.01	8.94	7.27	7.37	5.11	6.33	4.81	3.19	4.38
GE, kcal/kg[1]	5,177	5,403	5,421	5,335	5,314	5,274	5,351	5,344	5,366	5,237	5,266	5,303	5,288	5,249	5,378	5,325	5,253
Laboratory 2																	
Dry matter, %	90.27	89.53	91.18	91.13	91.35	91.70	90.51	93.64	88.83	90.94	92.56	93.18	91.05	93.85	91.71	92.78	92.35
Ash, %	5.15	4.64	3.64	4.37	4.31	4.02	4.21	3.50	4.04	4.56	4.15	4.37	4.76	5.36	4.33	4.33	5.09
Crude protein, %	29.78	29.28	33.34	30.84	31.29	31.88	28.81	29.60	30.79	27.30	29.09	29.39	31.26	29.88	30.52	29.63	30.02
Crude fat, %	9.46	14.63	12.67	13.00	12.90	11.79	13.79	12.12	11.94	13.20	12.60	13.59	13.43	11.44	14.11	13.33	13.32
Crude fiber, %	7.88	6.89	7.71	6.86	7.32	7.47	7.00	7.67	6.97	6.64	6.62	7.00	6.86	7.61	7.34	8.13	7.04
ADF, %	13.42	11.75	13.43	10.91	12.45	16.70	10.21	12.68	14.77	10.04	9.18	12.21	10.54	9.12	12.68	12.61	10.90
NDF, %	42.74	41.55	43.51	41.86	42.61	38.36	40.02	43.34	40.72	39.80	36.35	39.82	35.55	32.41	42.24	42.38	40.63
Starch, %	2.63	3.35	1.63	5.40	2.76	3.77	3.20	3.52	9.08	6.14	5.60	3.62	3.90	4.99	3.33	1.79	2.99
GE, kcal/kg[1]	5,177	5,403	5,421	5,335	5,314	5,274	5,351	5,344	5,366	5,237	5,266	5,303	5,288	5,249	5,378	5,325	5,253
Laboratory 1 and 2 combined																	
Dry matter, %	87.73	88.72	89.45	90.97	90.48	91.60	90.30	93.42	88.26	90.00	92.16	92.24	91.82	93.50	90.00	91.86	91.62
Ash, %	5.13	4.51	3.61	4.29	4.42	4.02	4.28	3.62	4.03	4.69	4.35	4.42	4.63	5.39	4.38	4.51	5.34
Crude protein, %	29.69	29.44	31.52	30.92	31.50	32.04	29.16	30.65	30.95	27.55	29.00	29.60	31.63	29.64	30.91	30.12	30.41
Crude fat, %	9.49	13.02	11.49	11.95	11.60	10.26	12.30	11.36	10.52	11.60	11.75	12.55	12.32	11.07	12.81	12.02	11.91
Crude fiber, %	8.10	7.43	8.04	6.74	7.56	7.93	7.49	7.00	7.68	7.32	7.62	6.44	7.48	7.35	8.11	7.95	7.56
ADF, %	15.66	12.68	14.52	12.01	13.33	15.55	10.36	12.84	15.19	11.12	9.69	12.31	10.52	9.47	12.04	13.41	12.05
NDF, %	36.07	35.83	38.51	35.18	37.16	32.38	33.91	37.37	33.81	32.85	31.78	33.26	30.68	28.86	36.92	37.84	35.22
Starch, %	3.60	3.84	2.04	5.60	3.16	4.29	4.25	4.78	9.05	7.54	6.44	5.50	4.51	5.66	4.07	2.49	3.69
GE, kcal/kg[1]	5,177	5,403	5,421	5,335	5,314	5,274	5,351	5,344	5,366	5,237	5,266	5,303	5,288	5,249	5,378	5,325	5,253

[1] Analysis carried out by the laboratory of Pioneer Hi-Bred

Table 6. Analyzed composition of the experimental diets containing the DDGS samples (ground) for Laboratory 1 and 2 (dry matter basis).

		DDGS sample																
tem	*Corn*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*
aboratory 1																		
Dry matter, %	87.87	88.09	88.70	88.43	89.48	89.43	89.68	89.33	90.42	87.84	88.51	88.82	88.83	89.00	88.78	87.63	88.66	88.52
Ash, %	3.51	4.95	4.72	4.48	5.00	4.86	4.74	4.41	4.11	5.00	5.25	4.78	4.72	5.24	5.42	4.60	5.55	5.44
Crude protein, %	14.2	24.40	24.50	26.60	25.60	24.60	24.90	22.10	22.60	24.40	23.90	22.80	23.30	25.10	24.70	23.20	25.00	25.30
Crude fat, %	3.36	5.67	8.54	7.77	7.72	7.38	6.39	7.99	7.42	7.21	7.23	7.29	7.96	8.31	7.22	8.16	6.84	6.98
Crude fiber, %	0.76	4.27	4.96	4.50	3.83	4.78	2.44	4.28	4.32	3.99	4.34	4.09	3.74	4.58	4.94	4.24	4.17	4.96
ADF, %	2.3	6.79	6.06	6.60	7.11	7.90	8.20	4.70	6.44	8.15	7.08	6.64	5.92	7.27	5.48	6.80	7.94	7.09
NDF, %	9.57	19.20	18.70	19.30	16.20	17.20	15.90	14.70	18.90	16.30	16.20	16.40	16.20	16.70	19.40	19.40	22.20	22.40
Starch, %	63.48	31.72	32.92	31.52	29.11	27.59	34.85	30.95	30.33	32.71	38.01	31.50	35.17	29.36	33.94	33.14	30.92	33.51
GE, kcal/kg[1]	4,455	4,351	4,465	4,474	4,430	4,420	4,400	4,438	4,435	4,446	4,381	4,396	4,414	4,407	4,387	4,452	4,425	4,389
aboratory 2																		
Dry matter, %	88.61	89.19	90.24	90.22	90.51	90.52	91.03	90.60	91.28	90.27	90.66	91.03	91.09	91.78	91.23	90.63	91.19	90.87
Ash, %	3.86	5.65	5.49	5.09	5.52	5.44	5.20	5.22	4.82	5.35	5.29	5.19	5.48	5.47	5.85	5.36	5.44	5.07
Crude protein, %	14.24	23.44	23.16	25.85	25.26	24.78	25.52	23.71	24.22	24.34	23.19	24.06	23.90	24.73	24.43	23.92	24.26	24.46
Crude fat, %	3.80	5.61	8.43	8.24	7.62	7.83	6.69	7.35	7.06	5.79	7.18	7.49	7.72	7.62	7.11	7.73	7.22	7.34
Crude fiber, %	1.92	4.89	4.07	4.46	4.15	4.28	4.14	3.91	4.60	3.81	4.20	4.16	4.24	4.06	4.69	4.46	4.57	4.21
ADF, %	2.26	7.18	6.97	7.40	6.11	6.71	7.24	5.63	7.35	8.22	6.13	5.62	6.60	6.20	5.58	6.47	7.38	6.56
NDF, %	10.69	29.31	24.42	25.70	23.31	23.20	38.54	23.54	25.72	30.29	26.89	25.42	43.14	35.07	36.91	26.24	26.10	24.82
Starch, %	65.40	32.85	32.66	28.75	32.14	31.05	31.01	32.51	31.85	32.75	32.23	30.74	30.52	30.66	29.77	30.60	29.54	29.80
GE, kcal/kg[1]	4,455	4,351	4,465	4,474	4,430	4,420	4,400	4,438	4,435	4,446	4,381	4,396	4,414	4,407	4,387	4,452	4,425	4,389

Analysis carried out by a the laboratory of Pioneer Hi-Bred

Table 7. Least squares means for the daily energy balance of pigs fed experimental diets containing the DDGS sample (ground) (dry matter basis).

		DDGS sample																		
Item	*Corn* [a]	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*SEM*	*P-value*
Gross energy:																				
Intake, kcal/day	4,493	4,529	4,513	4,432	4,520	4,464	4,466	4,529	4,490	4,451	4,510	4,457	4,513	4,541	4,463	4,467	4,525	4,470	67.0	0.73
In feces, kcal/kg																				
Total	5,004	4,952$^{cde}_{f}$	4,969$^{c}_{d}$	5,013^{a}	4,972^{c}	4,989$^{ab}_{c}$	4,934$^{de}_{f}$	5,026^{a}	5,012^{ab}	4,973^{bc}	4,933^{def}	4,912^{fg}	4,926$^{ef}_{g}$	4,927$^{e}_{f}$	4,814^{h}	4,958^{cde}	4,974$^{b}_{c}$	4,886^{g}	17.4	0.01
Daily	564	1,042^{a}	876^{ef}	966^{abcd}	897^{cdef}	976^{abc}	868^{ef}	879^{def}	970^{abc}	897^{cdef}	890^{cdef}	868^{ef}	956^{abcde}	843^{f}	905^{bcdef}	911^{bcdef}	989^{ab}	937^{bcde}	44.1	0.01
In urine, kcal/kg																				
Total	2,033	2,339	1,983	2,128	2,189	2,164	2,139	2,072	2,120	2,212	2,044	2,158	2,126	2,090	2,091	2,176	2,099	2,218	81.9	0.44
Daily	90	182	143	154	166	155	132	162	140	160	137	171	163	164	169	163	147	163	16.1	0.64
Energy content, kcal/kg																				
Experimental diet																				
Digestible energy	3,893	3,763^{g}	4,013^{a}	3,908$^{cde}_{f}$	3,966$^{abcd}_{e}$	3,874^{f}	3,986$^{ab}_{c}$	3,994$^{a}_{b}$	3,899$^{de}_{f}$	3,969$^{abc}_{d}$	3,922$^{bcd}_{ef}$	3,942$^{abcd}_{ef}$	3,891^{ef}	4,008^{a}	3,913$^{cde}_{f}$	3,961$^{abcd}_{e}$	3,879^{f}	3,872^{f}	30.2	0.01
Metabolizable energy	3,813	3,570^{e}	3,849^{a}	3,728$^{bc}_{d}$	3,786^{abc}	3,700^{cd}	3,820^{ab}	3,829$^{a}_{b}$	3,738$^{bc}_{d}$	3,764$^{abc}_{d}$	3,767$^{abc}_{d}$	3,749^{bcd}	3,722^{cd}	3,824$^{a}_{b}$	3,715^{cd}	3,777^{abcd}	3,715$^{c}_{d}$	3,689^{d}	36.6	0.01
Energy digestibility, %	87.4	77.4^{h}	80.5$^{abc}_{d}$	78.2^{gh}	80.1^{abcde}	78.4^{fgh}	81.1^{ab}	80.5^{abc}	78.7^{efgh}	79.8$^{abcd}_{ef}$	80.1^{abcde}	80.3^{abcde}	78.9$^{defg}_{h}$	81.4^{a}	79.8$^{bcde}_{f}$	79.6^{bcdefg}	78.4^{fgh}	79.0$^{cdefg}_{h}$	0.61	0.01
Energy metabolizability, %	85.4	73.4^{f}	77.1^{ab}	74.6^{ef}	76.5^{abcd}	74.9^{def}	77.7^{a}	77.2^{ab}	75.4^{bcde}	75.7^{bcde}	77.0^{abc}	76.3^{abcde}	75.5^{bcde}	77.7^{a}	75.8^{bcde}	75.9^{abcde}	75.1$^{cde}_{f}$	75.2^{bcdef}	0.74	0.01
DDGS sample																				
Digestible energy	3,893	3,663^{g}	4,107^{a}	3,920$^{cde}_{f}$	4,023$^{abcd}_{e}$	3,859^{f}	4,057$^{ab}_{c}$	4,073$^{a}_{b}$	3,903$^{de}_{f}$	4,028$^{abc}_{d}$	3,945$^{bcd}_{ef}$	3,980$^{abcd}_{ef}$	3,890^{ef}	4,097^{a}	3,928$^{cde}_{f}$	4,013$^{abcd}_{e}$	3,868^{f}	3,856^{f}	53.7	0.01
Metabolizable energy	3,813	3,381^{e}	3,876^{a}	3,661$^{bc}_{d}$	3,765^{abc}	3,612^{cd}	3,825^{ab}	3,842$^{a}_{b}$	3,679$^{bc}_{d}$	3,726$^{abc}_{d}$	3,732$^{abc}_{d}$	3,699^{bcd}	3,651^{cd}	3,832$^{a}_{b}$	3,639^{cd}	3,749^{abcd}	3,638$^{c}_{d}$	3,593^{d}	65.0	0.01
Energy digestibility, %	87.4	69.7^{h}	75.1$^{abc}_{d}$	71.0^{gh}	74.5^{abcde}	71.5^{fgh}	76.2^{ab}	75.2^{abc}	71.9^{efgh}	74.0$^{abcd}_{ef}$	74.5^{abcde}	74.7^{abcde}	72.3$^{defg}_{h}$	76.7^{a}	74.0$^{bcde}_{f}$	73.6^{bcdefg}	71.5^{fgh}	72.4$^{cdefg}_{h}$	1.09	0.01
Energy metabolizability, %	85.4	64.1^{f}	70.7^{ab}	66.1^{ef}	69.5^{abcd}	66.8^{def}	71.7^{a}	70.8^{ab}	67.7^{bcde}	68.2^{bcde}	70.4^{abc}	69.3^{abcde}	67.7^{bcde}	71.6^{a}	68.3^{bcde}	68.6^{abcde}	67.1$^{cde}_{f}$	67.3^{bcdef}	1.32	0.01

[a] Means from the corn sample was used as a covariate.

Table 8. Correlations between energy contents, and particle size and chemical composition (dry matter basis) of the DDGS samples (ground) analyzed by Laboratory 1, 2, and combined.

Item	*GE*[1]	*DE*[2]	*ME*[3]	*Ash*	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Starch*
Laboratory 1										
DE	**0.53**									
ME	**0.53**	**0.98**								
Ash	**-0.71**	-0.42	-0.45							
Crude protein	0.22	0.18	0.16	-0.32						
Crude fat	0.31	0.21	0.23	0.11	-0.14					
Crude fiber	0.00	0.14	0.07	0.05	-0.04	-0.33				
ADF	0.01	**-0.51**	**-0.50**	-0.20	0.16	**-0.60**	0.15			
NDF	**0.50**	-0.33	-0.27	-0.27	0.21	0.16	0.11	0.44		
Starch	-0.26	0.19	0.14	0.05	-0.33	-0.13	-0.20	-0.30	**-0.72**	
Particle size[6]	0.10	-0.05	-0.01	-0.17	-0.34	-0.01	0.13	0.37	0.05	0.13
Laboratory 2										
Ash	**-0.63**	-0.27	-0.32							
Crude protein	0.37	0.08	0.01	-0.30						
Crude fat	**0.58**	**0.60**	**0.67**	-0.17	-0.16					
Crude fiber	-0.01	**-0.56**	**-0.52**	-0.06	0.34	-0.46				
ADF	0.22	-0.08	-0.07	-0.44	**0.54**	-0.30	0.45			
NDF	0.42	-0.32	-0.23	-0.46	0.15	0.09	0.31	0.47		
Starch	-0.09	0.35	0.24	-0.01	-0.24	-0.13	**-0.57**	-0.09	-0.36	
Particle size[6]	0.10	-0.05	-0.01	-0.01	-0.24	0.06	-0.29	0.08	0.47	0.07
Laboratory 1 and 2 combined										
Ash	**-0.68**	-0.35	-0.40							
Crude protein	0.34	0.14	0.09	-0.38						
Crude fat	**0.52**	**0.49**	**0.54**	-0.05	-0.15					
Crude fiber	0.00	-0.14	-0.19	0.03	0.24	-0.34				
ADF	0.12	-0.33	-0.31	-0.35	**0.47**	**-0.56**	0.40			
NDF	**0.48**	-0.34	-0.26	-0.41	0.25	0.10	0.27	**0.54**		
Starch	-0.18	0.27	0.20	0.00	-0.37	-0.17	-0.38	-0.22	**-0.57**	
Particle size[6]	0.22	0.14	0.17	-0.38	-0.17	-0.04	-0.03	0.16	0.09	0.16

Statistically significant correlations ($P < 0.05$) were values $\geq$ 0.47 and are in bold.

[1] GE: gross energy, [2] DE: digestible energy, [3] ME: metabolizable energy, [4] ADF: acid detergent fiber, [5] NDF: neutral detergent fiber, [6] After grinding (Table 1)

Table 9. Selected equations to predict the ME of DDGS based on proximate analysis and other components for Laboratory 1 and 2 and combined.

			Proximate analysis				*Other components*							
Equation No.	*No. Variables*	*Intercept*	*Ash*	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
Laboratory 1														
1	1	4144.01	-98.93	.	.	.	.	.	.	.	.	0.20	18.7	109.7
5	2	3728.02	-105.98	.	42.60	.	.	.	.	.	.	0.28	17.5	107.6
11	3	3391.35	-110.39	.	53.52	31.03	.	.	.	.	.	0.32	17.8	108.3
15	4	3166.18	-106.15	6.22	54.71	31.60	.	.	.	.	.	0.33	19.7	112.4
16	5	3354.77	-139.7	16.66	79.93	50.32	.	-26.51	.	.	.	0.62	6.0	87.8
21	6	-2834.42	-38.21	15.34	39.93	36.15	.	-33.16	.	1.22	.	0.74	7.0	76.4
31	7	-2159.8	-38.27	12.75	-0.1	27.88	-19.42	-23.48	.	1.2	.	0.78	8.0	74.0
41	8	-1782.88	-44.62	6.64	-6.42	21.89	-20.3	-30.15	-14.47	1.24	.	0.80	9.0	75.0
46	9	-2167.57	-23.52	13.58	-39.49	9.37	-25.52	-34.63	-17.84	1.31	0.73	0.82	10.0	75.4
Laboratory 2														
47	1	2859.55	.	.	65.74	.	.	.	.	.	.	0.44	2.0	91.5
51	2	3549.96	.	.	53.13	-73.12	.	.	.	.	.	0.50	3.0	89.5
57	3	3994.38	-62.17	.	46.66	-85.29	.	.	.	.	.	0.57	4.0	86.7
61	4	3656.94	-52.47	11.90	47.62	-95.87	.	.	.	.	.	0.58	5.0	88.6
62	5	4170.47	-95.15	8.77	55.52	-51.05	.	-16.32	.	.	.	0.70	6.0	78.5
67	6	4278.38	-75.99	-2.07	64.70	-59.96	21.04	-20.55	.	.	.	0.75	7.0	74.4
77	7	825.72	-37.15	-13.72	40.13	-73.69	22.74	-22.83	.	0.78	.	0.80	8.0	71.0
87	8	1107.24	-50.93	-10.09	46.58	-49.79	21.38	-26.51	.	0.67	0.4	0.81	9.0	74.0
92	9	779.60	-45.20	-15.06	36.19	-79.27	23.74	-26.91	-6.62	0.83	0.29	0.81	10.0	78.7
Combined laboratories														
93	1	2891.27	.	.	69.43	.	.	.	.	.	.	0.29	2.0	103.3
97	2	3307.38	-86.87	.	66.88	.	.	.	.	.	.	0.43	3.0	96.2
103	3	3202.90	-84.30	2.83	67.50	.	.	.	.	.	.	0.43	4.0	99.8
107	4	3210.45	-84.18	2.95	67.31	-1.26	.	.	.	.	.	0.43	5.0	103.9
108	5	3746.87	-143.46	6.24	84.27	54.28	.	-28.57	.	.	.	0.73	6.0	74.3
113	6	3669.34	-137.20	-1.10	108.26	53.53	19.50	-35.68	.	.	.	0.76	7.0	74.1
123	7	1381.94	-103.87	-3.98	86.39	44.78	16.83	-36.29	.	0.49	.	0.77	8.0	75.5
133	8	1377.08	-103.15	-3.03	87.41	46.27	16.63	-35.67	1.41	0.48	.	0.77	9.0	80.1
138	9	1391.59	-104.38	-3.64	87.44	46.32	16.89	-35.83	1.34	0.48	-0.02	0.77	10.0	85.6

Table 10. Selected equations to predict the ME of DDGS based on other components for Laboratory 1 and 2 and combined.

			Other components							
Equation No.	*No. Variables*	*Intercept*	*ADF*	*NDF*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
139	1	-1530.37	.	.	.	0.98	.	0.28	2.0	103.7
Laboratory 1										
140	1	4052.59	-27.02	.	.	.	.	0.25	2.0	106.3
144	2	-4080.43	.	-31.46	.	1.64	.	0.67	3.0	73.3
154	3	-3385.89	-14.14	-24.82	.	1.50	.	0.72	4.0	70.0
164	4	-3412.26	-13.18	-34.80	-17.54	1.58	.	0.75	5.0	68.2
169	5	-3301.37	-15.53	-34.56	-19.15	1.55	0.28	0.76	6.0	70.3
Laboratory 2										
171	1	3636.67	.	.	15.90	.	.	0.06	2.0	118.9
175	2	-2966.33	.	-21.69	.	1.42	.	0.54	3.0	86.3
185	3	-3303.19	.	-26.48	.	1.47	0.71	0.58	4.0	85.4
195	4	-3304.43	4.76	-28.21	.	1.47	0.76	0.58	5.0	88.3
200	5	-3284.91	4.20	-26.71	3.85	1.46	0.69	0.59	6.0	92.0
Combined laboratories										
202	1	3940.04	-19.18	.	.	.	.	0.10	2.0	116.4
206	2	-3739.02	.	-29.99	.	1.60	.	0.64	3.0	75.9
216	3	-3624.60	-4.26	-28.06	.	1.57	.	0.65	4.0	78.4
226	4	-3508.91	-5.00	-27.67	.	1.54	0.08	0.65	5.0	81.3
231	5	-3498.65	-4.65	-29.17	-3.29	1.55	0.09	0.65	6.0	84.8

Table 11a. Equations to predict the ME of DDGS based on proximate analysis and other components (based on analysis carried out by Laboratory 1).

Equation No.	*No. Variables*	*Intercept*	*Ash*	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
1	1	4144.01	-98.93	.	.	.	.	.	.	.	.	0.20	18.7	109.7
2	1	3335.19	.	.	34.72	.	.	.	.	.	.	0.05	24.4	119.2
3	1	3239.83	.	15.14	.	.	.	.	.	.	.	0.02	25.6	121.1
4	1	3617.97	.	.	.	10.53	.	.	.	.	.	0.01	26.4	122.2
5	2	3728.02	-105.98	.	42.60	.	.	.	.	.	.	0.28	17.5	107.6
6	2	4040.30	-100.10	.	.	13.99	.	.	.	.	.	0.21	20.3	112.8
7	2	4088.54	-97.74	1.65	.	.	.	.	.	.	.	0.20	20.7	113.5
8	2	2728.45	.	18.61	38.64	.	.	.	.	.	.	0.09	25.0	121.0
9	2	3063.31	.	.	42.87	23.90	.	.	.	.	.	0.08	25.4	121.7
10	2	3142.02	.	15.44	.	11.39	.	.	.	.	.	0.03	27.4	124.9
11	3	3391.35	-110.39	.	53.52	31.03	.	.	.	.	.	0.32	17.8	108.3
12	3	3556.61	-102.59	4.87	43.37	.	.	.	.	.	.	0.28	19.4	111.5
13	3	3976.79	-98.76	1.88	.	14.04	.	.	.	.	.	0.21	22.3	117.1
14	3	2375.12	.	20.15	48.05	26.64	.	.	.	.	.	0.12	25.8	123.4
15	4	3166.18	-106.15	6.22	54.71	31.60	.	.	.	.	.	0.33	19.7	112.4
16	5	3354.77	-139.7	16.66	79.93	50.32	.	-26.51	.	.	.	0.62	9.9	87.8
17	5	4328.26	-125.13	8.39	-5.66	28.12	-36.88	.	.	.	.	0.61	10.4	89.3
18	5	2307.51	-103.85	20.32	70.31	47.82	.	.	23.62	.	.	0.43	17.5	108.0
19	5	1205.31	-71.6	4.99	40.14	25.67	.	.	.	0.38	.	0.34	21.1	116.3
20	5	3468.84	-114.88	1.04	54.97	33.94	.	.	.	.	-0.38	0.34	21.2	116.4
21	6	-2834.42	-38.21	15.34	39.93	36.15	.	-33.16	.	1.22	.	0.74	7.3	76.4
22	6	3931.49	-137.49	13.88	36.61	41.23	-20.59	-16.39	.	.	.	0.67	10.1	86.3
23	6	138.14	-51.12	5.9	-44.57	14.66	-41.04	.	.	0.85	.	0.67	10.0	85.9
24	6	3948.11	-110.85	19.94	-20	22.34	-45.31	.	.	.	0.8	0.65	10.8	88.7
25	6	3739.61	-146.45	12.68	77.9	46.91	.	-31.1	-9.69	.	.	0.63	11.6	91.0
26	6	3588.84	-146.25	12.55	79.96	52.01	.	-26.32			-0.29	0.63	11.6	91.2
27	6	4118.85	-123.7	10.66	0.29	31.07	-34.86	.	4.01	.	.	0.61	12.3	93.4
28	6	-1010.76	-46.91	19.99	48.31	40.05	.	.	26.46	0.63	.	0.47	18.2	109.7
29	6	2631.02	-113.47	14.77	70.81	50.62	.	.	23.93	.	-0.42	0.45	19.0	111.8
30	6	1611.84	-81.91	0.26	41.31	28.22	.	.	.	0.36	-0.35	0.35	22.7	121.0
31	7	-2159.8	-38.27	12.75	-0.1	27.88	-19.42	-23.48	.	1.2	.	0.78	7.7	74.0
32	7	-2522.14	-43.93	9.94	35.86	31.09	.	-39.56	-13.04	1.26	.	0.76	8.6	78.0
33	7	-1475.75	-12.23	21.13	-74.41	3.2	-53.69	.	.	1.07	1.1	0.74	9.2	80.2
34	7	-2599.35	-43.73	12.84	40.53	37.39	.	-32.95	.	1.21	-0.18	0.74	9.1	80.1
35	7	4398.49	-145.26	9.17	32.75	36.96	-21.3	-21.37	-11.25	.	.	0.68	11.6	89.4
36	7	3827.13	-127.66	18.48	20.27	35.5	-28.34	-12.84	.	.	0.4	0.68	11.8	90.0
37	7	-298.94	-46.88	9.32	-36.53	18.79	-38.06	.	6.14	0.87	.	0.68	11.8	89.8
38	7	4128.84	-110.83	18.78	-27.84	18.6	-48.35	.	-4.24	.	0.89	0.65	12.8	93.3
39	7	3920.36	-151.83	9.29	78.09	48.7	.	-30.57	-8.92	.	-0.26	0.64	13.3	95.2
40	7	-588.31	-57.83	15.01	49.63	42.88	.	.	26.63	0.61	-0.37	0.48	19.7	114.4
41	8	-1782.88	-44.62	6.64	-6.42	21.89	-20.3	-30.15	-14.47	1.24	.	0.80	8.9	75.0
42	8	-2523.51	-20.89	19.18	-24.43	19.32	-30.3	-18.72	.	1.24	0.57	0.80	9.1	75.9
43	8	-2355.5	-47.89	8.24	36.45	32.19	.	-39.19	-12.61	1.25	-0.14	0.76	10.6	82.5
44	8	-1292.07	-12.1	19.91	-82.69	-0.74	-56.89	.	-4.45	1.07	1.19	0.75	11.1	84.7
45	8	4357.03	-134.03	14.2	10.68	28.62	-31.54	-17.76	-13.53	.	0.52	0.69	13.2	93.1
46	9	-2167.57	-23.52	13.58	-39.49	9.37	-25.52	-34.63	-17.84	1.31	0.73	0.82	10.0	75.4

Table 11b. Equations to predict the ME of DDGS based on proximate analysis and other components (based on analysis carried out by Laboratory 2).

Equation No.	*No. Variables*	*Intercept*	*Ash*	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
47	1	2859.55	.	.	65.74	.	.	.	.	.	.	0.44	7.3	91.5
48	1	4708.57	.	.	.	-139.38	.	.	.	.	.	0.28	13.3	104.3
49	1	4037.92	-76.77	.	.	.	.	.	.	.	.	0.10	19.6	116.1
50	1	3686.32	.	0.45	.	.	.	.	.	.	.	0.00	23.4	122.6
51	2	3549.96	.	.	53.13	-73.12	.	.	.	.	.	0.50	7.1	89.5
52	2	3131.20	-51.26	.	62.14	.	.	.	.	.	.	0.49	7.6	90.8
53	2	2545.88	.	9.68	67.46	.	.	.	.	.	.	0.46	8.8	93.7
54	2	5120.97	-84.51	.	.	-144.97	.	.	.	.	.	0.40	10.8	98.3
55	2	4299.13	.	18.11	.	-158.27	.	.	.	.	.	0.31	13.9	105.1
56	2	4334.27	-84.04	-8.76	.	.	.	.	.	.	.	0.11	21.3	119.5
57	3	3994.38	-62.17	.	46.66	-85.29	.	.	.	.	.	0.57	6.8	86.7
58	3	3145.38	.	17.96	53.05	-91.95	.	.	.	.	.	0.54	7.7	89.3
59	3	2987.58	-47.69	3.85	63.08	.	.	.	.	.	.	0.49	9.6	94.1
60	3	4879.56	-77.41	9.14	.	-154.04	.	.	.	.	.	0.41	12.5	101.2
61	4	3656.94	-52.47	11.90	47.62	-95.87	.	.	.	.	.	0.58	8.2	88.6
62	5	4170.47	-95.15	8.77	55.52	-51.05	.	-16.32	.	.	.	0.70	5.9	78.5
63	5	2785.05	-39.83	14.65	63.55	-33.24	.	.	19.23	.	.	0.62	8.8	88.2
64	5	1688.99	-28.80	6.09	32.95	-106.11	.	.	.	0.43	.	0.60	9.7	91.0
65	5	3958.99	-55.88	9.70	46.10	-105.50	.	.	.	.	-0.39	0.60	9.7	91.0
66	5	3647.10	-40.73	8.01	50.39	-103.84	8.17	.	.	.	.	0.59	9.9	91.5
67	6	4278.38	-75.99	-2.07	64.70	-59.96	21.04	-20.55	.	.	.	0.75	5.9	74.4
68	6	1081.10	-61.86	-0.85	32.92	-62.66	.	-18.04	.	0.69	.	0.74	6.6	77.3
69	6	3800.09	-110.56	11.79	62.95	-6.71	.	-24.99	.	.	0.83	0.73	6.8	77.8
70	6	3585.49	-83.73	10.74	64.76	-15.85	.	-14.95	11.96	.	.	0.71	7.4	80.4
71	6	1094.22	-21.31	-0.44	22.71	-126.47	.	.	.	0.67	-0.60	0.63	10.6	91.8
72	6	3060.18	-43.21	12.99	61.05	-45.39	.	.	17.37	.	-0.25	0.63	10.6	91.9
73	6	2829.46	-32.75	11.90	64.46	-42.22	5.44	.	18.10	.	.	0.62	10.7	92.0
74	6	2182.52	-32.79	12.37	56.94	-42.73	.	.	17.41	0.15	.	0.62	10.8	92.4
75	6	4082.08	-38.35	2.35	49.91	-122.92	13.29	.	.	.	-0.57	0.62	10.9	92.8
76	6	1654.53	-16.55	2.05	35.59	-114.36	8.32	.	.	0.44	.	0.61	11.3	94.2
77	7	825.72	-37.15	-13.72	40.13	-73.69	22.74	-22.83	.	0.78	.	0.80	6.3	71.0
78	7	3962.23	-90.49	1.42	70.01	-22.48	19.11	-27.33	.	.	0.69	0.78	7.1	74.9
79	7	3995.40	-71.91	-0.41	68.44	-42.77	19.61	-19.62	5.63	.	.	0.76	7.8	77.9
80	7	3063.86	-98.34	14.44	74.73	39.69	.	-24.18	14.33	.	0.91	0.75	8.0	78.9
81	7	1487.52	-80.65	3.51	43.42	-27.18	.	-24.10	.	0.54	0.62	0.75	8.1	79.0
82	7	1183.08	-61.67	0.42	37.09	-52.82	.	-17.56	3.02	0.64	.	0.74	8.6	81.3
83	7	778.08	5.55	-10.99	23.53	-150.98	16.11	.	.	0.77	-0.85	0.66	11.4	92.6
84	7	3314.00	-32.79	7.05	61.08	-69.03	9.65	.	14.19	.	-0.40	0.64	12.2	95.5
85	7	1562.99	-25.83	5.24	40.38	-81.63	.	.	10.79	0.43	-0.44	0.63	12.3	95.8
86	7	2114.18	-23.83	8.97	56.65	-54.19	5.84	.	15.85	0.18	.	0.63	12.6	96.8
87	8	1107.24	-50.93	-10.09	46.58	-49.79	21.38	-26.51	.	0.67	0.4	0.81	8.1	74
88	8	456.38	-34.57	-19.6	27.34	-107.55	25.7	-25.04	-9.96	0.97	.	0.8	8.1	74.1
89	8	3505.2	-85.69	4.27	76.14	7.00	16.77	-26.56	8.51	.	0.75	0.78	8.9	78.3
90	8	1882.94	-84.04	8.31	58.28	10.18	.	-23.91	9.17	0.34	0.75	0.76	9.9	82.9
91	8	791.86	5.27	-10.78	23.97	-149.7	16.01	.	0.27	0.77	-0.85	0.66	13.4	98.2
92	9	779.60	-45.20	-15.06	36.19	-79.27	23.74	-26.91	-6.62	0.83	0.29	0.81	10.0	78.7

Table 11c. Equations to predict the ME of DDGS based on proximate analysis and other components (based on combined Laboratory analysis).

Equation No.	*No. Variables*	*Intercept*	*Ash*	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
93	1	2891.27	.	.	69.43	.	.	.	.	.	.	0.29	8.8	103.3
94	1	4115.50	-93.41	.	.	.	.	.	.	.	.	0.16	12.9	112.5
95	1	4054.76	.	.	.	-47.19	.	.	.	.	.	0.03	16.7	120.5
96	1	3436.80	.	8.69	.	.	.	.	.	.	.	0.01	17.6	122.1
97	2	3307.38	-86.87	.	66.88	.	.	.	.	.	.	0.43	6.7	96.2
98	2	2323.78	.	17.45	72.79	.	.	.	.	.	.	0.32	10.0	104.8
99	2	2895.22	.	.	69.36	-0.41	.	.	.	.	.	0.29	10.8	107.0
100	2	4446.26	-92.35	.	.	-44.62	.	.	.	.	.	0.19	14.0	114.3
101	2	4387.96	-100.45	-7.96	.	.	.	.	.	.	.	0.16	14.8	116.1
102	2	3691.38	.	14.14	.	-55.80	.	.	.	.	.	0.05	18.2	123.5
103	3	3202.90	-84.30	2.83	67.50	.	.	.	.	.	.	0.43	8.7	99.8
104	3	3303.87	-86.87	.	66.94	0.37	.	.	.	.	.	0.43	8.7	99.8
105	3	2395.74	.	18.26	71.16	-10.31	.	.	.	.	.	0.32	12.0	108.6
106	3	4531.03	-94.93	-2.87	.	-42.80	.	.	.	.	.	0.19	16.0	118.6
107	4	3210.45	-84.18	2.95	67.31	-1.26	.	.	.	.	.	0.43	10.7	103.9
108	5	3746.87	-143.46	6.24	84.27	54.28	.	-28.57	.	.	.	0.73	3.3	74.3
109	5	1823.02	-67.70	20.94	89.72	46.87	.	.	30.95	.	.	0.56	8.4	94.5
110	5	3441.63	-107.20	11.89	45.67	14.71	-21.36	.	.	.	.	0.48	11.0	103.2
111	5	3029.52	-74.34	6.14	68.41	-2.16	.	.	.	.	0.11	0.43	12.6	108.1
112	5	2881.21	-78.88	2.38	64.55	-2.94	.	.	.	0.07	.	0.43	12.7	108.4
113	6	3669.34	-137.20	-1.10	108.26	53.53	19.50	-35.68	.	.	.	0.76	4.5	74.1
114	6	1007.33	-102.70	1.61	62.12	43.73	.	-30.46	.	0.58	.	0.75	4.6	74.6
115	6	3371.08	-134.24	10.19	88.03	60.65	.	-26.00	7.31	.	.	0.74	5.1	77.2
116	6	3640.10	-137.56	8.08	84.85	53.57	.	-28.47	.	.	0.06	0.73	5.3	77.8
117	6	2109.64	-83.80	24.70	73.88	51.95	-13.37	.	27.79	.	.	0.58	9.8	96.9
118	6	1663.84	-58.89	23.76	90.65	45.93	.	.	30.87	.	0.10	0.57	10.3	98.7
119	6	2132.60	-72.72	21.58	92.47	48.72	.	.	31.10	-0.07	.	0.56	10.4	99.1
120	6	3171.20	-93.19	17.51	45.98	14.35	-22.78	.	.	.	0.17	0.49	12.7	107.2
121	6	1848.07	-83.66	10.04	29.72	8.17	-23.70	.	.	0.34	.	0.49	12.8	107.5
122	6	2806.14	-70.87	5.68	66.49	-3.30	.	.	.	0.05	0.11	0.43	14.5	113.3
123	7	1381.94	-103.87	-3.98	86.39	44.78	16.83	-36.29	.	0.49	.	0.77	6.0	75.5
124	7	3430.81	-131.56	1.80	109.53	57.67	18.57	-33.68	4.71	.	.	0.76	6.4	77.7
125	7	3673.57	-137.43	-1.19	108.29	53.56	19.55	-35.70	.	.	0.00	0.76	6.5	78.1
126	7	1006.50	-101.10	3.60	65.08	47.13	.	-29.22	3.18	0.55	.	0.75	6.6	78.4
127	7	986.78	-99.88	2.74	62.80	43.47	.	-30.37	.	0.58	0.04	0.75	6.6	78.5
128	7	3259.05	-128.12	12.10	88.66	59.96	.	-25.88	7.36	.	0.06	0.74	7.1	81.2
129	7	1909.95	-72.76	29.07	73.70	51.09	-14.65	.	27.36	.	0.14	0.59	11.6	101.3
130	7	1600.63	-76.34	23.87	68.09	49.15	-14.29	.	27.33	0.11	.	0.58	11.8	102.0
131	7	2062.36	-65.12	24.69	94.28	48.30	.	.	31.05	-0.09	0.10	0.57	12.3	104.0
132	7	1678.76	-71.56	15.53	30.91	8.19	-24.93	.	.	0.32	0.16	0.50	14.5	112.2
133	8	1377.08	-103.15	-3.03	87.41	46.27	16.63	-35.67	1.41	0.48	.	0.77	8.0	80.1
134	8	1397.73	-105.20	-4.60	86.48	44.91	17.11	-36.43	.	0.49	-0.02	0.77	8.0	80.1
135	8	3427.58	-131.39	1.87	109.52	57.65	18.54	-33.67	4.72	.	0.00	0.76	8.4	82.4
136	8	984.58	-98.05	4.88	65.90	46.97	.	-29.09	3.29	0.54	0.04	0.75	8.5	83.1
137	8	1462.07	-66.30	28.28	68.58	48.62	-15.44	.	26.96	0.10	0.14	0.59	13.6	107.3
138	9	1391.59	-104.38	-3.64	87.44	46.32	16.89	-35.83	1.34	0.48	-0.02	0.77	10.0	85.6

Table12a. Equations to predict the ME of DDGS based on ADF, NDF, starch, and gross energy content and particle size (based on analysis carried out by Laboratory 1).

Equation No.	*No. Variables*	*Intercept*	*ADF*	*NDF*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
139	1	-1530.37	.	.	.	0.98	.	0.28	15.3	103.7
140	1	4052.59	-27.02	.	.	.	.	0.25	16.8	106.3
141	1	4047.39	.	-12.02	.	.	.	0.07	23.7	118.0
142	1	3649.24	.	.	9.25	.	.	0.02	25.8	121.3
143	1	3708.71	.	.	.	.	-0.03	0.00	26.6	122.6
144	2	-4080.43	.	-31.46	.	1.64	.	0.67	2.2	73.3
145	2	-1227.61	-27.34	.	.	1.00	.	0.54	7.3	86.1
146	2	-2409.09	.	.	19.44	1.13	.	0.37	13.9	100.7
147	2	-1525.37	.	.	.	1.00	-0.18	0.29	17.2	107.0
148	2	3896.31	-31.13	.	.	.	0.62	0.28	17.3	107.3
149	2	4115.98	-25.46	-2.90	.	.	.	0.25	18.6	109.7
150	2	4054.40	-27.07	.	-0.21	.	.	0.25	18.8	110.0
151	2	4185.74	.	-15.49	-6.96	.	.	0.08	25.5	121.7
152	2	4043.58	.	-12.03	.	.	0.01	0.07	25.7	122.1
153	2	3676.16	.	.	9.48	.	-0.08	0.02	27.8	125.5
154	3	-3385.89	-14.14	-24.82	.	1.50	.	0.72	2.2	70.0
155	3	-4057.58	.	-41.87	-19.17	1.71	.	0.71	2.6	71.1
156	3	-4075.92	.	-31.47	.	1.65	-0.19	0.67	4.1	75.6
157	3	-1718.33	-24.81	.	10.24	1.07	.	0.56	8.4	87.3
158	3	-1206.94	-30.32	.	.	0.97	0.45	0.56	8.5	87.5
159	3	-2452.35	.	.	20.60	1.16	-0.33	0.38	15.5	103.5
160	3	3917.61	-32.45	.	-3.90	.	0.67	0.29	19.2	111.1
161	3	3935.45	-30.16	-1.62	.	.	0.61	0.29	19.3	111.3
162	3	4227.01	-25.34	-5.73	-5.60	.	.	0.26	20.4	113.6
163	3	4173.51	.	-15.78	-7.45	.	0.07	0.08	27.4	126.3
164	4	-3412.26	-13.18	-34.80	-17.54	1.58	.	0.75	2.8	68.2
165	4	-3331.21	-15.32	-24.26	.	1.49	0.13	0.72	4.1	72.6
166	4	-4056.77	.	-41.68	-18.82	1.71	-0.05	0.71	4.5	74.0
167	4	-1598.82	-27.55	.	8.06	1.04	0.33	0.57	10.0	89.8
168	4	4112.60	-30.61	-6.62	-10.25	.	0.69	0.30	20.8	114.9
169	5	-3301.37	-15.53	-34.56	-19.15	1.55	0.28	0.76	4.6	70.3

Table12b. Equations to predict the ME of DDGS based on ADF, NDF, starch, and gross energy content and particle size (based on analysis carried out by Laboratory 2).

Equation No.	*No. Variables*	*Intercept*	*ADF*	*NDF*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
170	1	-1530.37	.	.	.	0.98	.	0.28	13.0	103.7
171	1	3636.67	.	.	15.90	.	.	0.06	21.2	118.9
172	1	4060.24	.	-8.95	.	.	.	0.05	21.5	119.3
173	1	3746.62	-3.89	.	.	.	.	0.00	23.2	122.3
174	1	3708.71	.	.	.	.	-0.03	0.00	23.4	122.6
175	2	-2966.33	.	-21.69	.	1.42	.	0.54	5.8	86.3
176	2	-1870.70	.	.	19.25	1.03	.	0.37	11.9	100.6
177	2	-1805.11	-11.43	.	.	1.06	.	0.32	13.7	104.7
178	2	-1525.37	.	.	.	1.00	-0.18	0.29	14.9	107.0
179	2	3907.52	.	-6.35	12.06	.	.	0.08	22.4	121.6
180	2	4023.62	.	-11.31	.	.	0.39	0.07	23.0	122.7
181	2	3668.47	-2.57	.	15.64	.	.	0.06	23.1	123.0
182	2	3662.79	.	.	16.02	.	-0.08	0.06	23.2	123.0
183	2	4061.63	3.29	-9.97	.	.	.	0.05	23.4	123.3
184	2	3749.67	-3.88	.	.	.	-0.01	0.00	25.2	126.6
185	3	-3303.19	.	-26.48	.	1.47	0.71	0.58	6.3	85.4
186	3	-2984.57	.	-19.68	8.54	1.40	.	0.55	7.3	88.1
187	3	-2957.64	2.14	-22.33	.	1.42	.	0.54	7.8	89.4
188	3	-2100.19	-10.15	.	18.44	1.10	.	0.40	12.9	102.2
189	3	-1871.58	.	.	19.70	1.05	-0.26	0.38	13.6	103.9
190	3	-1796.59	-11.24	.	.	1.07	-0.15	0.32	15.7	108.4
191	3	3903.13	.	-8.08	10.66	.	0.24	0.09	24.2	125.9
192	3	3911.18	2.21	-7.08	11.85	.	.	0.08	24.3	126.1
193	3	4021.49	4.82	-13.06	.	.	0.43	0.07	24.8	127.0
194	3	3689.44	-2.45	.	15.76	.	-0.07	0.06	25.1	127.6
195	4	-3304.43	4.76	-28.21	.	1.47	0.76	0.58	8.1	88.3
196	4	-3280.25	.	-24.95	4.56	1.46	0.64	0.58	8.1	88.4
197	4	-2978.64	1.39	-20.13	8.41	1.40	.	0.55	9.3	91.6
198	4	-2093.95	-9.84	.	18.85	1.11	-0.22	0.40	14.9	105.9
199	4	3907.94	3.34	-9.46	10.11	.	0.27	0.09	26.1	130.8
200	5	-3284.91	4.20	-26.71	3.85	1.46	0.69	0.59	10.0	92.0

Table12c. Equations to predict the ME of DDGS based on ADF, NDF, starch, and gross energy content and particle size (based on combined Laboratory analysis).

Equation No.	*No. Variables*	*Intercept*	*ADF*	*NDF*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
201	1	-1530.37	.	.	.	0.98	.	0.28	9.0	103.7
202	1	3940.04	-19.18	.	.	.	.	0.10	14.8	116.4
203	1	4100.60	.	-11.59	.	.	.	0.07	15.6	118.2
204	1	3636.75	.	.	13.35	.	.	0.04	16.6	120.1
205	1	3623.71	.	.	.	.	0.24	0.03	16.9	120.8
206	2	-3739.02	.	-29.99	.	1.60	.	0.64	0.0	75.9
207	2	-1685.07	-23.40	.	.	1.07	.	0.43	6.6	95.8
208	2	-2175.77	.	.	20.53	1.09	.	0.38	8.2	100.2
209	2	-1438.48	.	.	.	0.96	0.08	0.29	10.9	107.1
210	2	3865.79	-21.41	.	.	.	0.32	0.15	15.2	117.1
211	2	3873.41	-17.34	.	9.21	.	.	0.12	16.2	119.2
212	2	4086.82	-14.79	-5.84	.	.	.	0.11	16.4	119.6
213	2	4038.63	.	-12.32	.	.	0.27	0.11	16.5	119.9
214	2	4013.23	.	-9.74	4.97	.	.	0.07	17.5	122.1
215	2	3580.42	.	.	11.86	.	0.20	0.06	18.0	123.1
216	3	-3624.60	-4.26	-28.06	.	1.57	.	0.65	1.9	78.4
217	3	-3664.98	.	-29.95	.	1.58	0.06	0.64	2.0	78.6
218	3	-3735.36	.	-31.18	-2.89	1.61	.	0.64	2.0	78.7
219	3	-2167.99	-20.49	.	15.97	1.14	.	0.48	6.9	94.7
220	3	-1504.61	-24.34	.	.	1.03	0.16	0.44	8.2	98.4
221	3	-2195.41	.	.	20.66	1.09	-0.01	0.38	10.2	104.0
222	3	4012.36	-17.02	-5.83	.	.	0.32	0.16	16.9	120.7
223	3	3825.87	-19.94	.	6.40	.	0.29	0.16	17.0	121.0
224	3	3959.99	-15.60	-2.86	7.17	.	.	0.12	18.1	123.6
225	3	4020.58	.	-11.91	1.09	.	0.27	0.11	18.5	124.5
226	4	-3508.91	-5.00	-27.67	.	1.54	0.08	0.65	3.8	81.3
227	4	-3630.15	-3.95	-29.10	-2.21	1.58	.	0.65	3.9	81.6
228	4	-3639.97	.	-31.54	-3.90	1.59	0.08	0.65	3.9	81.6
229	4	-2046.66	-21.15	.	15.03	1.11	0.08	0.49	8.8	98.3
230	4	3962.71	-17.27	-4.59	2.98	.	0.30	0.16	18.8	125.5
231	5	-3498.65	-4.65	-29.17	-3.29	1.55	0.09	0.65	5.8	84.8

APPENDICES

Appendix Table 1a. One variable prediction equations of ME of DDGS from chemical composition by laboratory 1 and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
-1530.37	.	.	.	.	.	.	.	0.98	.	0.28	15.3	103.7
4052.59	.	.	.	-27.02	.	.	.	.	.	0.25	16.8	106.3
4144.01	.	.	.	.	.	-98.93	.	.	.	0.20	18.7	109.7
4047.39	.	.	.	.	-12.02	.	.	.	.	0.07	23.7	118.0
3335.19	.	34.72	.	.	.	.	.	.	.	0.05	24.4	119.2
3239.83	15.14	.	.	.	.	.	.	.	.	0.02	25.6	121.1
3649.24	.	.	.	.	.	.	9.25	.	.	0.02	25.8	121.3
3617.97	.	.	10.53	.	.	.	.	.	.	0.01	26.4	122.2
3708.71	.	.	.	.	.	.	.	.	-0.03	0.00	26.6	122.6

Appendix Table 1b. One variable prediction equations of ME of DDGS from chemical composition by laboratory 2 and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
2859.55	.	65.74	.	.	.	.	.	.	.	0.44	7.3	91.5
-1530.37	.	.	.	.	.	.	.	0.98	.	0.28	13.0	103.7
4708.57	.	.	-139.38	.	.	.	.	.	.	0.28	13.3	104.3
4037.92	.	.	.	.	.	-76.77	.	.	.	0.10	19.6	116.1
3636.67	.	.	.	.	.	.	15.90	.	.	0.06	21.2	118.9
4060.24	.	.	.	.	-8.95	.	.	.	.	0.05	21.5	119.3
3746.62	.	.	.	-3.89	.	.	.	.	.	0.00	23.2	122.3
3708.71	.	.	.	.	.	.	.	.	-0.03	0.00	23.4	122.6
3686.32	0.45	.	.	.	.	.	.	.	.	0.00	23.4	122.6

Appendix Table 1c. One variable prediction equations of ME of DDGS from chemical composition (combined laboratories) and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
2891.27	.	69.43	.	.	.	.	.	.	.	0.29	8.9	103.3
-1530.37	.	.	.	.	.	.	.	0.98	.	0.28	9.0	103.7
4115.50	.	.	.	.	.	-93.41	.	.	.	0.16	12.9	112.5
3940.04	.	.	.	-19.18	.	.	.	.	.	0.10	14.8	116.4
4100.60	.	.	.	.	-11.59	.	.	.	.	0.07	15.6	118.2
3636.75	.	.	.	.	.	.	13.35	.	.	0.04	16.6	120.1
4054.76	.	.	-47.19	.	.	.	.	.	.	0.03	16.7	120.5
3623.71	.	.	.	.	.	.	.	.	0.24	0.03	16.9	120.8
3436.80	8.69	.	.	.	.	.	.	.	.	0.01	17.6	122.1

Appendix Table 2a. Two variable prediction equations of ME of DDGS from chemical composition by laboratory 1 and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
-4080.43	.	.	.	.	-31.46	.	.	1.64	.	0.67	2.2	73.3
4704.53	.	.	.	-33.37	.	-126.81	.	.	.	0.56	6.3	83.9
-1227.61	.	.	.	-27.34	.	.	.	1.00	.	0.54	7.3	86.1
-2409.09	.	.	.	.	.	.	19.44	1.13	.	0.37	13.9	100.7
4792.30	.	.	.	.	-18.59	-123.68	.	.	.	0.36	14.2	101.2
3372.47	23.25	.	.	-29.05	.	.	.	.	.	0.30	16.5	105.8
-421.98	.	.	.	.	.	-31.05	.	0.80	.	0.29	16.9	106.6
-1606.93	.	.	10.21	.	.	.	.	0.98	.	0.29	17.1	106.9
-1418.71	.	10.92	.	.	.	.	.	0.94	.	0.29	17.1	106.9
-1525.37	.	.	.	.	.	.	.	1.00	-0.18	0.29	17.2	107.0
-1558.56	3.69	.	.	.	.	.	.	0.97	.	0.29	17.3	107.2
3896.31	.	.	.	-31.13	.	.	.	.	0.62	0.28	17.3	107.3
3728.02	.	42.60	.	.	.	-105.98	.	.	.	0.28	17.5	107.6
3899.86	.	.	21.69	-28.27	.	.	.	.	.	0.27	17.9	108.3
4263.52	.	-15.76	.	-30.50	.	.	.	.	.	0.26	18.5	109.5
4115.98	.	.	.	-25.46	-2.90	.	.	.	.	0.25	18.6	109.7
4054.40	.	.	.	-27.07	.	.	-0.21	.	.	0.25	18.8	110.0
4093.50	.	.	.	.	.	-100.68	10.65	.	.	0.23	19.6	111.5
4040.30	.	.	13.99	.	.	-100.10	.	.	.	0.21	20.3	112.8
4250.32	.	.	.	.	.	-102.34	.	.	-0.27	0.21	20.4	113.0
4088.54	1.65	.	.	.	.	-97.74	.	.	.	0.20	20.7	113.5
3661.69	.	42.20	.	.	-14.02	.	.	.	.	0.15	22.6	116.8
3448.55	21.70	.	.	.	-14.12	.	.	.	.	0.12	23.8	118.9
2728.45	18.61	38.64	.	.	.	.	.	.	.	0.09	25.0	121.0
3235.29	.	38.25	.	.	.	.	11.45	.	.	0.09	25.2	121.3
3946.15	.	.	14.83	.	-12.51	.	.	.	.	0.08	25.3	121.4
3063.31	.	42.87	23.90	.	.	.	.	.	.	0.08	25.4	121.7
4185.74	.	.	.	.	-15.49	.	-6.96	.	.	0.08	25.5	121.7
4043.58	.	.	.	.	-12.03	.	.	.	0.01	0.07	25.7	122.1
2943.67	22.32	.	.	.	.	.	14.19	.	.	0.07	25.9	122.5
3342.71	.	34.71	.	.	.	.	.	.	-0.02	0.05	26.4	123.4
3522.07	.	.	15.33	.	.	.	10.66	.	.	0.03	27.3	124.8
3142.02	15.44	.	11.39	.	.	.	.	.	.	0.03	27.4	124.9
3137.92	16.79	.	.	.	.	.	.	.	0.15	0.03	27.6	125.2
3676.16	.	.	.	.	.	.	9.48	.	-0.08	0.02	27.8	125.5
3634.14	.	.	10.86	.	.	.	.	.	-0.06	0.01	28.4	126.5

Appendix Table 2b. Two variable prediction equations of ME of DDGS from chemical composition by laboratory 2 and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
-493.85	.	.	-138.42	.	.	.	.	0.98	.	0.56	5.1	84.5
2717.89	.	70.01	.	.	.	.	21.88	.	.	0.55	5.2	84.8
-2966.33	.	.	.	.	-21.69	.	.	1.42	.	0.54	5.8	86.3
3284.48	.	68.34	.	.	-11.39	.	.	.	.	0.53	6.2	87.2
3549.96	.	53.13	-73.12	.	.	.	.	.	.	0.50	7.1	89.5
3131.20	.	62.14	.	.	.	-51.26	.	.	.	0.49	7.6	90.8
865.13	.	53.06	.	.	.	.	.	0.41	.	0.48	8.1	91.9
2701.42	.	70.00	.	8.66	.	.	.	.	.	0.46	8.6	93.0
2545.88	9.68	67.46	.	.	.	.	.	.	.	0.46	8.8	93.7
2906.47	.	66.04	.	.	.	.	.	.	-0.15	0.45	9.2	94.5
5120.97	.	.	-144.97	.	.	-84.52	.	.	.	0.40	10.8	98.3
-1870.70	.	.	.	.	.	.	19.25	1.03	.	0.37	11.9	100.6
-1755.68	-19.36	.	.	.	.	.	.	1.14	.	0.33	13.5	104.0
-1805.11	.	.	.	-11.43	.	.	.	1.06	.	0.32	13.7	104.7
4299.13	18.11	.	-158.27	.	.	.	.	.	.	0.31	13.9	105.1
4739.39	.	.	-164.63	12.68	.	.	.	.	.	0.31	14.0	105.3
4984.49	.	.	-152.76	.	.	.	.	.	-0.53	0.30	14.3	105.9
-1525.37	.	.	.	.	.	.	.	1.00	-0.18	0.29	14.9	107.0
-1675.07	.	.	.	.	.	4.81	.	1.01	.	0.29	15.0	107.3
5016.14	.	.	.	.	-18.61	-128.91	.	.	.	0.28	15.1	107.5
4825.53	.	.	-152.46	.	.	.	-5.61	.	.	0.28	15.2	107.6
4779.72	.	.	-133.34	.	-2.86	.	.	.	.	0.28	15.2	107.6
3973.45	.	.	.	.	.	-76.38	15.76	.	.	0.16	19.5	116.2
4335.77	.	.	.	-15.15	.	-103.21	.	.	.	0.16	19.7	116.6
4334.27	-8.76	.	.	.	.	-84.04	.	.	.	0.11	21.3	119.5
4051.63	.	.	.	.	.	-76.82	.	.	-0.04	0.10	21.6	120.1
3907.52	.	.	.	.	-6.35	.	12.06	.	.	0.08	22.4	121.6
4023.62	.	.	.	.	-11.31	.	.	.	0.39	0.07	23.0	122.7
3454.39	5.90	.	.	.	.	.	16.98	.	.	0.06	23.1	122.8
3668.47	.	.	.	-2.57	.	.	15.64	.	.	0.06	23.1	123.0
3662.79	.	.	.	.	.	.	16.02	.	-0.08	0.06	23.2	123.0
4061.63	.	.	.	3.29	-9.97	.	.	.	.	0.05	23.4	123.3
3963.32	3.53	.	.	.	-9.19	.	.	.	.	0.05	23.4	123.4
3618.24	5.00	.	.	-5.76	.	.	.	.	.	0.01	25.1	126.5
3749.67	.	.	.	-3.88	.	.	.	.	-0.01	0.00	25.2	126.6
3699.06	0.29	.	.	.	.	.	.	.	-0.02	0.00	25.4	126.9

Appendix Table 2c. Two variables prediction equations of ME of DDGS from chemical composition (combined laboratories) and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
-3739.02	.	.	.	.	-29.99	.	.	1.60	.	0.64	0.0	75.9
-1685.07	.	.	.	-23.40	.	.	.	1.07	.	0.43	6.6	95.8
3307.38	.	66.88	.	.	.	-86.87	.	.	.	0.43	6.7	96.2
3330.43	.	73.61	.	.	-14.11	.	.	.	.	0.39	7.7	99.0
4691.68	.	.	.	-31.26	.	-135.00	.	.	.	0.39	7.8	99.3
-250.41	.	46.11	.	.	.	.	.	0.64	.	0.38	8.1	100.1
2720.00	.	75.99	.	.	.	.	20.03	.	.	0.38	8.2	100.2
-2175.77	.	.	.	.	.	.	20.53	1.09	.	0.38	8.2	100.2
5109.09	.	.	.	.	-22.43	-142.50	.	.	.	0.37	8.3	100.3
2795.62	.	70.32	.	.	.	.	.	.	0.26	0.32	9.8	104.3
-1178.13	.	.	-47.61	.	.	.	.	0.99	.	0.32	9.9	104.7
2323.78	17.45	72.79	.	.	.	.	.	.	.	0.32	10.0	104.8
-1552.27	-10.84	.	.	.	.	.	.	1.05	.	0.29	10.7	106.6
2916.67	.	68.28	.	-0.96	.	.	.	.	.	0.29	10.9	106.9
2895.22	.	69.36	-0.41	.	.	.	.	.	.	0.29	10.9	107.0
-1438.48	.	.	.	.	.	.	.	0.96	0.08	0.29	10.9	107.1
-1066.07	.	.	.	.	.	-14.12	.	0.91	.	0.29	11.0	107.2
4052.63	.	.	.	.	.	-93.61	13.47	.	.	0.20	13.7	113.6
4446.26	.	.	-44.62	.	.	-92.35	.	.	.	0.19	14.0	114.3
3116.72	30.80	.	.	-27.92	.	.	.	.	.	0.17	14.6	115.6
4387.96	-7.96	.	.	.	.	-100.45	.	.	.	0.16	14.8	116.1
4099.35	.	.	.	.	.	-91.71	.	.	0.03	0.16	14.9	116.5
3865.79	.	.	.	-21.41	.	.	.	.	0.32	0.15	15.2	117.1
3873.41	.	.	.	-17.34	.	.	9.21	.	.	0.12	16.2	119.2
4086.82	.	.	.	-14.79	-5.84	.	.	.	.	0.11	16.4	119.6
4038.63	.	.	.	.	-12.32	.	.	.	0.27	0.11	16.5	119.9
4055.93	.	.	-18.31	-17.44	.	.	.	.	.	0.10	16.6	120.2
3664.68	16.40	.	.	.	-13.34	.	.	.	.	0.09	16.9	120.8
4286.59	.	.	-31.41	.	-10.14	.	.	.	.	0.08	17.2	121.5
4013.23	.	.	.	.	-9.74	.	4.97	.	.	0.07	17.5	122.1
3051.83	18.62	.	.	.	.	.	17.81	.	.	0.07	17.7	122.4
3971.83	.	.	-45.99	.	.	.	.	.	0.23	0.06	17.9	123.0
3580.42	.	.	.	.	.	.	11.86	.	0.20	0.06	18.0	123.1
3897.45	.	.	-32.65	.	.	.	10.13	.	.	0.05	18.1	123.4
3691.38	14.14	.	-55.80	.	.	.	.	.	.	0.05	18.2	123.5
3252.55	11.96	.	.	.	.	.	.	.	0.26	0.04	18.5	124.2

Appendix Table 3a. Three variable prediction equations of ME of DDGS from chemical composition by laboratory 1 and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
-3385.89	.	.	.	-14.14	-24.82	.	.	1.50	.	0.72	2.2	70.0
-4057.58	.	.	.	.	-41.87	.	-19.17	1.71	.	0.71	2.6	71.1
-4312.93	.	.	21.11	.	-32.38	.	.	1.65	.	0.69	3.3	73.5
-4220.13	11.13	.	.	.	-32.13	.	.	1.60	.	0.68	3.7	74.6
-3966.06	.	11.30	.	.	-31.47	.	.	1.59	.	0.67	4.0	75.4
-4075.92	.	.	.	.	-31.47	.	.	1.65	-0.19	0.67	4.1	75.6
-3896.97	.	.	.	.	-31.35	-4.89	.	1.61	.	0.67	4.2	76.0
-1748.32	.	-67.02	.	-42.21	.	.	.	1.26	.	0.65	5.0	78.1
4521.15	.	.	28.96	-35.24	.	-130.80	.	.	.	0.60	6.7	82.9
1707.34	.	.	.	-31.24	.	-81.01	.	0.52	.	0.60	6.8	83.1
4938.01	.	.	.	-29.05	-8.77	-134.88	.	.	.	0.59	7.1	84.0
4580.15	.	.	.	-36.05	.	-123.61	.	.	0.43	0.58	7.6	85.3
4939.89	.	-17.45	.	-37.23	.	-127.15	.	.	.	0.57	8.0	86.2
4449.49	7.79	.	.	-33.78	.	-121.54	.	.	.	0.57	8.1	86.5
4710.96	.	.	.	-33.55	.	-126.84	-0.72	.	.	0.56	8.3	87.0
-1375.09	.	.	21.49	-28.58	.	.	.	0.99	.	0.56	8.4	87.2
-1718.33	.	.	.	-24.81	.	.	10.24	1.07	.	0.56	8.4	87.3
-1206.94	.	.	.	-30.32	.	.	.	0.97	0.45	0.56	8.5	87.5
-1307.21	11.89	.	.	-28.36	.	.	.	0.94	.	0.55	8.7	88.0
4358.04	.	56.71	.	.	-22.01	-137.63	.	.	.	0.50	10.7	92.9
2628.65	38.55	.	.	-38.18	.	.	.	.	1.18	0.41	14.4	101.1
5222.71	.	.	.	.	-28.39	-133.67	-18.62	.	.	0.40	14.7	101.8
-2645.08	.	.	19.79	.	.	.	21.38	1.14	.	0.39	15.2	102.9
-2630.09	13.40	.	.	.	.	.	22.07	1.09	.	0.39	15.3	103.1
4662.85	.	.	21.59	.	-19.47	-126.67	.	.	.	0.39	15.3	103.1
-2452.35	.	.	.	.	.	.	20.60	1.16	-0.33	0.38	15.5	103.5
-2285.26	.	13.54	.	.	.	.	19.77	1.08	.	0.38	15.6	103.8
-1901.49	.	.	.	.	.	-13.50	18.88	1.05	.	0.37	15.9	104.3
4898.94	.	.	.	.	-18.59	-127.10	.	.	-0.27	0.37	15.9	104.4
4553.77	7.59	.	.	.	-19.06	-118.85	.	.	.	0.37	16.0	104.6
3173.62	24.28	.	23.94	-30.52	.	.	.	.	.	0.33	17.4	107.6
3621.52	.	46.97	.	.	.	-108.92	13.46	.	.	0.32	17.8	108.3
3391.35	.	53.52	31.03	.	.	-110.39	.	.	.	0.32	17.8	108.3
3433.61	24.83	.	.	-26.55	-4.91	.	.	.	.	0.31	18.2	109.0
694.56	.	24.58	.	.	.	-55.28	.	0.56	.	0.31	18.2	109.1
3260.45	25.54	.	.	-27.97	.	.	5.13	.	.	0.31	18.3	109.4
3562.83	22.86	-13.38	.	-31.97	.	.	.	.	.	0.31	18.3	109.4
4243.52	.	-28.74	.	-38.46	.	.	.	.	0.77	0.31	18.5	109.7
3766.68	.	.	19.67	-32.03	.	.	.	.	0.59	0.30	18.6	109.9
-435.66	.	.	11.41	.	.	-33.06	.	0.79	.	0.30	18.7	110.1
-287.51	.	.	.	.	.	-34.64	.	0.79	-0.23	0.30	18.7	110.1

-1474.61	.	16.80	15.47	.	.	.	.	0.92	.	0.30	18.7	110.2
-472.35	1.52	.	.	.	.	-29.96	.	0.80	.	0.29	18.9	110.6
-1610.70	.	.	11.49	.	.	.	.	1.00	-0.22	0.29	18.9	110.6
-1417.37	.	10.58	.	.	.	.	.	0.95	-0.18	0.29	19.0	110.7
-1440.99	5.53	12.88	.	.	.	.	.	0.91	.	0.29	19.0	110.8
-1639.09	3.98	.	10.44	.	.	.	.	0.97	.	0.29	19.1	110.8
3837.42	.	42.80	.	.	.	-109.58	.	.	-0.28	0.29	19.2	111.0
-1538.88	1.70	.	.	.	.	.	.	0.99	-0.16	0.29	19.2	111.1
3917.61	.	.	.	-32.45	.	.	-3.90	.	0.67	0.29	19.2	111.1
3935.45	.	.	.	-30.16	-1.62	.	.	.	0.61	0.29	19.3	111.3
3556.61	4.87	43.37	.	.	.	-102.59	.	.	.	0.28	19.4	111.5
3967.80	.	.	22.13	-26.55	-3.25	.	.	.	.	0.28	19.7	112.1
4021.04	.	-8.08	19.84	-29.95	.	.	.	.	.	0.27	19.8	112.3
3882.47	.	.	22.25	-27.92	.	.	1.54	.	.	0.27	19.8	112.4
4336.34	.	-19.21	.	-32.02	.	.	-3.04	.	.	0.26	20.4	113.5
4258.10	.	-14.27	.	-29.81	-0.66	.	.	.	.	0.26	20.5	113.6
4227.01	.	.	.	-25.34	-5.73	.	-5.60	.	.	0.26	20.5	113.6
3938.75	.	.	19.69	.	.	-102.64	12.48	.	.	0.25	20.9	114.4
4225.70	.	.	.	.	.	-105.24	11.65	.	-0.35	0.24	21.1	114.8
3805.82	8.31	.	.	.	.	-94.99	12.40	.	.	0.23	21.4	115.3
2835.12	27.50	49.60	.	.	-17.03	.	.	.	.	0.23	21.6	115.8
4150.62	.	.	16.03	.	.	-104.30	.	.	-0.32	0.22	21.9	116.3
3976.79	1.88	.	14.04	.	.	-98.76	.	.	.	0.21	22.3	117.1
4349.61	-2.57	.	.	.	.	-104.60	.	.	-0.30	0.21	22.4	117.2
3326.81	.	54.30	32.85	.	-15.69	.	.	.	.	0.20	22.7	117.8
2246.10	28.52	46.34	.	.	.	.	18.23	.	.	0.16	24.3	120.7
3788.78	.	41.93	.	.	-17.13	.	-6.27	.	.	0.16	24.4	120.9
3654.31	.	42.22	.	.	-14.03	.	.	.	0.02	0.15	24.6	121.2
3313.23	22.43	.	16.85	.	-14.75	.	.	.	.	0.14	25.2	122.4
2824.65	.	50.74	33.20	.	.	.	15.22	.	.	0.13	25.4	122.7
3265.17	25.03	.	.	.	-14.63	.	.	.	0.29	0.13	25.5	122.9
2375.12	20.15	48.05	26.64	.	.	.	.	.	.	0.12	25.8	123.4
3493.92	21.23	.	.	.	-14.88	.	-1.63	.	.	0.12	25.8	123.4
2588.42	20.82	39.15	.	.	.	.	.	.	0.20	0.09	26.9	125.3
4063.38	.	.	13.31	.	-15.14	.	-5.37	.	.	0.09	27.1	125.8
3264.67	.	38.30	.	.	.	.	11.70	.	-0.09	0.09	27.2	125.8
2734.67	23.89	.	19.21	.	.	.	16.30	.	.	0.09	27.2	125.9
3953.85	.	.	14.99	.	-12.50	.	.	.	-0.03	0.08	27.3	126.0
3086.74	.	43.05	24.48	.	.	.	.	.	-0.09	0.08	27.4	126.2
4173.51	.	.	.	.	-15.78	.	-7.45	.	0.07	0.08	27.4	126.3
2850.16	23.83	.	.	.	.	.	14.14	.	0.14	0.07	27.8	127.0
3558.11	.	.	16.37	.	.	.	11.13	.	-0.14	0.03	29.3	129.4
3065.72	16.75	.	10.73	.	.	.	.	.	0.12	0.03	29.3	129.5

Appendix Table 3b. Three variable prediction equations of ME of DDGS from chemical composition by laboratory 2 and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
4120.77	.	62.75	.	.	-18.99	-104.23	.	.	.	0.67	2.8	75.1
-1792.15	.	.	-104.70	.	-15.79	.	.	1.30	.	0.67	2.8	75.1
-865.38	.	41.87	.	.	-18.51	.	.	0.90	.	0.65	3.7	77.8
3134.27	.	82.50	.	25.03	-19.61	.	.	.	.	0.64	4.0	78.6
-342.26	.	.	-156.11	.	.	.	.	1.02	-0.70	0.61	5.4	82.7
2083.64	18.81	74.07	.	.	.	.	25.65	.	.	0.60	5.7	83.7
2979.81	.	66.50	.	.	.	-48.95	21.49	.	.	0.59	5.8	83.9
2492.19	.	76.12	.	11.76	.	.	23.59	.	.	0.59	6.0	84.5
647.28	.	56.90	.	.	.	.	22.12	0.42	.	0.59	6.0	84.6
3037.04	.	70.88	.	.	-7.75	.	17.27	.	.	0.59	6.0	84.6
411.61	.	25.23	-107.22	.	.	.	.	0.70	.	0.59	6.1	84.7
-3200.39	-19.71	.	.	.	-21.76	.	.	1.58	.	0.58	6.2	85.1
-3303.19	.	.	.	.	-26.48	.	.	1.47	0.71	0.58	6.3	85.4
3994.38	.	46.66	-85.29	.	.	-62.17	.	.	.	0.57	6.8	86.7
3522.59	.	56.22	-102.05	16.46	.	.	.	.	.	0.56	6.9	87.1
-332.68	.	.	-146.68	4.13	.	.	.	0.95	.	0.56	7.0	87.3
2787.87	.	70.55	.	.	.	.	22.28	.	-0.23	0.56	7.0	87.4
-240.94	.	.	-139.01	.	.	-8.26	.	0.94	.	0.56	7.1	87.6
-523.93	-1.54	.	-136.80	.	.	.	.	0.99	.	0.56	7.1	87.7
-469.01	.	.	-140.07	.	.	.	-0.71	0.98	.	0.56	7.1	87.7
-1859.23	.	.	.	.	-23.23	-40.22	.	1.26	.	0.55	7.2	88.0
2859.26	14.35	71.12	.	.	-12.46	.	.	.	.	0.55	7.2	88.0
2748.32	.	69.42	-2.91	.	.	.	21.42	.	.	0.55	7.2	88.0
-2984.57	.	.	.	.	-19.68	.	8.54	1.40	.	0.55	7.3	88.1
3625.99	.	59.93	-45.60	.	-9.00	.	.	.	.	0.55	7.5	88.6
3145.38	17.96	53.05	-91.95	.	.	.	.	.	.	0.54	7.7	89.3
-2957.64	.	.	.	2.14	-22.33	.	.	1.42	.	0.54	7.8	89.4
3255.01	.	68.13	.	.	-13.42	.	.	.	0.34	0.54	7.8	89.6
3786.53	.	51.91	-84.82	.	.	.	.	.	-0.40	0.52	8.5	91.4
2295.14	.	57.98	.	.	.	-40.16	.	0.16	.	0.49	9.5	94.0
3179.23	.	62.45	.	.	.	-51.31	.	.	-0.15	0.49	9.5	94.0
2987.58	3.85	63.08	.	.	.	-47.69	.	.	.	0.49	9.6	94.1
3059.28	.	63.72	.	2.49	.	-46.27	.	.	.	0.49	9.6	94.1
872.53	.	53.11	.	.	.	.	.	0.42	-0.19	0.48	9.9	95.0
1157.15	.	57.37	.	4.05	.	.	.	0.33	.	0.48	10.0	95.1
904.47	0.97	53.68	.	.	.	.	.	0.39	.	0.48	10.1	95.4
5585.69	.	.	-121.33	.	-12.20	-117.44	.	.	.	0.47	10.3	95.9
2755.11	.	70.60	.	9.09	.	.	.	.	-0.20	0.47	10.4	96.2
2585.90	4.51	69.97	.	6.97	.	.	.	.	.	0.46	10.5	96.4
2586.04	9.16	67.52	.	.	.	.	.	.	-0.08	0.46	10.8	97.1
5423.49	.	.	-159.39	.	.	-85.94	.	.	-0.57	0.43	11.6	99.2

4879.56	9.14	.	-154.04	.	.	-77.41	.	.	.	0.41	12.5	101.2
5272.68	.	.	-161.42	.	.	-85.57	-7.04	.	.	0.41	12.5	101.3
5107.84	.	.	-149.38	2.35	.	-80.66	.	.	.	0.40	12.8	101.9
-2100.19	.	.	.	-10.15	.	.	18.44	1.10	.	0.40	12.9	102.2
-1993.74	-13.90	.	.	.	.	.	17.06	1.14	.	0.39	13.1	102.7
-1871.58	.	.	.	.	.	.	19.70	1.05	-0.26	0.38	13.6	103.9
-2243.43	.	.	.	.	.	12.27	19.47	1.09	.	0.37	13.8	104.3
5124.75	.	.	-190.35	16.43	.	.	.	.	-0.72	0.36	14.3	105.3
-1788.54	-23.14	.	.	.	.	.	.	1.19	-0.41	0.34	14.9	106.6
5063.32	.	.	.	.	-25.18	-146.33	.	.	0.87	0.34	14.9	106.8
-1856.38	-14.13	.	.	-6.72	.	.	.	1.14	.	0.34	15.1	107.3
4923.74	.	.	-158.70	17.10	-6.97	.	.	.	.	0.34	15.1	107.3
4575.71	16.05	.	-167.28	.	.	.	.	.	-0.44	0.33	15.3	107.5
-1716.18	-19.40	.	.	.	.	-1.33	.	1.13	.	0.33	15.5	108.0
4441.79	12.70	.	-169.40	8.42	.	.	.	.	.	0.33	15.5	108.1
4941.27	.	.	-190.25	14.46	.	.	-9.48	.	.	0.33	15.5	108.2
-1216.74	.	.	.	-13.07	.	-20.88	.	0.97	.	0.32	15.6	108.3
-1796.59	.	.	.	-11.24	.	.	.	1.07	-0.15	0.32	15.7	108.4
4372.21	18.47	.	-151.75	.	-3.26	.	.	.	.	0.32	15.7	108.6
4404.31	17.78	.	-168.87	.	.	.	-4.70	.	.	0.32	15.8	108.8
5155.29	.	.	-170.70	.	.	.	-7.32	.	-0.57	0.31	16.0	109.2
4984.15	.	.	-160.13	.	2.22	.	.	.	-0.64	0.31	16.3	109.7
5290.40	-8.20	.	.	.	-18.55	-135.56	.	.	.	0.29	16.8	110.9
5065.96	.	.	.	-6.34	-17.19	-135.99	.	.	.	0.29	16.8	110.9
-1703.12	.	.	.	.	.	5.91	.	1.02	-0.19	0.29	16.9	111.0
4917.60	.	.	.	.	-17.15	-124.69	5.31	.	.	0.29	16.9	111.1
4954.22	.	.	-148.52	.	-3.74	.	-7.32	.	.	0.29	16.9	111.1
4246.72	.	.	.	-13.61	.	-100.16	14.34	.	.	0.20	20.0	117.5
4090.02	-3.37	.	.	.	.	-79.20	15.15	.	.	0.16	21.4	120.5
4004.59	.	.	.	.	.	-76.49	15.91	.	-0.09	0.16	21.5	120.5
4293.82	1.56	.	.	-15.69	.	-102.87	.	.	.	0.16	21.7	121.0
4330.08	.	.	.	-15.18	.	-103.25	.	.	0.02	0.16	21.7	121.0
4409.33	-9.73	.	.	.	.	-84.98	.	.	-0.12	0.11	23.2	123.9
3704.45	6.89	.	.	.	-6.58	.	13.18	.	.	0.09	24.2	125.7
3903.13	.	.	.	.	-8.08	.	10.66	.	0.24	0.09	24.2	125.9
3911.18	.	.	.	2.21	-7.08	.	11.85	.	.	0.08	24.3	126.1
3789.28	8.15	.	.	.	-12.55	.	.	.	0.50	0.07	24.7	126.8
3372.09	11.22	.	.	-6.62	.	.	17.27	.	.	0.07	24.7	126.8
4021.49	.	.	.	4.82	-13.06	.	.	.	0.43	0.07	24.8	127.0
3472.76	5.67	.	.	.	.	.	16.99	.	-0.03	0.06	25.1	127.4
3689.44	.	.	.	-2.45	.	.	15.76	.	-0.07	0.06	25.1	127.6
4013.88	1.73	.	.	2.57	-9.86	.	.	.	.	0.06	25.4	128.0
3589.61	5.54	.	.	-6.03	.	.	.	.	0.05	0.01	27.1	131.2

Appendix Table 3c. Three variables prediction equations of ME of DDGS from chemical composition (combined laboratories) and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
4335.02	.	72.64	.	.	-24.77	-140.52	.	.	.	0.69	0.6	73.5
-2787.10	.	29.12	.	.	-28.04	.	.	1.34	.	0.68	0.9	74.8
-2546.42	.	.	.	.	-30.70	-37.86	.	1.41	.	0.66	1.6	77.3
-3624.60	.	.	.	-4.26	-28.06	.	.	1.57	.	0.65	1.9	78.4
-3664.98	.	.	.	.	-29.95	.	.	1.58	0.06	0.64	2.0	78.6
-3732.68	-4.16	.	.	.	-29.79	.	.	1.62	.	0.64	2.0	78.7
-3735.36	.	.	.	.	-31.18	.	-2.89	1.61	.	0.64	2.0	78.7
-3723.37	.	.	-1.32	.	-29.91	.	.	1.59	.	0.64	2.0	78.8
3135.54	.	73.41	.	.	.	-86.53	19.91	.	.	0.51	6.0	92.1
2885.72	.	119.19	.	34.53	-29.11	.	.	.	.	0.49	6.6	93.6
-835.46	.	50.59	.	.	.	.	22.56	0.72	.	0.49	6.8	94.3
-2167.99	.	.	.	-20.49	.	.	15.97	1.14	.	0.48	6.9	94.7
1489.25	35.39	85.86	.	.	.	.	29.36	.	.	0.48	7.2	95.4
508.88	.	.	.	-28.09	.	-67.68	.	0.72	.	0.47	7.4	96.1
3868.79	.	46.10	.	-16.84	.	-111.30	.	.	.	0.47	7.4	96.2
5177.61	.	.	.	-21.85	-14.88	-155.06	.	.	.	0.46	7.5	96.5
2509.61	28.35	80.03	.	.	-17.37	.	.	.	.	0.46	7.6	96.6
-1504.61	.	.	.	-24.34	.	.	.	1.03	0.16	0.44	8.2	98.4
3246.39	.	74.90	.	.	-14.99	.	.	.	0.31	0.44	8.3	98.6
-1682.13	10.56	.	.	-26.18	.	.	.	1.01	.	0.44	8.3	98.8
-1599.89	.	.	-10.60	-22.37	.	.	.	1.07	.	0.43	8.5	99.3
-1438.49	.	8.29	.	-20.91	.	.	.	1.00	.	0.43	8.5	99.3
3256.62	.	67.28	.	.	.	-81.98	.	.	0.08	0.43	8.6	99.6
3202.90	2.83	67.50	.	.	.	-84.30	.	.	.	0.43	8.7	99.8
2890.55	.	64.21	.	.	.	-80.26	.	0.08	.	0.43	8.7	99.8
3303.87	.	66.94	0.37	.	.	-86.87	.	.	.	0.43	8.7	99.8
3101.91	.	76.14	.	.	-9.93	.	11.50	.	.	0.41	9.1	101.0
4232.48	15.34	.	.	-34.82	.	-126.18	.	.	.	0.40	9.3	101.6
3086.71	.	79.43	30.87	.	-15.74	.	.	.	.	0.40	9.4	101.7
2218.51	.	86.05	47.60	.	.	.	25.61	.	.	0.40	9.5	101.9
2659.19	.	76.17	.	.	.	.	18.49	.	0.20	0.40	9.6	102.2
4635.29	.	.	.	-29.82	.	-133.19	6.40	.	.	0.40	9.6	102.3
23.65	.	49.12	.	.	.	.	.	0.57	0.16	0.39	9.8	102.8
4636.66	.	.	10.23	-32.38	.	-136.75	.	.	.	0.39	9.8	102.9
4661.52	.	.	.	-31.33	.	-131.78	.	.	0.05	0.39	9.8	102.9
2462.31	.	87.44	.	8.76	.	.	23.13	.	.	0.39	9.8	103.0
5336.02	.	.	.	.	-26.57	-151.42	-9.32	.	.	0.39	9.9	103.1
-234.86	.	41.47	-19.51	.	.	.	.	0.68	.	0.38	10.0	103.4
-1949.84	.	.	-21.31	.	.	.	18.36	1.08	.	0.38	10.0	103.5
-195.56	3.10	47.86	.	.	.	.	.	0.61	.	0.38	10.1	103.8
-2195.41	.	.	.	.	.	.	20.66	1.09	-0.01	0.38	10.2	104.0

-2251.66	.	.	.	.	.	2.23	20.61	1.10	.	0.38	10.2	104.0
-2175.28	-0.11	.	.	.	.	.	20.50	1.09	.	0.38	10.2	104.0
5153.77	.	.	-9.19	.	-21.90	-141.12	.	.	.	0.38	10.2	104.0
5184.63	-2.35	.	.	.	-22.31	-144.34	.	.	.	0.38	10.2	104.1
5132.17	.	.	.	.	-22.51	-144.73	.	.	-0.03	0.38	10.2	104.1
2074.66	21.59	74.65	.	.	.	.	.	.	0.32	0.37	10.5	104.8
2366.63	23.38	63.29	.	-8.93	.	.	.	.	.	0.33	11.7	107.8
2882.44	.	66.25	.	-3.44	.	.	.	.	0.28	0.33	11.7	108.0
2778.03	.	70.63	1.83	.	.	.	.	.	0.27	0.32	11.8	108.2
-1217.30	-6.02	.	-43.96	.	.	.	.	1.02	.	0.32	11.9	108.4
-1098.55	.	.	-47.24	.	.	.	.	0.97	0.07	0.32	11.9	108.4
-791.37	.	.	-47.26	.	.	-11.84	.	0.92	.	0.32	11.9	108.5
2395.74	18.26	71.16	-10.31	.	.	.	.	.	.	0.32	12.0	108.6
-818.56	-12.51	.	.	.	.	-22.42	.	0.94	.	0.30	12.6	110.2
-1500.18	-9.99	.	.	.	.	.	.	1.03	0.04	0.30	12.7	110.5
2912.46	.	68.33	0.55	-1.00	.	.	.	.	.	0.29	12.9	111.0
-1145.71	.	.	.	.	.	-9.40	.	0.92	0.06	0.29	12.9	111.1
2723.28	41.47	.	.	-34.19	.	.	.	.	0.46	0.27	13.6	112.8
2774.97	39.19	.	.	-27.06	.	.	16.27	.	.	0.22	15.0	116.3
4284.50	.	.	-29.45	.	.	-92.87	10.56	.	.	0.21	15.3	117.1
4068.65	.	.	.	.	.	-95.41	13.68	.	-0.03	0.20	15.7	117.9
4019.39	0.94	.	.	.	.	-92.79	13.69	.	.	0.20	15.7	117.9
4531.03	-2.87	.	-42.80	.	.	-94.93	.	.	.	0.19	16.0	118.6
4432.91	.	.	-44.55	.	.	-91.00	.	.	0.02	0.19	16.0	118.6
3263.39	30.67	.	.	-23.60	-5.69	.	.	.	.	0.18	16.2	119.2
3247.40	31.48	.	-23.51	-25.88	.	.	.	.	.	0.18	16.4	119.5
4413.20	-8.41	.	.	.	.	-101.90	.	.	-0.02	0.16	16.8	120.5
4012.36	.	.	.	-17.02	-5.83	.	.	.	0.32	0.16	16.9	120.7
3825.87	.	.	.	-19.94	.	.	6.40	.	0.29	0.16	17.0	121.0
3943.90	.	.	-12.11	-20.21	.	.	.	.	0.31	0.15	17.2	121.4
3460.59	21.26	.	.	.	-14.75	.	.	.	0.33	0.15	17.3	121.7
3959.99	.	.	.	-15.60	-2.86	.	7.17	.	.	0.12	18.1	123.6
4210.70	.	.	-28.74	.	-10.97	.	.	.	0.26	0.12	18.1	123.7
3921.45	.	.	-6.96	-16.79	.	.	8.66	.	.	0.12	18.2	123.7
3823.86	19.48	.	-40.69	.	-11.79	.	.	.	.	0.12	18.2	123.8
4184.29	.	.	-16.24	-13.40	-5.63	.	.	.	.	0.11	18.3	123.9
4020.58	.	.	.	.	-11.91	.	1.09	.	0.27	0.11	18.5	124.5
3412.24	19.78	.	.	.	-10.27	.	9.25	.	.	0.11	18.5	124.5
2918.62	20.77	.	.	.	.	.	16.58	.	0.23	0.09	18.9	125.3
3303.08	20.54	.	-39.00	.	.	.	14.42	.	.	0.09	19.1	125.7
3507.29	17.52	.	-56.45	.	.	.	.	.	0.27	0.09	19.1	125.8
4230.23	.	.	-29.15	.	-9.33	.	2.45	.	.	0.08	19.2	126.0
3850.07	.	.	-33.99	.	.	.	8.46	.	0.20	0.07	19.5	126.7

Appendix Table 4a. Four variable prediction equations of ME of DDGS from chemical composition by laboratory 1 and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
-3412.26	.	.	.	-13.18	-34.80	.	-17.54	1.58	.	0.75	2.8	68.2
-3602.82	.	.	24.78	-15.28	-25.36	.	.	1.51	.	0.75	3.0	68.9
-3239.15	.	-33.04	.	-23.94	-20.18	.	.	1.54	.	0.74	3.4	70.2
-3511.63	13.90	.	.	-15.13	-25.20	.	.	1.45	.	0.74	3.4	70.3
-1726.43	.	.	.	-17.34	-22.43	-40.06	.	1.22	.	0.73	3.6	71.1
-4241.21	.	.	16.47	.	-41.54	.	-17.26	1.72	.	0.72	4.0	72.4
-3331.21	.	.	.	-15.32	-24.26	.	.	1.49	0.13	0.72	4.1	72.6
-3967.62	.	8.94	.	.	-41.66	.	-18.77	1.67	.	0.71	4.4	73.6
-4128.53	5.50	.	.	.	-41.36	.	-17.63	1.69	.	0.71	4.4	73.7
-3512.86	.	.	.	.	-41.89	-14.51	-19.80	1.62	.	0.71	4.5	73.8
-4056.77	.	.	.	.	-41.68	.	-18.82	1.71	-0.05	0.71	4.5	74.0
-4167.36	.	22.00	28.11	.	-32.71	.	.	1.57	.	0.71	4.7	74.3
-1821.47	.	-81.27	.	-50.78	.	.	.	1.27	0.82	0.71	4.7	74.4
-4473.78	11.98	.	22.06	.	-33.14	.	.	1.62	.	0.70	4.8	74.7
-4323.66	.	.	22.63	.	-32.45	.	.	1.67	-0.25	0.70	5.1	75.7
-4017.60	.	.	21.34	.	-32.21	-7.95	.	1.60	.	0.69	5.3	76.4
-4086.83	13.46	16.07	.	.	-32.30	.	.	1.53	.	0.69	5.3	76.4
-4207.46	10.25	.	.	.	-32.08	.	.	1.61	-0.07	0.68	5.7	77.6
-4373.71	11.44	.	.	.	-32.24	3.99	.	1.63	.	0.68	5.7	77.6
-3103.24	.	16.63	.	.	-31.00	-21.57	.	1.44	.	0.68	5.9	78.1
-3965.24	.	10.95	.	.	-31.48	.	.	1.60	-0.18	0.68	5.9	78.1
-3775.55	.	.	.	.	-31.29	-8.00	.	1.60	-0.20	0.67	6.0	78.6
-98.01	.	-55.48	.	-41.72	.	-43.07	.	0.96	.	0.66	6.4	79.7
-1775.74	6.65	-64.83	.	-42.29	.	.	.	1.23	.	0.65	6.8	80.9
-1770.31	.	-63.90	6.75	-41.90	.	.	.	1.25	.	0.65	6.9	81.1
-1857.53	.	-64.31	.	-40.93	.	.	2.72	1.27	.	0.65	6.9	81.2
4761.98	.	.	30.73	-30.69	-9.47	-139.77	.	.	.	0.64	7.3	82.4
1804.96	.	.	26.53	-33.14	.	-88.72	.	0.47	.	0.63	7.5	82.8
5353.70	.	.	.	-28.90	-18.32	-144.49	-18.02	.	.	0.63	7.7	83.4
1649.46	.	.	.	-33.84	.	-78.89	.	0.51	0.41	0.62	8.2	84.8
4422.16	.	.	27.51	-37.47	.	-127.83	.	.	0.37	0.62	8.2	84.9
4235.99	8.62	.	29.44	-35.73	.	-125.05	.	.	.	0.61	8.4	85.6
1166.59	.	.	.	-29.53	.	-73.24	5.41	0.61	.	0.61	8.6	85.9
1493.18	7.32	.	.	-31.65	.	-76.45	.	0.52	.	0.61	8.6	86.0
3878.18	18.84	.	.	-38.90	.	-108.69	.	.	0.72	0.61	8.6	86.1
4624.28	.	-6.90	27.37	-36.66	.	-130.72	.	.	.	0.60	8.7	86.2
4815.38	.	.	.	-31.62	-7.90	-131.53	.	.	0.34	0.60	8.7	86.2
4503.26	.	.	29.53	-34.87	.	-130.81	1.59	.	.	0.60	8.7	86.3
4628.81	9.88	.	.	-29.32	-9.30	-128.70	.	.	.	0.60	8.7	86.4
-1348.28	23.60	.	.	-34.73	.	.	.	0.85	0.81	0.60	8.8	86.6
4903.53	.	-27.01	.	-42.91	.	-123.10	.	.	0.57	0.60	8.9	86.8

3927.22	.	75.51	47.84	.	-25.09	-148.87	.	.	.	0.60	8.9	86.8
4907.31	.	3.35	.	-28.04	-9.32	-135.32	.	.	.	0.59	9.1	87.4
-2001.26	.	.	25.94	-25.76	.	.	12.43	1.09	.	0.59	9.1	87.5
-1977.94	16.92	.	.	-25.50	.	.	13.29	1.02	.	0.59	9.4	88.1
4597.22	.	.	.	-37.15	.	-123.44	-3.30	.	0.47	0.58	9.6	88.6
-1469.98	12.94	.	22.70	-29.76	.	.	.	0.94	.	0.58	9.7	89.0
-1346.30	.	.	20.06	-31.23	.	.	.	0.97	0.42	0.58	9.7	89.1
4692.53	7.22	-16.63	.	-37.44	.	-122.25	.	.	.	0.58	9.8	89.2
5036.05	.	-21.95	.	-39.23	.	-127.42	-3.95	.	.	0.57	9.9	89.4
-1598.82	.	.	.	-27.55	.	.	8.06	1.04	0.33	0.57	10.0	89.8
4423.19	8.31	.	.	-33.55	.	-121.14	1.04	.	.	0.57	10.1	90.0
4793.37	.	56.96	.	.	-31.99	-147.84	-18.92	.	.	0.54	11.1	92.7
3921.01	13.23	59.45	.	.	-23.01	-129.88	.	.	.	0.52	12.1	95.1
4469.79	.	56.91	.	.	-22.03	-141.32	.	.	-0.29	0.51	12.4	95.8
2995.41	40.20	-34.87	.	-47.37	.	.	.	.	1.38	0.44	15.1	102.4
2470.69	39.07	.	21.35	-39.25	.	.	.	.	1.15	0.43	15.5	103.3
5073.91	.	.	17.32	.	-28.08	-135.03	-16.68	.	.	0.42	16.1	104.7
2687.37	39.45	.	.	-36.15	-3.65	.	.	.	1.16	0.42	16.2	104.8
-2519.29	.	24.63	28.13	.	.	.	22.79	1.06	.	0.41	16.3	105.2
2602.65	39.08	.	.	-37.75	.	.	1.56	.	1.17	0.41	16.3	105.2
-2921.87	15.12	.	22.08	.	.	.	24.57	1.10	.	0.41	16.4	105.3
-2738.07	.	.	23.06	.	.	.	23.15	1.18	-0.42	0.41	16.5	105.6
5260.77	.	.	.	.	-27.89	-135.09	-17.66	.	-0.15	0.40	16.6	105.7
5200.13	0.58	.	.	.	-28.33	-133.20	-18.44	.	.	0.40	16.7	105.9
-2503.15	16.75	19.91	.	.	.	.	23.20	1.01	.	0.40	16.7	106.0
4784.60	.	.	23.83	.	-19.56	-131.32	.	.	-0.34	0.40	16.8	106.3
3119.21	.	63.59	42.67	.	.	-116.08	18.43	.	.	0.40	16.8	106.3
4401.15	8.24	.	22.06	.	-20.00	-121.49	.	.	.	0.39	17.0	106.8
-2616.19	10.80	.	.	.	.	.	22.33	1.12	-0.22	0.39	17.1	106.9
-2073.75	.	.	20.07	.	.	-15.29	20.77	1.05	.	0.39	17.1	106.9
-2331.93	.	13.06	.	.	.	.	20.89	1.11	-0.33	0.39	17.2	107.1
-861.13	.	22.21	.	.	.	-35.77	18.47	0.83	.	0.39	17.3	107.3
-2585.14	13.29	.	.	.	.	-1.15	22.00	1.09	.	0.39	17.3	107.3
-1779.07	.	.	.	.	.	-17.98	19.92	1.05	-0.36	0.39	17.3	107.4
4732.25	4.57	.	.	.	-18.88	-123.46	.	.	-0.21	0.37	17.8	108.5
3233.49	26.06	.	24.83	-27.82	-5.40	.	.	.	.	0.34	19.0	111.0
2978.57	27.88	.	27.06	-29.08	.	.	7.75	.	.	0.34	19.0	111.0
3091.18	14.35	50.30	.	.	.	-99.67	16.70	.	.	0.34	19.1	111.3
3760.22	.	47.60	.	.	.	-114.03	14.59	.	-0.38	0.34	19.2	111.4
3510.43	.	54.81	33.95	.	.	-115.77	.	.	-0.39	0.34	19.2	111.4
1299.71	.	38.57	24.96	.	.	-73.48	.	0.40	.	0.34	19.2	111.5
3244.29	24.11	-4.37	22.92	-31.41	.	.	.	.	.	0.33	19.4	111.9
4548.50	.	-48.11	.	-47.78	.	.	-13.02	.	1.04	0.33	19.5	112.0
3166.18	6.22	54.71	31.60	.	.	-106.15	.	.	.	0.33	19.7	112.4
867.88	.	25.21	.	.	.	-59.77	.	0.55	-0.25	0.32	19.9	113.0

4072.56	.	-22.29	14.11	-37.46	.	.	.	.	0.71	0.31	20.1	113.4
3475.71	24.55	-3.45	.	-27.59	-4.34	.	.	.	.	0.31	20.2	113.5
3412.68	25.05	.	.	-26.57	-4.55	.	0.75	.	.	0.31	20.2	113.5
617.35	3.45	25.39	.	.	.	-53.63	.	0.56	.	0.31	20.2	113.5
4288.84	.	-44.51	.	-46.08	5.99	.	.	.	0.91	0.31	20.2	113.5
3423.89	24.59	-9.12	.	-30.28	.	.	3.59	.	.	0.31	20.3	113.7
-279.93	.	.	13.22	.	.	-37.60	.	0.78	-0.28	0.31	20.4	113.9
-1477.74	.	16.88	16.79	.	.	.	.	0.93	-0.22	0.31	20.5	114.2
3813.26	.	.	20.01	-30.84	-2.01	.	.	.	0.57	0.31	20.5	114.3
-1507.60	6.99	19.78	16.80	.	.	.	.	0.88	.	0.30	20.5	114.3
3783.88	.	.	18.81	-32.70	.	.	-2.11	.	0.62	0.30	20.6	114.3
-492.28	1.71	.	11.47	.	.	-31.86	.	0.79	.	0.30	20.7	114.6
-201.85	-2.12	.	.	.	.	-36.56	.	0.79	-0.26	0.30	20.7	114.6
4112.60	.	.	.	-30.61	-6.62	.	-10.25	.	0.69	0.30	20.8	114.9
-1623.51	1.63	.	11.47	.	.	.	.	0.99	-0.20	0.30	20.9	115.1
-1433.09	3.82	12.02	.	.	.	.	.	0.93	-0.13	0.29	21.0	115.1
2330.23	31.00	64.97	39.19	.	-19.40	.	.	.	.	0.29	21.0	115.3
3793.44	1.10	42.96	.	.	.	-108.64	.	.	-0.27	0.29	21.2	115.5
4033.45	.	.	21.24	-26.44	-4.76	.	-3.01	.	.	0.28	21.6	116.5
3965.77	.	0.17	22.17	-26.50	-3.27	.	.	.	.	0.28	21.7	116.6
4014.01	.	-7.77	19.98	-29.83	.	.	0.22	.	.	0.27	21.8	116.8
4076.29	.	.	23.21	.	.	-108.69	14.06	.	-0.43	0.26	22.1	117.6
4369.24	.	-14.27	.	-29.69	-3.50	.	-5.60	.	.	0.26	22.3	117.9
3586.37	9.88	.	21.02	.	.	-96.01	14.70	.	.	0.25	22.6	118.4
4065.30	4.11	.	.	.	.	-101.80	12.38	.	-0.30	0.24	23.1	119.4
2576.04	32.06	51.06	.	.	-17.78	.	.	.	0.38	0.24	23.1	119.4
1498.54	34.52	64.46	43.64	.	.	.	24.60	.	.	0.24	23.3	119.8
2810.86	27.75	49.70	.	.	-16.64	.	0.83	.	.	0.23	23.6	120.5
4268.90	-3.09	.	16.19	.	.	-107.04	.	.	-0.36	0.22	23.9	121.0
3380.21	.	53.92	32.09	.	-16.76	.	-2.25	.	.	0.20	24.7	122.6
3342.87	.	54.41	33.24	.	-15.66	.	.	.	-0.06	0.20	24.7	122.6
2110.25	30.66	46.83	.	.	.	.	18.20	.	0.19	0.16	26.1	125.3
3775.31	.	41.95	.	.	-17.44	.	-6.80	.	0.07	0.16	26.4	125.8
3164.28	25.26	.	15.66	.	-15.15	.	.	.	0.25	0.14	27.0	127.0
2868.81	.	51.58	35.11	.	.	.	16.02	.	-0.21	0.14	27.2	127.4
3290.11	22.66	.	17.09	.	-14.40	.	0.76	.	.	0.14	27.2	127.4
3338.46	24.35	.	.	.	-16.06	.	-2.99	.	0.30	0.13	27.4	127.8
2287.59	21.64	48.16	25.93	.	.	.	.	.	0.14	0.12	27.7	128.3
4061.37	.	.	13.15	.	-15.23	.	-5.53	.	0.02	0.09	29.1	130.9
2682.20	24.79	.	18.69	.	.	.	16.22	.	0.09	0.09	29.2	131.0

Appendix Table 4b. Four variable prediction equations of ME of DDGS from chemical composition by laboratory 2 and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
3833.34	.	73.57	.	16.94	-22.87	-81.07	.	.	.	0.72	3.2	72.4
4178.81	.	61.48	.	.	-24.55	-119.46	.	.	0.74	0.72	3.3	72.9
-1512.03	.	.	-124.91	13.13	-18.62	.	.	1.26	.	0.71	3.7	74.2
55.82	.	58.76	.	18.23	-22.72	.	.	0.68	.	0.70	3.7	74.4
-913.91	.	24.08	-75.29	.	-15.62	.	.	1.03	.	0.70	3.9	74.9
3870.25	.	65.03	.	.	-15.77	-93.99	11.75	.	.	0.70	3.9	74.9
1554.12	.	49.56	.	.	-20.77	-73.88	.	0.50	.	0.70	3.9	74.9
2912.23	.	84.28	.	24.05	-15.94	.	15.91	.	.	0.69	4.1	75.7
4429.42	.	55.01	-42.23	.	-16.72	-103.28	.	.	.	0.69	4.2	76.1
-737.18	.	.	-104.20	.	-17.30	-38.53	.	1.14	.	0.69	4.3	76.4
3646.15	.	71.23	-70.91	28.23	-16.95	.	.	.	.	0.69	4.3	76.4
-671.58	.	46.31	.	.	-15.02	.	13.41	0.82	.	0.69	4.4	76.8
-1622.44	.	.	-118.56	.	-16.58	.	-6.66	1.29	.	0.68	4.6	77.4
-1972.32	-7.10	.	-96.15	.	-16.30	.	.	1.36	.	0.68	4.7	77.6
-1266.92	.	39.28	.	.	-22.57	.	.	0.98	0.57	0.68	4.7	77.8
3951.75	4.58	63.86	.	.	-19.03	-100.08	.	.	.	0.68	4.7	77.9
-1795.69	.	.	-104.53	.	-15.83	.	.	1.30	0.00	0.67	4.8	78.2
3070.30	.	83.43	.	27.32	-23.83	.	.	.	0.58	0.67	5.0	78.6
-1099.27	-5.12	38.42	.	.	-18.79	.	.	0.98	.	0.65	5.6	80.7
3191.48	-2.11	82.60	.	25.94	-19.75	.	.	.	.	0.64	5.9	81.7
2383.42	20.31	75.34	.	.	-8.51	.	20.89	.	.	0.64	6.2	82.6
339.65	.	19.51	-129.87	.	.	.	.	0.80	-0.62	0.62	6.8	84.3
-9.14	.	.	-174.39	8.07	.	.	.	0.97	-0.79	0.62	6.9	84.7
-3279.19	-31.52	.	.	15.08	-26.35	.	.	1.66	.	0.62	7.0	84.9
2435.94	14.01	70.48	.	.	.	-35.61	24.40	.	.	0.61	7.0	85.1
-1782.23	.	.	.	.	-29.65	-57.68	.	1.25	0.85	0.61	7.1	85.5
-462.80	-6.69	.	-150.24	.	.	.	.	1.07	-0.75	0.61	7.2	85.7
-245.26	.	.	-162.68	.	.	.	-2.69	1.01	-0.71	0.61	7.3	86.0
-165.93	.	.	-156.47	.	.	-5.78	.	0.99	-0.70	0.61	7.3	86.1
2123.55	13.70	76.55	.	6.90	.	.	25.63	.	.	0.60	7.4	86.2
-1906.90	-21.15	.	.	.	-23.59	-47.61	.	1.39	.	0.60	7.4	86.2
1089.86	.	33.28	-117.21	9.98	.	.	.	0.55	.	0.60	7.4	86.3
2770.21	.	71.14	.	6.98	.	-34.83	22.62	.	.	0.60	7.4	86.4
-3391.73	-14.95	.	.	.	-25.27	.	.	1.58	0.52	0.60	7.5	86.4
1172.03	13.56	66.04	.	.	.	.	24.72	0.22	.	0.60	7.5	86.5
489.01	.	39.99	-58.96	.	.	.	12.87	0.58	.	0.60	7.5	86.5
3050.32	.	67.04	.	.	.	-48.98	21.89	.	-0.23	0.60	7.5	86.7
3884.51	.	54.92	-125.77	19.63	.	.	.	.	-0.63	0.60	7.6	86.8
1202.35	.	65.43	.	7.84	.	.	23.18	0.28	.	0.60	7.6	86.8
1868.77	.	61.02	.	.	.	-34.20	21.73	0.21	.	0.60	7.6	86.8
3287.31	.	60.65	-27.35	.	.	-52.92	17.12	.	.	0.60	7.6	86.9

2569.42	.	77.21	.	12.50	.	.	24.23	.	-0.30	0.60	7.6	86.9
2257.40	19.49	70.39	-18.79	.	.	.	22.81	.	.	0.60	7.6	86.9
2134.36	18.17	74.16	.	.	.	.	25.69	.	-0.10	0.60	7.7	87.0
653.15	.	57.05	.	.	.	.	22.61	0.44	-0.28	0.60	7.7	87.1
2870.21	.	69.10	-40.30	14.04	.	.	17.54	.	.	0.60	7.7	87.2
1417.11	.	29.50	-103.91	.	.	-27.85	.	0.52	.	0.59	7.8	87.4
3201.79	19.00	60.19	-64.14	.	-9.45	.	.	.	.	0.59	7.9	87.9
2886.18	.	74.12	15.75	.	-8.09	.	19.56	.	.	0.59	8.0	87.9
629.26	5.58	28.26	-109.34	.	.	.	.	0.63	.	0.59	8.0	87.9
3037.03	.	70.73	.	.	-8.45	.	16.69	.	0.10	0.59	8.0	87.9
-3191.43	-18.02	.	.	.	-20.52	.	5.24	1.55	.	0.59	8.0	88.0
4270.46	.	45.11	-98.66	.	.	-64.03	.	.	-0.45	0.59	8.0	88.1
3838.37	.	50.66	-100.14	10.61	.	-42.81	.	.	.	0.59	8.1	88.2
-3304.43	.	.	.	4.76	-28.21	.	.	1.47	0.76	0.58	8.1	88.3
-3280.25	.	.	.	.	-24.95	.	4.56	1.46	0.64	0.58	8.1	88.4
3656.94	11.90	47.62	-95.87	.	.	-52.47	.	.	.	0.58	8.2	88.6
2633.89	20.13	71.86	.	.	-16.62	.	.	.	0.62	0.58	8.2	88.7
3315.07	9.45	55.57	-106.31	13.25	.	.	.	.	.	0.57	8.6	89.8
-2049.84	.	.	.	.	-21.34	-33.84	7.04	1.27	.	0.56	8.9	90.6
-373.94	-4.84	.	-144.32	5.49	.	.	.	0.98	.	0.56	8.9	90.7
-239.57	.	.	-152.58	4.61	.	.	-2.12	0.94	.	0.56	9.0	90.8
2967.83	.	67.37	-16.07	.	.	.	19.80	.	-0.27	0.56	9.0	90.9
-304.61	.	.	-146.57	4.04	.	-1.04	.	0.95	.	0.56	9.0	90.9
-263.27	-1.74	.	-137.20	.	.	-8.65	.	0.95	.	0.56	9.1	91.2
-183.12	.	.	-141.57	.	.	-8.92	-1.08	0.93	.	0.56	9.1	91.2
-498.70	-1.56	.	-138.48	.	.	.	-0.73	0.99	.	0.56	9.1	91.2
-1835.36	.	.	.	-0.65	-23.08	-41.18	.	1.25	.	0.55	9.2	91.5
-2978.64	.	.	.	1.39	-20.13	.	8.41	1.40	.	0.55	9.3	91.6
3361.20	16.51	52.12	-99.48	.	.	.	.	.	-0.31	0.55	9.4	92.0
3584.75	.	60.72	-41.03	.	-9.73	.	.	.	0.08	0.55	9.5	92.2
5988.28	.	.	-150.25	.	-14.63	-126.14	-14.38	.	.	0.50	11.2	97.0
2263.62	.	57.89	.	.	.	-39.09	.	0.17	-0.17	0.49	11.4	97.5
3098.00	.	64.35	.	2.98	.	-45.35	.	.	-0.17	0.49	11.5	97.7
3065.72	2.84	63.09	.	.	.	-48.66	.	.	-0.13	0.49	11.5	97.8
2339.23	.	59.45	.	1.61	.	-38.14	.	0.14	.	0.49	11.5	97.8
2384.46	1.87	59.23	.	.	.	-40.54	.	0.13	.	0.49	11.5	97.8
2975.92	3.03	63.80	.	1.45	.	-45.53	.	.	.	0.49	11.6	97.9
1192.84	.	57.83	.	4.43	.	.	.	0.34	-0.21	0.48	11.8	98.6
811.45	-1.52	52.14	.	.	.	.	.	0.44	-0.21	0.48	11.9	98.9
5583.65	.	.	-132.91	7.18	-13.20	-108.33	.	.	.	0.48	12.0	99.0
1128.93	-1.16	56.91	.	4.31	.	.	.	0.34	.	0.48	12.0	99.0
5400.76	6.53	.	-128.44	.	-11.87	-111.48	.	.	.	0.47	12.1	99.4
5586.01	.	.	-121.42	.	-12.18	-117.39	.	.	0.00	0.47	12.3	99.8
2683.53	2.52	70.50	.	8.09	.	.	.	.	-0.17	0.47	12.4	100.1
5638.76	.	.	-181.34	.	.	-87.38	-8.91	.	-0.61	0.44	13.2	102.1

5425.21	.	.	-172.97	6.28	.	-75.78	.	.	-0.64	0.44	13.4	102.7
5238.90	6.25	.	-164.67	.	.	-80.99	.	.	-0.53	0.44	13.5	102.9
5035.65	8.53	.	-168.59	.	.	-78.86	-6.48	.	.	0.42	14.2	104.7
5271.06	.	.	-171.34	4.06	.	-79.04	-8.01	.	.	0.41	14.4	105.2
4876.17	9.37	.	-153.41	-0.45	.	-77.98	.	.	.	0.41	14.5	105.3
-2029.27	-17.75	.	.	.	.	.	17.18	1.19	-0.42	0.41	14.5	105.3
-2093.95	.	.	.	-9.84	.	.	18.85	1.11	-0.22	0.40	14.7	105.9
-2112.19	-7.89	.	.	-7.59	.	.	17.40	1.14	.	0.40	14.7	105.9
-1823.55	.	.	.	-10.92	.	-9.68	18.20	1.06	.	0.40	14.9	106.3
-2206.88	-13.64	.	.	.	.	7.09	17.22	1.17	.	0.39	15.1	106.8
5460.63	.	.	-229.81	19.44	.	.	-13.30	.	-0.82	0.39	15.3	107.4
-2297.83	.	.	.	.	.	14.03	19.96	1.12	-0.27	0.38	15.6	107.9
5351.29	.	.	-199.65	22.14	-10.13	.	-16.15	.	.	0.37	15.9	108.8
4953.52	5.95	.	-190.46	14.13	.	.	.	.	-0.66	0.36	16.2	109.4
5131.55	.	.	-185.96	17.20	-1.85	.	.	.	-0.64	0.36	16.2	109.5
-1853.69	-19.02	.	.	-4.64	.	.	.	1.19	-0.36	0.35	16.7	110.7
5096.50	.	.	.	-4.40	-24.00	-150.73	.	.	0.84	0.35	16.8	110.8
4662.38	10.35	.	-163.19	13.18	-6.25	.	.	.	.	0.35	16.8	110.9
-1785.75	-23.14	.	.	.	.	-0.09	.	1.19	-0.41	0.34	16.9	111.0
5088.25	.	.	.	.	-25.71	-147.81	-1.28	.	0.89	0.34	16.9	111.1
5108.61	-1.38	.	.	.	-25.05	-147.12	.	.	0.85	0.34	16.9	111.1
4736.49	15.46	.	-182.06	.	.	.	-6.25	.	-0.48	0.34	17.0	111.4
-1417.58	-13.47	.	.	-8.16	.	-15.48	.	1.07	.	0.34	17.1	111.5
4653.97	10.80	.	-189.97	10.53	.	.	-7.87	.	.	0.34	17.2	111.7
4580.26	15.87	.	-168.87	.	0.53	.	.	.	-0.47	0.33	17.3	111.9
4535.77	18.11	.	-164.91	.	-4.04	.	-6.52	.	.	0.33	17.5	112.5
-1245.95	.	.	.	-12.80	.	-19.57	.	0.98	-0.13	0.33	17.5	112.6
5145.51	.	.	-174.00	.	1.30	.	-6.91	.	-0.63	0.31	18.0	113.6
4964.34	.	.	.	-6.55	-15.61	-131.80	5.56	.	.	0.30	18.6	114.9
5231.78	-5.46	.	.	-4.21	-17.63	-138.04	.	.	.	0.29	18.7	115.2
5174.74	-6.87	.	.	.	-17.51	-131.43	3.83	.	.	0.29	18.7	115.2
4044.30	7.26	.	.	-16.02	.	-98.33	15.42	.	.	0.21	21.8	122.0
4257.20	.	.	.	-13.53	.	-100.08	14.40	.	-0.04	0.20	22.0	122.3
4167.09	-4.36	.	.	.	.	-80.16	15.16	.	-0.13	0.16	23.4	125.3
4269.80	2.01	.	.	-15.92	.	-102.85	.	.	0.04	0.16	23.7	125.9
3612.92	9.76	.	.	.	-9.32	.	11.49	.	0.36	0.10	25.8	130.2
3907.94	.	.	.	3.34	-9.46	.	10.11	.	0.27	0.09	26.1	130.8
3676.24	7.78	.	.	-1.18	-6.22	.	13.44	.	.	0.09	26.2	130.9
3836.54	6.47	.	.	2.37	-13.16	.	.	.	0.50	0.07	26.7	131.9
3344.00	11.75	.	.	-6.89	.	.	17.27	.	0.05	0.07	26.7	132.0

Appendix Table 4c. Four variables prediction equations of ME of DDGS from chemical composition (combined laboratories) and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
540.24	.	48.27	.	.	-28.36	-85.76	.	0.75	.	0.73	1.3	71.0
3941.11	.	83.41	57.43	.	-28.42	-148.83	.	.	.	0.73	1.4	71.6
3974.46	.	100.32	.	20.90	-32.88	-127.74	.	.	.	0.72	1.5	72.1
3974.96	10.42	75.06	.	.	-25.34	-132.33	.	.	.	0.70	2.3	75.5
-2385.55	.	54.36	.	15.79	-33.52	.	.	1.21	.	0.70	2.4	75.6
4397.10	.	72.12	.	.	-25.78	-142.75	-2.32	.	.	0.69	2.6	76.4
4323.19	.	72.71	.	.	-24.73	-139.45	.	.	0.02	0.69	2.6	76.5
-2571.04	.	31.40	.	.	-27.81	.	.	1.29	0.11	0.68	2.7	77.1
-2884.83	.	33.26	19.72	.	-28.95	.	.	1.33	.	0.68	2.8	77.3
-2708.34	4.70	31.75	.	.	-28.09	.	.	1.29	.	0.68	2.9	77.6
-2773.37	.	29.58	.	.	-27.61	.	0.98	1.33	.	0.68	2.9	77.8
-1898.85	.	.	.	-8.46	-27.11	-51.22	.	1.29	.	0.67	3.3	79.1
-2323.31	.	.	.	.	-33.32	-44.70	-6.07	1.39	.	0.66	3.5	79.9
-2391.75	-7.18	.	.	.	-30.44	-42.43	.	1.42	.	0.66	3.5	80.0
-2556.51	.	.	1.15	.	-30.77	-37.97	.	1.41	.	0.66	3.6	80.5
-2551.15	.	.	.	.	-30.69	-37.55	.	1.41	0.00	0.66	3.6	80.5
-3508.91	.	.	.	-5.00	-27.67	.	.	1.54	0.08	0.65	3.8	81.3
-3630.15	.	.	.	-3.95	-29.10	.	-2.21	1.58	.	0.65	3.9	81.6
-3724.23	-6.06	.	.	.	-31.49	.	-4.37	1.64	.	0.65	3.9	81.6
-3639.97	.	.	.	.	-31.54	.	-3.90	1.59	0.08	0.65	3.9	81.6
-3657.82	.	.	3.44	-4.54	-28.14	.	.	1.57	.	0.65	3.9	81.6
-3635.13	-1.42	.	.	-3.79	-28.20	.	.	1.58	.	0.65	3.9	81.6
-3673.84	-3.18	.	.	.	-29.80	.	.	1.60	0.05	0.64	4.0	81.7
-3652.80	.	.	-1.05	.	-29.89	.	.	1.58	0.06	0.64	4.0	81.8
-3746.45	-4.27	.	1.18	.	-29.86	.	.	1.62	.	0.64	4.0	81.9
-3685.66	.	.	-4.17	.	-31.07	.	-3.23	1.60	.	0.64	4.0	81.9
2294.77	21.48	79.98	.	.	.	-66.99	25.60	.	.	0.54	7.1	92.9
2211.41	34.84	83.20	.	.	-19.27	.	.	.	0.41	0.54	7.2	92.9
2627.66	.	83.62	48.31	.	.	-86.76	25.57	.	.	0.54	7.3	93.4
2855.97	.	116.44	.	31.67	-28.56	.	.	.	0.24	0.52	7.7	94.6
3415.07	.	63.04	.	-7.68	.	-97.72	17.18	.	.	0.52	7.8	95.1
-572.86	22.38	64.27	.	.	.	.	27.72	0.51	.	0.52	7.9	95.2
1863.19	36.73	86.39	.	.	-10.93	.	20.32	.	.	0.52	7.9	95.2
1722.52	.	64.75	.	.	.	-64.24	20.87	0.27	.	0.52	7.9	95.2
2491.25	16.82	113.53	.	27.35	-27.92	.	.	.	.	0.51	7.9	95.5
3135.11	.	73.41	.	.	.	-86.48	19.90	.	0.00	0.51	8.0	95.8
2683.15	.	120.82	.	34.01	-25.05	.	10.53	.	.	0.51	8.1	95.9
1316.91	38.07	86.84	.	.	.	.	28.07	.	0.27	0.51	8.1	96.0
-2253.59	19.62	.	.	-25.11	.	.	18.98	1.05	.	0.51	8.2	96.3
2678.09	.	123.71	27.01	34.09	-30.34	.	.	.	.	0.50	8.3	96.6
-461.92	.	.	.	-24.45	.	-50.16	13.32	0.87	.	0.50	8.3	96.7

-1357.81	.	30.72	.	-10.64	.	.	19.40	0.89	.	0.50	8.4	97.0
1023.45	35.02	95.36	45.45	.	.	.	34.59	.	.	0.50	8.5	97.2
-941.89	.	58.05	28.68	.	.	.	25.79	0.68	.	0.50	8.5	97.3
-701.54	.	51.76	.	.	.	.	21.93	0.69	0.07	0.49	8.7	97.9
-2046.66	.	.	.	-21.15	.	.	15.03	1.11	0.08	0.49	8.8	98.3
-2297.95	.	.	12.29	-21.48	.	.	17.00	1.15	.	0.48	8.9	98.4
1733.43	.	26.15	.	-21.19	.	-81.46	.	0.43	.	0.48	9.0	98.9
3512.85	12.73	44.70	.	-20.23	.	-104.71	.	.	.	0.48	9.1	99.1
1499.30	35.89	84.79	.	-0.93	.	.	29.16	.	.	0.48	9.2	99.3
4788.90	12.42	.	.	-25.06	-14.36	-147.22	.	.	.	0.47	9.2	99.4
457.16	9.04	.	.	-30.35	.	-66.00	.	0.69	.	0.47	9.2	99.5
3749.67	.	47.20	18.49	-18.53	.	-113.89	.	.	.	0.47	9.3	99.7
414.68	.	.	.	-28.17	.	-61.98	.	0.73	0.08	0.47	9.3	99.7
5353.33	.	.	.	-21.33	-18.30	-161.73	-7.28	.	.	0.47	9.3	99.8
3818.39	.	46.52	.	-16.82	.	-106.49	.	.	0.07	0.47	9.4	99.9
5083.61	.	.	20.60	-23.80	-15.40	-159.27	.	.	.	0.47	9.4	100.0
509.58	.	.	1.11	-28.21	.	-67.97	.	0.72	.	0.47	9.4	100.0
2371.76	27.31	83.81	21.29	.	-18.37	.	.	.	.	0.47	9.4	100.0
5173.59	.	.	.	-21.87	-14.86	-154.68	.	.	0.01	0.46	9.5	100.4
-1407.10	18.10	.	.	-29.60	.	.	.	0.91	0.24	0.46	9.6	100.7
2958.71	.	81.74	35.97	.	-16.93	.	.	.	0.32	0.45	9.8	101.2
3106.21	.	76.42	.	.	-12.17	.	7.50	.	0.28	0.45	10.0	101.9
-1164.58	.	11.12	.	-21.05	.	.	.	0.93	0.17	0.44	10.1	102.2
-1446.39	.	.	-7.80	-23.57	.	.	.	1.03	0.15	0.44	10.2	102.4
2575.45	.	87.30	52.77	.	-10.70	.	17.03	.	.	0.44	10.2	102.5
-1370.90	11.17	10.46	.	-23.20	.	.	.	0.92	.	0.44	10.3	102.6
-1578.80	11.06	.	-12.84	-25.07	.	.	.	1.01	.	0.44	10.3	102.6
-1403.02	.	7.03	-9.09	-20.41	.	.	.	1.01	.	0.43	10.5	103.3
3017.66	5.91	68.74	.	.	.	-74.60	.	.	0.11	0.43	10.6	103.5
2806.86	.	64.41	.	.	.	-74.77	.	0.08	0.08	0.43	10.6	103.6
3247.26	.	67.44	0.97	.	.	-81.97	.	.	0.08	0.43	10.6	103.7
2920.76	2.22	65.42	.	.	.	-80.02	.	0.06	.	0.43	10.7	103.8
3210.45	2.95	67.31	-1.26	.	.	-84.18	.	.	.	0.43	10.7	103.9
2859.50	.	63.50	-2.20	.	.	-79.42	.	0.09	.	0.43	10.7	103.9
3951.96	21.60	.	.	-33.90	.	-119.58	10.58	.	.	0.43	10.7	103.9
2174.80	.	85.93	46.18	.	.	.	23.96	.	0.20	0.42	10.9	104.4
3978.19	20.70	.	.	-36.30	.	-113.04	.	.	0.16	0.41	11.1	104.9
2026.39	.	95.34	44.67	7.58	.	.	27.95	.	.	0.41	11.2	105.3
4210.60	15.03	.	5.79	-35.39	.	-127.35	.	.	.	0.40	11.3	105.7
2483.93	.	84.31	.	6.24	.	.	20.91	.	0.18	0.40	11.4	105.9
4510.65	.	.	20.59	-31.74	.	-136.25	7.98	.	.	0.40	11.4	106.0
2087.93	33.13	58.29	.	-15.82	.	.	.	.	0.40	0.40	11.5	106.2
4622.06	.	.	.	-29.91	.	-131.62	6.18	.	0.03	0.40	11.6	106.4
260.84	9.28	55.16	.	.	.	.	.	0.46	0.20	0.40	11.6	106.6
20.18	.	45.07	-16.26	.	.	.	.	0.61	0.15	0.39	11.7	106.7

5694.58	-9.00	.	.	.	-27.41	-161.18	-12.19	.	.	0.39	11.7	106.9
5456.30	.	.	-17.68	.	-26.17	-150.12	-10.73	.	.	0.39	11.8	107.0
4603.06	.	.	10.63	-32.51	.	-133.45	.	.	0.05	0.39	11.8	107.0
5338.81	.	.	.	.	-26.56	-151.76	-9.27	.	-0.01	0.39	11.9	107.3
-161.53	4.09	43.53	-20.60	.	.	.	.	0.64	.	0.38	12.0	107.6
-1950.58	1.26	.	-21.77	.	.	.	18.57	1.07	.	0.38	12.0	107.7
-1961.06	.	.	-21.24	.	.	.	18.43	1.08	-0.01	0.38	12.0	107.7
-2001.80	.	.	-21.27	.	.	1.52	18.41	1.09	.	0.38	12.0	107.7
5176.55	.	.	-9.17	.	-21.98	-143.34	.	.	-0.03	0.38	12.2	108.2
5264.28	-3.70	.	.	.	-22.38	-148.91	.	.	-0.05	0.38	12.2	108.3
-2242.50	.	.	.	.	.	1.48	20.69	1.10	-0.01	0.38	12.2	108.3
-2195.28	-0.34	.	.	.	.	.	20.60	1.09	-0.01	0.38	12.2	108.3
5196.78	-1.48	.	-8.29	.	-21.88	-142.41	.	.	.	0.38	12.2	108.3
-2256.21	0.14	.	.	.	.	2.35	20.64	1.10	.	0.38	12.2	108.3
2143.70	22.36	73.09	-9.85	.	.	.	.	.	0.32	0.37	12.4	108.9
2399.14	23.57	62.83	-4.85	-8.64	.	.	.	.	.	0.33	13.6	112.2
2838.69	.	66.73	5.68	-3.88	.	.	.	.	0.28	0.33	13.7	112.4
-671.27	-7.44	.	-42.59	.	.	-17.01	.	0.94	.	0.33	13.8	112.6
-1149.85	-4.93	.	-44.34	.	.	.	.	1.00	0.05	0.32	13.8	112.7
-865.49	.	.	-47.07	.	.	-7.53	.	0.93	0.06	0.32	13.9	112.8
2467.13	47.68	.	.	-32.98	.	.	13.65	.	0.43	0.30	14.5	114.6
-820.16	-12.49	.	.	.	.	-22.34	.	0.94	0.00	0.30	14.6	114.7
2868.82	41.32	.	.	-29.91	-5.62	.	.	.	0.46	0.28	15.3	116.5
2819.23	41.76	.	-16.11	-32.69	.	.	.	.	0.45	0.27	15.5	117.2
2704.33	39.91	.	.	-28.25	1.66	.	17.59	.	.	0.22	17.0	120.9
2803.00	39.14	.	-3.85	-26.74	.	.	15.95	.	.	0.22	17.0	121.0
4189.40	2.91	.	-30.44	.	.	-90.28	11.16	.	.	0.21	17.3	121.8
4294.47	.	.	-29.28	.	.	-94.15	10.73	.	-0.02	0.21	17.3	121.9
4059.54	0.24	.	.	.	.	-95.13	13.73	.	-0.03	0.20	17.7	122.7
4519.64	-2.65	.	-42.92	.	.	-94.24	.	.	0.01	0.19	18.0	123.5
3375.55	31.29	.	-21.49	-21.95	-5.41	.	.	.	.	0.19	18.0	123.6
3617.97	24.20	.	-39.65	.	-13.23	.	.	.	0.32	0.17	18.6	125.1
4073.55	.	.	-9.99	-16.13	-5.70	.	.	.	0.31	0.16	18.8	125.5
3962.71	.	.	.	-17.27	-4.59	.	2.98	.	0.30	0.16	18.8	125.5
3857.93	.	.	-4.62	-19.57	.	.	6.04	.	0.29	0.16	19.0	125.9
3324.30	22.96	.	.	.	-12.86	.	5.44	.	0.31	0.15	19.2	126.4
3625.77	21.48	.	-35.62	.	-9.82	.	6.53	.	.	0.12	20.0	128.4
4029.47	.	.	-8.94	-14.74	-3.11	.	6.28	.	.	0.12	20.1	128.6
4244.85	.	.	-30.12	.	-11.51	.	-1.56	.	0.27	0.12	20.1	128.7
3178.58	22.90	.	-41.32	.	.	.	12.93	.	0.24	0.12	20.2	128.8

Appendix Table 5a. Five variable prediction equations of ME of DDGS from chemical composition by laboratory 1 and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
-3261.71	.	-34.00	.	-23.24	-30.19	.	-17.84	1.62	.	0.77	4.0	68.1
-1400.54	.	.	.	-16.97	-32.82	-48.63	-19.17	1.24	.	0.77	4.0	68.4
-3587.87	.	.	20.49	-14.26	-33.81	.	-15.03	1.58	.	0.77	4.0	68.4
-3752.82	15.16	.	26.25	-16.43	-25.80	.	.	1.46	.	0.77	4.1	68.7
-1647.03	.	.	27.13	-19.20	-22.57	-47.71	.	1.18	.	0.77	4.3	69.2
-3489.04	8.92	.	.	-13.96	-33.56	.	-14.95	1.53	.	0.76	4.5	70.2
-3301.37	.	.	.	-15.53	-34.56	.	-19.15	1.55	0.28	0.76	4.6	70.3
-3469.68	.	-20.09	19.77	-21.01	-22.43	.	.	1.53	.	0.75	4.8	71.1
-2988.68	.	-47.57	.	-32.26	-16.24	.	.	1.49	0.45	0.75	4.8	71.3
-3383.30	20.32	.	.	-19.61	-23.47	.	.	1.36	0.46	0.75	4.9	71.5
-3366.81	11.37	-27.45	.	-23.09	-21.28	.	.	1.49	.	0.75	4.9	71.6
-3567.48	.	.	24.46	-15.97	-25.02	.	.	1.50	0.08	0.75	5.0	71.9
-2205.18	11.89	.	.	-17.48	-23.29	-31.10	.	1.24	.	0.74	5.1	72.4
-2144.53	.	-27.10	.	-24.34	-19.40	-27.06	.	1.34	.	0.74	5.2	72.5
-1941.71	22.00	-79.75	.	-54.51	.	.	.	1.15	1.15	0.74	5.2	72.7
-1650.85	.	.	.	-18.65	-21.81	-40.46	.	1.20	0.14	0.73	5.6	74.0
-4129.02	.	17.91	22.57	.	-41.00	.	-15.74	1.64	.	0.73	5.6	74.1
-4342.32	16.61	29.26	31.73	.	-33.88	.	.	1.50	.	0.73	5.6	74.2
-4343.39	6.97	.	17.58	.	-40.88	.	-15.18	1.69	.	0.73	5.9	75.0
-3644.10	.	.	16.76	.	-41.56	-15.99	-17.91	1.62	.	0.72	5.9	75.3
-4250.07	.	.	17.43	.	-41.09	.	-16.34	1.72	-0.12	0.72	6.0	75.4
-2405.40	.	35.23	33.64	.	-31.96	-45.05	.	1.24	.	0.72	6.1	75.8
-2727.36	.	16.47	.	.	-41.52	-31.01	-19.76	1.45	.	0.72	6.1	75.9
-4035.57	7.60	11.91	.	.	-40.89	.	-16.50	1.63	.	0.72	6.2	76.2
-4177.48	.	22.11	29.69	.	-32.79	.	.	1.59	-0.25	0.71	6.4	76.7
-3726.24	4.46	.	.	.	-41.47	-10.35	-18.37	1.63	.	0.71	6.4	76.8
-3967.37	.	8.89	.	.	-41.48	.	-18.44	1.67	-0.05	0.71	6.4	76.9
-1571.84	.	-90.12	.	-55.24	.	.	-6.51	1.25	0.95	0.71	6.4	76.9
-4129.02	5.54	.	.	.	-41.37	.	-17.64	1.69	0.00	0.71	6.4	77.0
-3478.81	.	.	.	.	-41.63	-15.39	-19.35	1.62	-0.07	0.71	6.5	77.0
-781.46	.	-73.14	.	-49.94	.	-27.03	.	1.09	0.77	0.71	6.5	77.0
-1821.19	.	-81.33	-0.10	-50.79	.	.	.	1.27	0.82	0.71	6.7	77.7
-4457.94	10.38	.	22.73	.	-33.08	.	.	1.63	-0.13	0.70	6.7	77.8
-4525.12	12.08	.	22.02	.	-33.18	1.34	.	1.63	.	0.70	6.8	78.1
-3863.41	.	.	23.11	.	-32.20	-12.40	.	1.59	-0.27	0.70	7.0	78.9
-3505.20	12.82	19.40	.	.	-31.94	-14.40	.	1.43	.	0.69	7.3	79.6
-4083.52	13.11	15.89	.	.	-32.28	.	.	1.54	-0.03	0.69	7.3	79.8
-2947.99	.	17.17	.	.	-30.93	-25.43	.	1.42	-0.21	0.68	7.7	81.0
-4295.39	10.51	.	.	.	-32.15	2.26	.	1.62	-0.06	0.68	7.7	81.0
251.52	.	-46.30	13.84	-40.98	.	-53.37	.	0.87	.	0.67	8.1	82.3
-212.91	5.06	-54.47	.	-41.81	.	-40.62	.	0.95	.	0.66	8.3	82.9

5130.13	.	.	26.80	-30.35	-17.31	-147.13	-14.98	.	.	0.66	8.4	83.1
-178.85	.	-54.67	.	-41.23	.	-42.09	1.07	0.97	.	0.66	8.4	83.2
-1984.05	8.98	-59.12	.	-40.00	.	.	4.95	1.23	.	0.66	8.6	84.0
-1805.16	7.34	-60.82	8.14	-41.93	.	.	.	1.21	.	0.65	8.7	84.1
-1948.59	.	-58.40	9.52	-39.80	.	.	4.21	1.26	.	0.65	8.8	84.4
4445.37	.	29.67	38.50	-22.16	-14.46	-144.85	.	.	.	0.65	8.8	84.4
5245.14	.	.	.	-32.64	-18.67	-141.22	-21.11	.	0.50	0.65	8.8	84.5
4415.58	10.93	.	31.45	-31.02	-10.07	-133.03	.	.	.	0.65	8.9	84.7
1749.04	.	.	25.16	-35.33	.	-86.47	.	0.47	0.36	0.65	9.0	85.1
4670.93	.	.	29.53	-32.68	-8.75	-136.90	.	.	0.27	0.65	9.0	85.2
1065.98	.	.	28.63	-30.93	.	-78.61	7.47	0.59	.	0.65	9.1	85.3
3724.59	18.73	.	27.40	-40.30	.	-112.97	.	.	0.67	0.64	9.2	85.7
1569.10	8.13	.	27.01	-33.63	.	-83.81	.	0.47	.	0.64	9.2	85.7
1087.56	17.86	.	.	-36.62	.	-66.33	.	0.49	0.69	0.64	9.3	85.9
4098.43	19.46	.	.	-34.41	-8.18	-116.39	.	.	0.65	0.63	9.6	86.9
5221.07	3.42	.	.	-29.00	-17.92	-141.76	-16.92	.	.	0.63	9.6	87.0
5312.70	.	4.60	.	-27.51	-19.09	-145.12	-18.07	.	.	0.63	9.7	87.1
4174.62	20.64	-30.38	.	-46.89	.	-106.68	.	.	0.91	0.63	9.7	87.1
-2332.59	19.35	.	29.10	-26.67	.	.	16.18	1.03	.	0.63	9.8	87.5
3354.77	16.66	79.93	50.32	.	-26.51	-139.70	.	.	.	0.62	9.9	87.8
4640.36	.	-16.25	23.40	-41.39	.	-126.88	.	.	0.47	0.62	10.0	88.0
-1497.74	24.14	.	21.05	-35.79	.	.	.	0.85	0.78	0.62	10.0	88.0
-1865.56	25.84	.	.	-31.59	.	.	10.37	0.92	0.70	0.62	10.0	88.2
4288.62	.	74.09	43.73	.	-32.27	-155.52	-14.10	.	.	0.62	10.1	88.2
5173.33	.	-44.47	.	-51.27	.	-122.15	-11.74	.	0.82	0.62	10.1	88.3
4070.17	.	77.23	51.37	.	-25.35	-155.47	.	.	-0.45	0.62	10.1	88.3
1365.92	.	.	.	-32.67	.	-74.94	2.89	0.56	0.37	0.62	10.1	88.4
562.11	11.26	.	.	-29.29	.	-62.28	8.16	0.64	.	0.62	10.2	88.5
4427.34	.	.	27.22	-37.69	.	-127.75	-0.69	.	0.38	0.62	10.2	88.7
4125.31	10.62	.	30.97	-34.94	.	-123.72	3.95	.	.	0.61	10.3	89.0
4328.26	8.39	-5.66	28.12	-36.88	.	-125.13	.	.	.	0.61	10.4	89.3
4892.39	.	-11.67	.	-35.77	-5.80	-129.20	.	.	0.43	0.61	10.6	89.9
3893.52	18.53	.	.	-39.11	.	-108.89	-0.78	.	0.73	0.61	10.6	89.9
4606.77	.	-6.14	27.74	-36.38	.	-130.73	0.54	.	.	0.60	10.7	90.0
4547.30	10.39	7.14	.	-27.18	-10.49	-129.31	.	.	.	0.60	10.7	90.1
-1894.63	.	.	24.44	-27.77	.	.	10.66	1.06	0.25	0.60	10.9	90.8
4791.28	5.98	-19.40	.	-38.57	.	-123.25	-2.31	.	.	0.58	11.7	93.1
4520.22	6.76	58.33	.	.	-31.36	-142.71	-16.75	.	.	0.55	13.0	96.5
4834.53	.	57.07	.	.	-31.44	-149.43	-17.86	.	-0.17	0.55	13.0	96.6
4047.65	11.12	59.12	.	.	-22.86	-132.99	.	.	-0.15	0.52	14.0	99.1
-2867.86	22.19	35.91	35.32	.	.	.	28.11	0.96	.	0.45	16.7	106.1
2820.40	40.24	-28.31	14.34	-46.36	.	.	.	.	1.32	0.45	16.8	106.1
3222.35	38.26	-45.15	.	-52.03	.	.	-7.11	.	1.50	0.45	16.8	106.3
3042.71	39.69	-45.72	.	-52.54	4.16	.	.	.	1.47	0.45	17.0	106.6
2531.61	40.11	.	22.08	-37.00	-4.12	.	.	.	1.12	0.44	17.2	107.2

2392.53	40.46	.	23.02	-38.25	.	.	3.94	.	1.11	0.44	17.4	107.6
-263.15	.	41.36	34.87	.	.	-58.08	21.41	0.64	.	0.43	17.4	107.7
2307.51	20.32	70.31	47.82	.	.	-103.85	23.62	.	.	0.43	17.5	108.0
3260.07	.	66.82	48.50	.	.	-124.78	20.83	.	-0.58	0.43	17.5	108.0
-2611.82	.	25.45	31.81	.	.	.	24.67	1.09	-0.43	0.43	17.6	108.1
5114.41	.	.	19.24	.	-27.28	-137.30	-15.02	.	-0.23	0.42	17.9	108.9
-2927.70	11.80	.	23.93	.	.	.	25.13	1.14	-0.30	0.42	18.1	109.2
4992.68	2.03	.	17.61	.	-27.85	-133.41	-15.99	.	.	0.42	18.1	109.3
2777.16	38.62	.	.	-36.19	-5.40	.	-3.68	.	1.18	0.42	18.1	109.3
-1951.88	.	.	23.67	.	.	-21.20	22.41	1.05	-0.44	0.41	18.3	109.8
-2861.38	14.97	.	22.09	.	.	-1.54	24.47	1.09	.	0.41	18.4	109.9
-1497.16	15.20	25.33	.	.	.	-24.76	21.98	0.84	.	0.41	18.5	110.3
-2499.30	14.53	18.82	.	.	.	.	23.34	1.03	-0.17	0.41	18.6	110.4
5333.11	-1.74	.	.	.	-28.01	-136.68	-18.10	.	-0.17	0.40	18.6	110.4
-697.39	.	22.98	.	.	.	-41.21	19.54	0.82	-0.37	0.40	18.7	110.7
4633.10	4.17	.	23.72	.	-19.82	-127.97	.	.	-0.29	0.40	18.8	110.9
-2325.16	9.85	.	.	.	.	-7.39	21.90	1.08	-0.24	0.39	19.1	111.6
1619.67	.	41.26	28.21	.	.	-82.08	.	0.36	-0.35	0.35	20.7	115.4
2990.51	27.66	16.99	29.26	-22.93	-8.26	.	.	.	.	0.35	20.8	115.6
3321.83	10.66	49.87	.	.	.	-105.53	16.64	.	-0.26	0.35	20.9	115.7
3094.29	27.47	.	26.31	-28.06	-3.22	.	4.57	.	.	0.35	20.9	115.7
2764.75	29.21	10.09	30.23	-26.65	.	.	9.76	.	.	0.35	20.9	115.8
1205.31	4.99	40.14	25.67	.	.	-71.60	.	0.38	.	0.34	21.1	116.3
3468.84	1.04	54.97	33.94	.	.	-114.88	.	.	-0.38	0.34	21.2	116.4
4486.54	.	-45.24	3.43	-46.91	.	.	-12.15	.	1.01	0.33	21.5	117.0
4543.90	.	-49.15	.	-48.28	0.62	.	-12.63	.	1.05	0.33	21.5	117.0
871.30	-0.11	25.19	.	.	.	-59.85	.	0.55	-0.25	0.32	21.9	118.0
4151.01	.	-35.03	10.24	-43.03	4.17	.	.	.	0.82	0.32	22.0	118.2
3455.78	24.75	-3.36	.	-27.58	-4.03	.	0.68	.	.	0.31	22.1	118.5
3962.62	.	.	17.47	-31.09	-5.75	.	-7.74	.	0.64	0.31	22.3	118.8
-176.63	-2.56	.	13.35	.	.	-39.95	.	0.78	-0.31	0.31	22.4	119.0
-1500.22	4.94	18.97	17.39	.	.	.	.	0.90	-0.16	0.31	22.5	119.2
2134.14	34.62	65.68	37.96	.	-19.94	.	.	.	0.31	0.30	22.7	119.7
2066.76	33.58	67.14	42.29	.	-16.06	.	7.61	.	.	0.30	22.8	119.9
4039.88	.	-0.52	21.11	-26.59	-4.68	.	-3.03	.	.	0.28	23.6	121.7
3890.18	4.74	.	23.41	.	.	-104.75	14.93	.	-0.38	0.27	24.1	122.6
2597.42	31.86	50.97	.	.	-18.17	.	-0.82	.	0.38	0.24	25.1	124.8
1444.23	35.44	64.47	43.11	.	.	.	24.51	.	0.09	0.24	25.3	125.1
3383.11	.	54.07	32.51	.	-16.57	.	-1.87	.	-0.05	0.20	26.7	128.0
3180.17	25.12	.	15.46	.	-15.43	.	-0.59	.	0.25	0.14	29.0	132.6

Appendix Table 5b. Five variable prediction equations of ME of DDGS from chemical composition by laboratory 2 and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
3867.48	.	73.31	.	18.74	-29.46	-95.59	.	.	0.82	0.77	3.3	68.2
137.39	.	40.65	-87.29	20.95	-20.01	.	.	0.80	.	0.77	3.3	68.4
4224.63	.	64.48	-61.35	20.30	-20.32	-75.09	.	.	.	0.75	3.9	71.0
3567.48	.	76.16	.	17.30	-19.61	-69.96	12.18	.	.	0.75	4.1	71.7
1487.74	.	47.60	.	.	-26.58	-88.09	.	0.53	0.76	0.75	4.2	72.1
-325.75	.	57.53	.	20.30	-28.12	.	.	0.74	0.69	0.74	4.3	72.5
-1893.10	-21.36	.	-110.81	20.66	-21.76	.	.	1.44	.	0.74	4.4	72.9
251.01	.	63.22	.	18.25	-19.24	.	13.44	0.59	.	0.74	4.4	73.0
1857.99	.	62.08	.	15.09	-23.83	-59.87	.	0.39	.	0.74	4.6	73.5
1120.27	.	33.40	-63.11	.	-17.98	-61.87	.	0.68	.	0.74	4.6	73.7
-1072.78	.	.	-159.92	17.44	-21.15	.	-13.64	1.25	.	0.73	4.8	74.2
3761.93	11.59	64.05	.	.	-25.67	-111.79	.	.	0.87	0.73	4.8	74.2
-522.00	-19.01	51.27	.	23.98	-25.10	.	.	0.92	.	0.73	4.8	74.3
4016.61	.	63.09	.	.	-21.59	-110.50	7.11	.	0.60	0.73	5.0	75.0
1447.62	.	52.40	.	.	-17.62	-65.71	11.15	0.48	.	0.72	5.0	75.1
4015.73	-6.03	73.63	.	19.31	-23.36	-83.29	.	.	.	0.72	5.0	75.2
4180.48	.	61.44	-0.25	.	-24.52	-119.42	.	.	0.73	0.72	5.3	76.1
3433.20	10.38	68.03	.	.	-15.17	-82.38	14.28	.	.	0.71	5.5	76.8
-968.79	.	.	-122.05	11.45	-19.08	-21.15	.	1.18	.	0.71	5.5	76.9
-1491.72	.	.	-125.85	13.15	-18.43	.	.	1.26	-0.02	0.71	5.6	77.5
2903.97	.	84.62	.	25.64	-19.14	.	13.60	.	0.36	0.70	5.8	77.8
-1032.48	.	25.61	-65.41	.	-17.26	.	.	1.04	0.18	0.70	5.8	78.0
1346.46	-4.19	46.68	.	.	-20.98	-73.39	.	0.57	.	0.70	5.8	78.1
-858.84	.	27.89	-63.77	.	-15.21	.	3.30	0.99	.	0.70	5.8	78.1
3984.21	.	62.73	-10.80	.	-15.64	-95.18	10.11	.	.	0.70	5.8	78.2
-274.70	.	.	-123.60	.	-18.73	-46.70	-9.37	1.10	.	0.70	5.8	78.2
-957.43	-0.96	23.55	-74.78	.	-15.69	.	.	1.05	.	0.70	5.9	78.2
3243.38	.	78.03	-35.63	25.99	-15.82	.	10.61	.	.	0.70	5.9	78.4
4170.47	8.77	55.52	-51.05	.	-16.32	-95.15	.	.	.	0.70	5.9	78.5
-988.75	.	43.61	.	.	-18.54	.	10.68	0.89	0.40	0.70	6.0	78.7
2748.62	5.47	84.14	.	21.63	-15.32	.	17.02	.	.	0.70	6.0	78.8
-869.65	-8.68	.	-93.72	.	-18.05	-41.73	.	1.21	.	0.70	6.0	78.9
3534.94	.	73.50	-58.86	28.55	-19.00	.	.	.	0.22	0.69	6.2	79.5
-798.97	.	.	-97.16	.	-18.88	-41.83	.	1.15	0.16	0.69	6.3	79.6
3595.29	2.25	70.90	-72.29	27.33	-16.75	.	.	.	.	0.69	6.3	79.8
-495.85	3.55	49.01	.	.	-14.59	.	14.35	0.75	.	0.69	6.4	80.1
-1805.75	-7.52	.	-110.12	.	-17.15	.	-6.96	1.36	.	0.69	6.4	80.1
-1635.58	.	.	-117.96	.	-16.71	.	-6.67	1.30	0.01	0.68	6.6	80.8
-1934.80	-7.27	.	-97.87	.	-15.92	.	.	1.36	-0.04	0.68	6.7	81.0
-1242.69	0.63	39.67	.	.	-22.58	.	.	0.97	0.58	0.68	6.7	81.3
2966.84	3.67	83.32	.	25.89	-23.87	.	.	.	0.62	0.67	6.9	82.0

1196.70	.	28.93	-146.16	12.78	.	.	.	0.62	-0.71	0.65	7.7	84.6
2283.38	23.41	75.44	.	.	-11.45	.	19.09	.	0.39	0.65	7.8	85.0
-77.87	-16.21	.	-172.43	13.47	.	.	.	1.07	-0.96	0.64	8.2	86.2
2381.99	20.30	75.38	0.17	.	-8.51	.	20.91	.	.	0.64	8.2	86.3
-1834.37	-15.48	.	.	.	-28.48	-59.17	.	1.35	0.66	0.64	8.3	86.4
-3465.22	-26.71	.	.	14.88	-29.72	.	.	1.66	0.51	0.64	8.3	86.5
393.89	.	28.90	-98.70	.	.	.	7.59	0.72	-0.55	0.63	8.6	87.4
1115.96	.	23.01	-126.47	.	.	-21.42	.	0.66	-0.60	0.63	8.6	87.5
-2388.84	-30.44	.	.	12.46	-26.79	-32.27	.	1.52	.	0.63	8.6	87.6
270.21	.	.	-192.48	9.62	.	.	-5.96	0.94	-0.83	0.62	8.7	87.9
294.33	-1.13	18.79	-129.84	.	.	.	.	0.82	-0.63	0.62	8.7	88.0
2785.05	14.65	63.55	-33.24	.	.	-39.83	19.23	.	.	0.62	8.8	88.2
-298.70	.	.	-176.13	9.13	.	10.92	.	1.01	-0.80	0.62	8.9	88.3
1140.75	.	47.17	-70.54	9.64	.	.	12.36	0.43	.	0.62	8.9	88.5
4150.43	.	49.96	-122.71	14.14	.	-38.81	.	.	-0.59	0.62	8.9	88.5
3307.32	.	65.21	-73.16	17.14	.	.	13.66	.	-0.51	0.62	8.9	88.5
2517.67	12.97	70.50	.	.	.	-36.63	24.42	.	-0.14	0.62	8.9	88.6
-3273.95	-30.63	.	.	14.58	-25.83	.	1.53	1.65	.	0.62	9.0	88.7
2407.02	12.32	72.10	.	3.16	.	-30.84	24.56	.	.	0.62	9.0	88.7
2494.06	14.22	70.86	.	.	.	-36.30	24.43	-0.01	.	0.61	9.0	88.9
3202.42	.	63.13	-44.49	9.25	.	-36.70	15.88	.	.	0.61	9.1	89.2
959.14	11.49	50.46	-49.48	.	.	.	16.56	0.38	.	0.61	9.1	89.2
-1831.59	.	.	.	1.35	-30.04	-55.82	.	1.26	0.86	0.61	9.1	89.2
2490.39	13.40	69.88	-38.25	9.17	.	.	19.84	.	.	0.61	9.1	89.2
-1806.87	.	.	.	.	-29.30	-56.58	0.86	1.25	0.84	0.61	9.1	89.3
2826.33	.	72.40	.	7.91	.	-32.99	23.25	.	-0.28	0.61	9.1	89.3
-360.71	-6.84	.	-157.20	.	.	.	-2.90	1.07	-0.76	0.61	9.2	89.3
1581.00	.	45.21	-53.42	.	.	-30.15	13.39	0.38	.	0.61	9.2	89.4
-248.56	-6.85	.	-150.54	.	.	-7.11	.	1.04	-0.75	0.61	9.2	89.4
1257.17	.	66.35	.	8.52	.	.	23.82	0.28	-0.31	0.61	9.2	89.5
3591.89	.	57.62	-45.22	.	.	-55.56	14.86	.	-0.34	0.61	9.2	89.5
2232.34	11.48	77.17	.	8.15	.	.	25.70	.	-0.19	0.61	9.3	89.6
1470.83	10.88	70.43	.	5.68	.	.	24.98	0.16	.	0.61	9.3	89.7
-3.66	.	.	-163.89	.	.	-7.55	-3.00	0.97	-0.71	0.61	9.3	89.8
-1982.63	-20.13	.	.	.	-22.80	-44.64	2.88	1.39	.	0.61	9.3	89.9
1811.67	.	60.95	.	.	.	-32.45	22.20	0.24	-0.26	0.61	9.3	89.9
1572.01	.	34.74	-114.23	8.84	.	-15.50	.	0.47	.	0.61	9.3	89.9
2016.98	.	66.68	.	6.07	.	-26.32	22.64	0.15	.	0.61	9.4	89.9
1092.57	11.41	64.69	.	.	.	.	24.62	0.26	-0.17	0.60	9.4	90.0
-3373.55	-14.34	.	.	.	-24.34	.	2.90	1.56	0.49	0.60	9.4	90.1
1116.76	1.11	33.69	-117.39	9.74	.	.	.	0.54	.	0.60	9.4	90.1
3788.38	3.47	54.76	-126.03	18.28	.	.	.	.	-0.59	0.60	9.5	90.5
2401.98	18.71	69.19	-25.64	.	.	.	21.83	.	-0.15	0.60	9.6	90.5
1688.99	6.09	32.95	-106.11	.	.	-28.80	.	0.43	.	0.60	9.7	91.0
3958.99	9.70	46.10	-105.50	.	.	-55.88	.	.	-0.39	0.60	9.7	91.0

2989.13	20.89	63.49	-47.11	.	-12.50	.	.	.	0.33	0.59	9.7	91.1
2725.77	.	77.20	32.50	.	-10.24	.	20.52	.	0.24	0.59	9.8	91.4
3647.10	8.01	50.39	-103.84	8.17	.	-40.73	.	.	.	0.59	9.9	91.5
-3284.91	.	.	.	4.20	-26.71	.	3.85	1.46	0.69	0.59	10.0	92.0
-2018.52	.	.	.	-0.87	-21.12	-35.11	7.07	1.26	.	0.56	10.9	94.6
-260.37	-5.33	.	-151.54	6.24	.	.	-2.68	0.97	.	0.56	10.9	94.6
-390.70	-4.86	.	-144.37	5.56	.	0.61	.	0.98	.	0.56	10.9	94.7
-196.46	.	.	-152.47	4.48	.	-1.55	-2.14	0.93	.	0.56	11.0	94.9
-203.86	-1.78	.	-139.81	.	.	-9.33	-1.12	0.94	.	0.56	11.1	95.2
6104.44	.	.	-179.15	12.59	-17.11	-112.76	-18.65	.	.	0.52	12.3	98.8
5843.22	4.67	.	-154.41	.	-14.32	-121.60	-13.92	.	.	0.50	13.1	101.1
5980.64	.	.	-147.07	.	-15.44	-128.15	-14.54	.	0.08	0.50	13.2	101.3
2318.17	.	59.76	.	2.05	.	-36.46	.	0.15	-0.18	0.49	13.4	101.8
2252.12	-0.23	57.74	.	.	.	-39.03	.	0.18	-0.17	0.49	13.4	101.9
3061.11	1.24	64.34	.	2.52	.	-45.12	.	.	-0.16	0.49	13.5	102.0
2387.54	1.19	59.96	.	1.30	.	-38.76	.	0.13	.	0.49	13.5	102.1
1081.85	-4.93	55.97	.	5.64	.	.	.	0.39	-0.26	0.48	13.8	102.8
5490.81	3.29	.	-134.72	6.08	-12.88	-106.72	.	.	.	0.48	13.9	103.3
5593.52	.	.	-136.04	7.35	-12.59	-106.56	.	.	-0.06	0.48	14.0	103.4
5390.55	6.66	.	-126.76	.	-12.27	-112.35	.	.	0.04	0.47	14.1	103.8
5703.81	.	.	-207.79	9.28	.	-72.78	-11.50	.	-0.73	0.46	14.7	105.4
5475.03	5.19	.	-184.65	.	.	-83.20	-8.48	.	-0.58	0.45	15.1	106.4
5326.41	3.34	.	-173.20	5.08	.	-75.08	.	.	-0.61	0.44	15.4	107.1
5056.87	7.74	.	-171.61	1.50	.	-77.06	-6.90	.	.	0.42	16.2	109.4
-2109.67	-12.80	.	.	-5.50	.	.	17.41	1.19	-0.36	0.41	16.3	109.5
-2283.39	-17.46	.	.	.	.	8.45	17.38	1.23	-0.43	0.41	16.5	110.0
-1886.78	.	.	.	-10.43	.	-7.26	18.66	1.08	-0.22	0.40	16.7	110.5
-1905.82	-7.63	.	.	-8.25	.	-7.21	17.26	1.11	.	0.40	16.7	110.5
5540.84	.	.	-224.91	22.10	-5.11	.	-15.73	.	-0.62	0.39	17.1	111.5
5414.94	1.35	.	-229.02	18.86	.	.	-13.03	.	-0.81	0.39	17.3	112.2
5179.22	5.52	.	-198.93	19.66	-9.51	.	-14.92	.	.	0.37	17.8	113.4
4957.00	6.08	.	-185.84	14.88	-1.95	.	.	.	-0.58	0.36	18.1	114.1
-1566.10	-18.38	.	.	-5.67	.	-10.15	.	1.14	-0.34	0.35	18.7	115.5
5034.15	2.08	.	.	-5.17	-24.00	-150.32	.	.	0.87	0.35	18.8	115.7
5112.88	.	.	.	-4.33	-24.37	-151.67	-0.86	.	0.86	0.35	18.8	115.7
5149.59	-1.72	.	.	.	-25.64	-149.08	-1.52	.	0.88	0.34	18.9	116.0
4736.21	15.55	.	-181.42	.	-0.28	.	-6.33	.	-0.46	0.34	19.0	116.4
5069.19	-3.03	.	.	-5.34	-16.05	-133.46	4.86	.	.	0.30	20.5	120.0
4020.55	7.71	.	.	-16.25	.	-98.31	15.42	.	0.04	0.21	23.8	127.4
3593.36	10.38	.	.	-0.83	-9.05	.	11.68	.	0.36	0.10	27.8	136.0

Appendix Table 5c. Five variables prediction equations of ME of DDGS from chemical composition (combined laboratories) and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
3641.29	.	107.91	53.06	19.12	-35.56	-136.51	.	.	.	0.76	2.5	70.6
992.16	.	61.42	44.24	.	-30.46	-103.07	.	0.60	.	0.75	2.6	71.1
950.73	.	73.69	.	15.88	-33.88	-85.93	.	0.61	.	0.75	2.7	71.5
597.06	.	47.45	.	.	-29.68	-88.30	-2.96	0.75	.	0.73	3.2	74.0
588.50	3.79	50.30	.	.	-28.40	-85.37	.	0.71	.	0.73	3.2	74.0
523.62	.	48.34	.	.	-28.32	-84.43	.	0.75	0.02	0.73	3.3	74.1
3746.87	6.24	84.27	54.28	.	-28.57	-143.46	.	.	.	0.73	3.3	74.3
3807.08	.	85.12	61.86	.	-27.01	-145.74	3.87	.	.	0.73	3.3	74.5
3924.55	.	83.52	57.50	.	-28.38	-147.38	.	.	0.02	0.73	3.4	74.7
3892.86	2.89	99.59	.	19.84	-32.63	-126.12	.	.	.	0.72	3.5	75.2
4019.29	.	99.84	.	20.81	-33.55	-129.36	-1.62	.	.	0.72	3.5	75.2
3976.33	.	100.33	.	20.92	-32.89	-127.92	.	.	0.00	0.72	3.5	75.3
-2205.99	.	55.57	.	15.27	-33.13	.	.	1.16	0.10	0.70	4.2	78.3
-2483.32	.	58.15	19.04	15.66	-34.35	.	.	1.20	.	0.70	4.2	78.3
3831.57	12.74	75.98	.	.	-25.27	-124.80	.	.	0.08	0.70	4.3	78.5
3895.37	11.43	75.67	.	.	-24.67	-129.93	1.67	.	.	0.70	4.3	78.8
-2359.81	.	55.31	.	15.91	-32.85	.	1.62	1.19	.	0.70	4.3	78.9
-2390.27	-0.54	54.33	.	15.96	-33.57	.	.	1.21	.	0.70	4.4	78.9
-2659.46	.	36.29	22.23	.	-28.80	.	.	1.27	0.13	0.69	4.6	79.8
4385.07	.	72.18	.	.	-25.81	-141.39	-2.51	.	0.02	0.69	4.6	79.8
-2329.61	9.48	37.57	.	.	-27.82	.	.	1.17	0.16	0.69	4.6	79.8
-2856.58	.	36.19	25.01	.	-27.47	.	3.90	1.30	.	0.68	4.7	80.5
-2573.58	.	31.26	.	.	-27.95	.	-0.34	1.29	0.12	0.68	4.7	80.5
-2815.24	3.85	35.19	18.68	.	-28.94	.	.	1.29	.	0.68	4.8	80.6
-2624.30	6.94	34.55	.	.	-26.64	.	3.34	1.25	.	0.68	4.8	80.9
-1905.01	-12.62	.	.	.	-34.58	-57.21	-10.06	1.41	.	0.67	5.1	82.1
-1718.70	.	.	.	-8.15	-29.63	-56.98	-5.54	1.29	.	0.67	5.1	82.1
-1911.79	.	.	12.41	-9.72	-27.34	-54.39	.	1.29	.	0.67	5.2	82.4
-1906.18	-2.24	.	.	-7.73	-27.34	-51.49	.	1.31	.	0.67	5.3	82.6
-1912.49	.	.	.	-8.52	-27.05	-50.11	.	1.29	0.02	0.67	5.3	82.6
-2275.46	.	.	-4.05	.	-33.21	-44.69	-6.40	1.39	.	0.66	5.4	83.4
-2341.17	.	.	.	.	-33.35	-43.28	-6.26	1.40	0.02	0.66	5.4	83.4
-2329.06	-8.15	.	.	.	-30.48	-45.80	.	1.42	-0.04	0.66	5.5	83.5
-2431.13	-7.85	.	6.10	.	-30.79	-43.43	.	1.43	.	0.66	5.5	83.5
-2561.23	.	.	1.15	.	-30.76	-37.66	.	1.41	0.00	0.66	5.6	84.0
-3498.65	.	.	.	-4.65	-29.17	.	-3.29	1.55	0.09	0.65	5.8	84.8
-3551.32	.	.	4.70	-5.39	-27.77	.	.	1.55	0.08	0.65	5.8	84.9
-3485.51	1.60	.	.	-5.60	-27.46	.	.	1.53	0.09	0.65	5.8	84.9
-3647.25	-5.07	.	.	.	-31.74	.	-4.97	1.62	0.06	0.65	5.9	85.0
-3661.58	-3.82	.	.	-2.51	-30.06	.	-3.39	1.61	.	0.65	5.9	85.1
-3581.92	.	.	-4.76	.	-31.42	.	-4.31	1.58	0.08	0.65	5.9	85.2

-3703.02	-5.94	.	-1.80	.	-31.44	.	-4.49	1.64	.	0.65	5.9	85.2
-3640.28	.	.	1.08	-4.05	-29.08	.	-2.10	1.58	.	0.65	5.9	85.2
-3673.84	-1.61	.	3.85	-4.03	-28.31	.	.	1.59	.	0.65	5.9	85.2
-3683.60	-3.27	.	0.82	.	-29.85	.	.	1.60	0.05	0.64	6.0	85.4
1736.98	40.64	87.84	.	.	-13.90	.	16.16	.	0.35	0.57	8.1	93.4
2246.59	25.49	106.78	.	19.67	-26.55	.	.	.	0.34	0.57	8.4	94.4
1823.02	20.94	89.72	46.87	.	.	-67.70	30.95	.	.	0.56	8.4	94.5
2585.47	24.76	65.44	.	-11.51	.	-80.78	22.37	.	.	0.56	8.7	95.4
1951.81	25.83	113.13	.	22.66	-20.71	.	17.06	.	.	0.55	8.8	95.8
2041.00	33.69	87.79	25.57	.	-20.50	.	.	.	0.41	0.55	8.9	96.2
2935.50	.	71.52	52.13	-9.55	.	-100.71	22.62	.	.	0.55	9.0	96.4
2103.41	24.66	81.26	.	.	.	-57.00	25.62	.	0.11	0.55	9.0	96.5
1365.52	36.40	97.10	51.01	.	-11.67	.	25.58	.	.	0.54	9.0	96.6
1727.89	20.34	75.89	.	.	.	-58.38	25.71	0.11	.	0.54	9.1	96.9
2098.73	.	79.55	45.32	.	.	-77.91	25.60	0.11	.	0.54	9.3	97.4
2632.29	.	83.61	48.38	.	.	-87.33	25.65	.	-0.01	0.54	9.3	97.5
2612.69	.	121.55	31.43	31.00	-29.97	.	.	.	0.26	0.54	9.3	97.6
-1188.58	24.57	41.21	.	-13.06	.	.	24.34	0.70	.	0.53	9.3	97.7
2226.07	.	129.46	47.05	33.01	-25.29	.	15.49	.	.	0.53	9.3	97.7
1270.81	.	43.03	.	-12.04	.	-67.74	17.20	0.43	.	0.53	9.4	97.9
2715.15	.	117.97	.	31.68	-25.74	.	7.53	.	0.21	0.53	9.4	98.0
876.66	37.64	95.90	43.43	.	.	.	33.10	.	0.26	0.53	9.5	98.2
-180.17	27.31	70.19	.	.	.	.	27.28	0.39	0.17	0.53	9.5	98.2
-683.50	23.57	73.74	33.60	.	.	.	31.77	0.45	.	0.53	9.5	98.3
2347.05	15.67	117.64	22.26	27.48	-29.02	.	.	.	.	0.52	9.8	99.1
-783.63	17.38	.	.	-27.97	.	-42.93	16.37	0.83	.	0.52	9.8	99.1
-2010.02	24.61	.	.	-27.73	.	.	17.69	0.97	0.18	0.52	9.8	99.3
3410.37	.	63.01	.	-7.72	.	-97.10	17.08	.	0.01	0.52	9.8	99.4
1721.58	.	64.75	.	.	.	-64.15	20.86	0.27	0.00	0.52	9.9	99.5
1367.78	42.18	78.91	.	-6.97	.	.	26.40	.	0.30	0.52	9.9	99.7
-2384.57	19.63	.	12.39	-26.11	.	.	20.02	1.06	.	0.51	10.1	100.4
-1454.06	.	38.33	28.08	-10.47	.	.	22.60	0.85	.	0.51	10.2	100.5
-550.69	.	.	18.37	-26.18	.	-53.26	14.70	0.87	.	0.51	10.2	100.6
-479.18	.	.	.	-24.55	.	-48.34	13.07	0.87	0.03	0.50	10.3	101.0
-1219.27	.	31.09	.	-11.22	.	.	18.44	0.86	0.09	0.50	10.3	101.0
-802.32	.	59.39	29.09	.	.	.	25.17	0.65	0.07	0.50	10.4	101.4
1039.55	36.20	92.94	46.24	-2.23	.	.	34.21	.	.	0.50	10.5	101.4
3238.99	18.36	45.03	.	-21.69	.	-90.67	.	.	0.17	0.49	10.8	102.5
-2177.74	.	.	12.53	-22.17	.	.	16.07	1.12	0.08	0.49	10.8	102.5
1758.22	10.33	27.94	.	-23.30	.	-80.49	.	0.37	.	0.49	10.8	102.5
1642.84	.	26.27	.	-21.24	.	-75.71	.	0.44	0.08	0.48	10.9	103.0
246.81	14.12	.	.	-31.78	.	-54.10	.	0.68	0.15	0.48	11.0	103.1
1846.76	.	28.44	10.22	-21.76	.	-85.39	.	0.39	.	0.48	11.0	103.1
3441.63	11.89	45.67	14.71	-21.36	.	-107.20	.	.	.	0.48	11.0	103.2
4743.12	11.43	.	16.84	-26.40	-14.83	-151.29	.	.	.	0.48	11.1	103.5

4626.37	15.54	.	.	-26.23	-13.87	-139.09	.	.	0.09	0.48	11.1	103.6
2588.60	.	87.39	51.88	.	-12.90	.	12.99	.	0.27	0.48	11.2	103.7
4968.97	9.70	.	.	-24.08	-16.32	-152.54	-3.93	.	.	0.48	11.2	103.7
456.15	9.09	.	-1.13	-30.24	.	-65.69	.	0.69	.	0.47	11.2	103.9
3691.87	.	47.68	19.15	-18.57	.	-108.87	.	.	0.08	0.47	11.2	103.9
5255.08	.	.	14.62	-22.80	-18.05	-163.52	-5.98	.	.	0.47	11.2	104.0
5340.05	.	.	.	-21.42	-18.30	-160.16	-7.51	.	0.03	0.47	11.3	104.2
415.35	.	.	1.59	-28.35	.	-62.39	.	0.73	0.08	0.47	11.3	104.2
5077.40	.	.	20.64	-23.84	-15.36	-158.70	.	.	0.01	0.47	11.4	104.4
-894.13	19.66	16.51	.	-25.17	.	.	.	0.76	0.26	0.47	11.5	104.7
-1330.60	18.38	.	-10.05	-28.68	.	.	.	0.91	0.24	0.46	11.6	105.1
-1148.84	.	10.31	-5.42	-20.75	.	.	.	0.94	0.16	0.44	12.1	106.7
-1325.88	11.52	9.00	-11.00	-22.67	.	.	.	0.93	.	0.44	12.2	107.1
3727.01	26.33	.	.	-35.29	.	-107.70	10.22	.	0.15	0.43	12.5	107.8
2850.75	5.50	67.46	.	.	.	-72.18	.	0.03	0.11	0.43	12.6	108.1
3029.52	6.14	68.41	-2.16	.	.	-74.34	.	.	0.11	0.43	12.6	108.1
3839.31	21.43	.	19.53	-35.68	.	-122.60	12.04	.	.	0.43	12.6	108.1
2783.14	.	63.86	-1.70	.	.	-74.15	.	0.09	0.08	0.43	12.6	108.2
2881.21	2.38	64.55	-2.94	.	.	-78.88	.	0.07	.	0.43	12.7	108.4
2050.68	.	92.19	44.37	5.10	.	.	25.72	.	0.17	0.42	12.7	108.7
3958.55	20.39	.	5.39	-36.83	.	-114.17	.	.	0.16	0.41	13.0	109.6
4499.17	.	.	20.49	-31.81	.	-134.81	7.77	.	0.02	0.40	13.4	110.7
273.16	9.91	51.11	-17.94	.	.	.	.	0.49	0.20	0.40	13.5	110.9
2086.07	33.12	58.31	0.27	-15.83	.	.	.	.	0.40	0.40	13.5	110.9
5750.15	-7.89	.	-14.64	.	-26.98	-158.91	-13.00	.	.	0.39	13.6	111.4
5770.97	-10.29	.	.	.	-27.47	-165.59	-12.17	.	-0.05	0.39	13.7	111.5
5456.69	.	.	-17.68	.	-26.17	-150.18	-10.72	.	0.00	0.39	13.8	111.7
-2047.52	1.56	.	-21.81	.	.	2.83	18.73	1.09	.	0.38	14.0	112.5
-1956.33	1.20	.	-21.71	.	.	.	18.60	1.07	0.00	0.38	14.0	112.5
-1997.87	.	.	-21.23	.	.	1.15	18.46	1.09	-0.01	0.38	14.0	112.5
5267.63	-2.78	.	-7.45	.	-21.98	-146.74	.	.	-0.05	0.38	14.2	113.0
-2236.16	-0.17	.	.	.	.	1.28	20.65	1.10	-0.01	0.38	14.2	113.1
-714.61	-6.73	.	-42.96	.	.	-14.66	.	0.94	0.03	0.33	15.8	117.6
2462.26	47.72	.	.	-33.06	0.12	.	13.75	.	0.43	0.30	16.5	119.7
2465.03	47.68	.	0.28	-33.00	.	.	13.67	.	0.43	0.30	16.5	119.7
2947.86	41.58	.	-14.07	-28.74	-5.44	.	.	.	0.45	0.28	17.2	121.5
2728.41	39.83	.	-2.79	-27.96	1.58	.	17.29	.	.	0.22	19.0	126.3
4200.41	2.70	.	-30.30	.	.	-90.98	11.18	.	-0.01	0.21	19.3	127.2
3548.58	24.83	.	-37.75	.	-12.44	.	2.47	.	0.32	0.17	20.6	130.6
4021.46	.	.	-7.56	-16.53	-4.80	.	2.23	.	0.30	0.16	20.8	131.0

Appendix Table 6a. Six variable prediction equations of ME of DDGS from chemical composition by laboratory 1 and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
-2895.39	.	-55.78	.	-35.42	-26.65	.	-21.95	1.56	0.67	0.80	4.8	66.7
-1378.45	.	.	22.70	-18.58	-31.52	-53.86	-16.56	1.20	.	0.80	5.1	67.8
-3038.48	20.49	-47.95	.	-36.72	-15.38	.	.	1.37	0.78	0.78	5.6	69.8
-1807.44	.	-26.16	.	-23.73	-29.79	-35.99	-18.98	1.36	.	0.78	5.6	69.9
-3701.56	11.14	.	22.57	-15.34	-32.17	.	-11.53	1.52	.	0.78	5.6	70.0
-2158.47	12.76	.	27.91	-19.40	-23.49	-38.32	.	1.20	.	0.78	5.7	70.2
-3423.12	.	-24.71	14.03	-21.23	-30.78	.	-16.04	1.61	.	0.78	5.7	70.2
-3627.85	20.86	.	25.18	-20.39	-24.23	.	.	1.38	0.41	0.78	5.7	70.2
-1210.36	.	.	.	-19.69	-32.49	-50.28	-20.99	1.19	0.30	0.78	5.7	70.5
-3346.58	15.66	.	.	-18.80	-32.19	.	-15.89	1.44	0.50	0.78	5.9	71.0
-3322.87	5.63	-31.14	.	-22.89	-29.80	.	-16.18	1.59	.	0.78	5.9	71.0
-3491.41	.	.	19.24	-16.01	-33.69	.	-16.43	1.55	0.21	0.78	5.9	71.1
-1639.63	5.23	.	.	-17.07	-32.29	-43.94	-17.49	1.25	.	0.77	5.9	71.3
-3670.33	14.03	-10.76	23.46	-19.41	-24.20	.	.	1.47	.	0.77	6.1	71.8
-1602.39	.	.	26.79	-19.97	-22.19	-47.86	.	1.16	0.09	0.77	6.2	72.5
-1758.91	.	-6.89	25.22	-20.85	-21.79	-43.87	.	1.21	.	0.77	6.2	72.5
-3234.84	.	-33.62	15.08	-27.69	-19.06	.	.	1.50	0.33	0.76	6.5	73.5
-2233.37	18.16	.	.	-21.42	-21.88	-27.56	.	1.18	0.43	0.76	6.6	74.0
-2151.93	.	-41.89	.	-31.97	-15.92	-21.13	.	1.34	0.42	0.76	6.7	74.3
-2504.23	10.39	-23.31	.	-23.48	-20.57	-21.06	.	1.34	.	0.75	6.8	74.6
-2200.71	.	32.16	28.34	.	-40.62	-49.25	-16.54	1.29	.	0.75	6.9	75.2
-1790.82	21.07	-84.98	.	-56.96	.	.	-3.80	1.15	1.22	0.74	7.1	75.9
-4265.15	11.97	24.21	26.63	.	-39.68	.	-11.62	1.57	.	0.74	7.1	76.0
-1577.70	21.24	-76.99	.	-54.09	.	-9.35	.	1.09	1.12	0.74	7.2	76.2
-1945.96	22.05	-79.01	1.38	-54.39	.	.	.	1.15	1.15	0.74	7.2	76.2
-2834.42	15.34	39.93	36.15	.	-33.16	-38.21	.	1.22	.	0.74	7.3	76.4
-4136.99	.	18.25	23.79	.	-40.48	.	-14.66	1.65	-0.13	0.73	7.5	77.4
-4334.90	15.62	28.86	31.99	.	-33.83	.	.	1.51	-0.08	0.73	7.6	77.7
-2091.92	.	37.83	36.78	.	-31.93	-53.41	.	1.20	-0.34	0.73	7.6	77.8
-3933.21	5.90	.	17.60	.	-40.99	-10.57	-15.93	1.63	.	0.73	7.8	78.5
-4338.87	6.37	.	17.94	.	-40.72	.	-14.91	1.69	-0.06	0.73	7.9	78.6
-3584.84	.	.	17.95	.	-41.01	-17.86	-16.89	1.61	-0.14	0.73	7.9	78.7
-2948.77	5.91	17.76	.	.	-40.94	-26.80	-17.86	1.45	.	0.72	8.0	79.2
-2676.43	.	16.69	.	.	-41.21	-32.28	-19.23	1.44	-0.08	0.72	8.1	79.5
-357.40	.	-81.95	.	-54.83	.	-30.76	-7.31	1.04	0.91	0.72	8.2	79.7
-4039.25	7.99	12.10	.	.	-40.97	.	-16.61	1.63	0.03	0.72	8.2	79.9
-1482.03	.	-96.46	-7.26	-57.12	.	.	-8.31	1.26	1.02	0.71	8.4	80.4
-3698.80	4.13	.	.	.	-41.41	-10.96	-18.32	1.62	-0.02	0.71	8.4	80.6
-638.30	.	-69.39	4.69	-49.39	.	-31.10	.	1.05	0.74	0.71	8.4	80.7
-4362.11	10.10	.	22.83	.	-33.01	-2.49	.	1.62	-0.14	0.70	8.7	81.6
-3433.03	11.94	19.36	.	.	-31.86	-16.00	.	1.43	-0.06	0.69	9.3	83.5

5060.86	.	.	24.19	-33.35	-17.71	-144.13	-17.87	.	0.42	0.68	9.8	85.2
4821.41	.	27.73	34.20	-22.39	-21.71	-151.62	-14.46	.	.	0.67	9.9	85.7
138.14	5.90	-44.57	14.66	-41.04	.	-51.12	.	0.85	.	0.67	10.0	85.9
3955.87	19.42	.	29.48	-35.46	-9.02	-121.79	.	.	0.58	0.67	10.0	85.9
60.90	.	-42.69	15.71	-39.43	.	-51.86	3.15	0.88	.	0.67	10.0	86.1
1187.39	17.85	.	25.15	-38.11	.	-73.91	.	0.45	0.64	0.67	10.1	86.3
3931.49	13.88	36.61	41.23	-20.59	-16.39	-137.49	.	.	.	0.67	10.1	86.3
-464.70	6.55	-52.00	.	-40.52	.	-37.23	2.89	0.98	.	0.67	10.2	86.8
4895.91	5.85	.	27.70	-30.57	-16.60	-142.55	-12.99	.	.	0.67	10.2	86.8
-2154.45	11.52	-48.92	14.07	-38.07	.	.	7.78	1.20	.	0.66	10.3	87.1
4695.52	13.18	.	.	-34.38	-17.26	-129.52	-17.97	.	0.68	0.66	10.4	87.2
336.23	13.47	.	30.39	-30.72	.	-65.82	10.89	0.63	.	0.66	10.5	87.5
5372.07	.	-17.39	.	-38.85	-15.84	-138.01	-21.70	.	0.63	0.66	10.7	88.1
-2201.69	27.17	.	26.65	-32.05	.	.	13.31	0.94	0.63	0.65	10.7	88.4
4455.76	.	26.72	37.45	-23.47	-13.80	-143.68	.	.	0.06	0.65	10.8	88.5
1223.56	.	.	26.99	-33.24	.	-79.60	5.44	0.55	0.28	0.65	10.8	88.6
3948.11	19.94	-20.00	22.34	-45.31	.	-110.85	.	.	0.80	0.65	10.8	88.7
440.04	19.97	.	.	-34.55	.	-56.75	5.93	0.59	0.64	0.65	11.0	89.4
3679.22	19.53	.	28.26	-39.78	.	-112.58	2.07	.	0.65	0.64	11.2	89.8
4481.70	17.89	-43.51	.	-52.86	.	-108.14	-9.12	.	1.06	0.64	11.2	89.9
4179.68	20.22	-16.53	.	-40.39	-5.21	-112.50	.	.	0.78	0.64	11.5	90.7
3739.61	12.68	77.90	46.91	.	-31.10	-146.45	-9.69	.	.	0.63	11.6	91.0
4335.02	.	75.73	47.35	.	-31.11	-159.55	-11.44	.	-0.36	0.63	11.6	91.0
3588.84	12.55	79.96	52.01	.	-26.32	-146.25	.	.	-0.29	0.63	11.6	91.2
5150.60	3.88	5.94	.	-27.22	-18.86	-142.20	-16.84	.	.	0.63	11.6	91.2
4887.30	.	-30.44	16.71	-47.15	.	-125.20	-7.47	.	0.65	0.63	11.7	91.5
4118.85	10.66	0.29	31.07	-34.86	.	-123.70	4.01	.	.	0.61	12.3	93.4
4608.64	5.24	58.09	.	.	-31.14	-144.91	-16.54	.	-0.11	0.55	15.0	101.1
-1010.76	19.99	48.31	40.05	.	.	-46.91	26.46	0.63	.	0.47	18.2	109.7
75.65	.	45.74	40.78	.	.	-69.75	23.46	0.60	-0.54	0.46	18.3	110.1
-2874.24	19.23	34.88	36.46	.	.	.	28.47	0.99	-0.25	0.46	18.5	110.7
3004.76	39.05	-36.30	10.53	-49.46	.	.	-4.32	.	1.41	0.45	18.7	111.1
2863.60	40.01	-34.09	12.57	-48.85	1.90	.	.	.	1.37	0.45	18.7	111.2
3207.07	38.35	-47.90	.	-53.37	1.64	.	-6.05	.	1.52	0.45	18.8	111.4
2631.02	14.77	70.81	50.62	.	.	-113.47	23.93	.	-0.42	0.45	19.0	111.8
2539.54	40.04	.	21.98	-37.00	-4.26	.	-0.30	.	1.12	0.44	19.2	112.5
5160.18	-1.09	.	19.19	.	-27.36	-138.29	-15.31	.	-0.24	0.42	19.9	114.2
-2538.66	10.53	.	24.12	.	.	-9.94	24.57	1.08	-0.32	0.42	20.0	114.4
-1253.31	11.86	25.13	.	.	.	-30.64	21.89	0.83	-0.24	0.41	20.3	115.2
2776.84	29.69	19.55	31.82	-22.49	-5.92	.	5.81	.	.	0.35	22.7	120.9
1611.84	0.26	41.31	28.22	.	.	-81.91	.	0.36	-0.35	0.35	22.7	121.0
4486.87	.	-45.87	3.29	-47.19	0.30	.	-12.00	.	1.01	0.33	23.5	122.7
1943.47	36.29	67.35	40.61	.	-17.18	.	6.16	.	0.27	0.30	24.5	125.2

Appendix Table 6b. Six variable prediction equations of ME of DDGS from chemical composition by laboratory 2 and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
1820.73	.	61.40	.	16.84	-30.53	-73.77	.	0.41	0.83	0.79	4.6	68.9
-332.71	-15.29	35.79	-81.69	25.41	-22.09	.	.	0.98	.	0.79	4.7	69.2
-1392.23	-28.53	.	-156.19	29.35	-26.43	.	-19.53	1.48	.	0.79	4.8	69.4
1392.23	.	44.99	-77.60	18.45	-21.08	-41.99	.	0.58	.	0.79	4.8	69.5
3711.34	.	74.82	.	18.66	-26.57	-86.99	6.91	.	0.69	0.78	5.0	70.3
4003.44	.	70.05	-22.28	19.63	-27.35	-90.80	.	.	0.67	0.78	5.2	71.1
-18.03	.	43.13	-73.14	21.28	-22.46	.	.	0.80	0.26	0.78	5.2	71.2
3831.19	1.22	73.29	.	18.28	-29.46	-95.36	.	.	0.83	0.77	5.2	71.5
126.94	.	39.65	-90.61	21.05	-20.15	.	-0.93	0.81	.	0.77	5.3	71.8
1756.29	.	65.46	.	15.58	-20.63	-50.85	11.68	0.36	.	0.76	5.6	73.2
-93.05	.	61.07	.	19.82	-24.30	.	9.78	0.67	0.53	0.76	5.7	73.5
3980.38	.	68.47	-42.69	19.45	-19.56	-71.67	5.74	.	.	0.76	5.8	73.9
-665.47	-13.26	52.51	.	23.97	-28.88	.	.	0.90	0.58	0.75	5.9	74.3
4278.38	-2.07	64.70	-59.96	21.04	-20.55	-75.99	.	.	.	0.75	5.9	74.4
1159.56	-16.25	55.31	.	20.37	-25.73	-53.07	.	0.63	.	0.75	5.9	74.4
1438.97	.	49.47	.	.	-23.94	-81.39	6.17	0.51	0.64	0.75	6.0	74.7
1311.29	.	40.90	-28.06	.	-23.90	-79.23	.	0.60	0.57	0.75	6.1	75.1
3566.54	0.03	76.16	.	17.29	-19.61	-69.94	12.19	.	.	0.75	6.1	75.2
-137.79	-11.36	57.75	.	21.68	-21.43	.	10.45	0.75	.	0.75	6.2	75.4
1680.51	3.97	50.22	.	.	-26.71	-89.37	.	0.46	0.80	0.75	6.2	75.5
3442.78	14.32	66.85	.	.	-21.92	-97.78	9.68	.	0.72	0.75	6.2	75.7
-1444.59	-20.97	.	-108.74	19.16	-22.08	-17.19	.	1.37	.	0.74	6.3	76.1
-1735.26	-22.34	.	-118.28	21.11	-20.28	.	.	1.43	-0.18	0.74	6.4	76.2
-336.48	.	.	-158.31	15.50	-21.91	-27.63	-14.47	1.14	.	0.74	6.5	76.9
1161.25	.	36.66	-53.19	.	-17.61	-61.67	2.85	0.64	.	0.74	6.6	77.2
1081.10	-0.85	32.92	-62.66	.	-18.04	-61.86	.	0.69	.	0.74	6.6	77.3
3800.09	11.79	62.95	-6.71	.	-24.99	-110.56	.	.	0.83	0.73	6.8	77.8
-1065.04	.	.	-160.27	17.44	-21.07	.	-13.64	1.25	-0.01	0.73	6.8	77.8
3653.78	.	70.70	38.48	.	-23.78	-111.14	11.60	.	0.78	0.73	6.8	77.9
1584.45	2.91	54.59	.	.	-17.25	-65.48	11.93	0.43	.	0.73	7.0	78.7
3585.49	10.74	64.76	-15.85	.	-14.95	-83.73	11.96	.	.	0.71	7.4	80.4
-991.49	.	.	-118.81	11.29	-19.72	-22.80	.	1.18	0.07	0.71	7.5	80.7
-391.26	-9.63	.	-113.24	.	-19.64	-50.79	-9.99	1.18	.	0.71	7.5	80.8
2644.76	8.62	84.45	.	22.13	-18.78	.	14.91	.	0.44	0.71	7.5	80.8
3048.53	.	81.85	-15.40	26.20	-18.52	.	11.72	.	0.30	0.71	7.7	81.5
-981.65	.	30.67	-49.28	.	-17.00	.	4.17	0.99	0.21	0.70	7.8	81.6
-336.76	.	.	-115.13	.	-20.86	-51.39	-9.76	1.11	0.21	0.70	7.8	81.7
-1020.22	0.32	25.81	-65.39	.	-17.27	.	.	1.03	0.18	0.70	7.8	81.8
3080.76	5.24	78.00	-35.00	23.63	-15.23	.	11.77	.	.	0.70	7.8	81.9
-831.69	0.52	28.42	-63.32	.	-15.14	.	3.51	0.98	.	0.70	7.8	81.9
-699.63	6.56	48.30	.	.	-18.13	.	12.09	0.78	0.44	0.70	7.9	82.2

-908.32	-8.35	.	-89.13	.	-19.13	-43.95	.	1.21	0.11	0.70	8.0	82.6
3427.02	3.88	73.34	-59.05	27.05	-19.03	.	.	.	0.26	0.69	8.2	83.2
-1775.60	-7.65	.	-111.49	.	-16.84	.	-6.94	1.36	-0.03	0.69	8.4	84.0
961.22	-10.45	24.34	-149.37	15.52	.	.	.	0.74	-0.84	0.66	9.5	87.9
1211.91	.	35.90	-121.54	12.38	.	.	5.87	0.56	-0.65	0.65	9.6	88.4
-2272.82	-24.21	.	.	11.21	-31.04	-44.62	.	1.47	0.62	0.65	9.7	88.6
1937.59	23.56	82.56	35.60	.	-13.43	.	23.30	.	0.55	0.65	9.7	88.6
1278.16	.	29.20	-145.47	12.57	.	-2.64	.	0.60	-0.71	0.65	9.7	88.7
331.23	-18.98	.	-199.34	16.74	.	.	-8.98	1.05	-1.05	0.65	9.8	89.1
-605.87	-17.42	.	-175.43	15.80	.	19.73	.	1.16	-1.00	0.64	10.1	90.0
-1799.52	-15.76	.	.	.	-28.96	-60.80	-1.25	1.35	0.68	0.64	10.3	90.6
-3474.48	-27.26	.	.	15.26	-30.21	.	-1.18	1.67	0.53	0.64	10.3	90.6
3605.86	.	59.69	-75.89	12.48	.	-34.80	12.24	.	-0.49	0.63	10.4	91.0
1260.00	.	33.68	-91.92	.	.	-23.76	8.32	0.55	-0.51	0.63	10.4	91.1
550.56	3.61	33.22	-92.01	.	.	.	9.24	0.64	-0.49	0.63	10.5	91.6
1094.22	-0.44	22.71	-126.47	.	.	-21.31	.	0.67	-0.60	0.63	10.6	91.8
3060.18	12.99	61.05	-45.39	.	.	-43.21	17.37	.	-0.25	0.63	10.6	91.9
-2395.29	-30.21	.	.	12.35	-26.65	-31.98	0.41	1.52	.	0.63	10.6	91.9
2829.46	11.90	64.46	-42.22	5.44	.	-32.75	18.10	.	.	0.62	10.7	92.0
-1.91	.	.	-193.82	10.58	.	10.11	-5.87	0.99	-0.85	0.62	10.7	92.1
2973.86	8.57	66.51	-65.03	13.39	.	.	15.93	.	-0.40	0.62	10.7	92.2
1324.21	7.16	52.49	-62.69	8.02	.	.	14.74	0.34	.	0.62	10.8	92.4
2182.52	12.37	56.94	-42.73	.	.	-32.79	17.41	0.15	.	0.62	10.8	92.4
1717.94	.	49.35	-65.48	8.27	.	-18.50	12.75	0.33	.	0.62	10.8	92.4
2504.52	10.25	72.76	.	4.41	.	-30.31	24.65	.	-0.18	0.62	10.8	92.6
4082.08	2.35	49.91	-122.92	13.29	.	-38.35	.	.	-0.57	0.62	10.9	92.8
2383.52	12.43	69.59	.	.	.	-35.06	24.36	0.03	-0.14	0.62	10.9	93.0
2502.37	12.64	72.74	.	3.19	.	-31.92	24.61	-0.02	.	0.62	11.0	93.0
1973.32	.	67.39	.	6.91	.	-23.25	23.30	0.17	-0.29	0.61	11.0	93.3
1426.45	7.38	69.52	.	6.89	.	.	24.89	0.20	-0.24	0.61	11.1	93.5
-73.38	-7.06	.	-158.49	.	.	-9.10	-3.28	1.03	-0.76	0.61	11.1	93.6
-1850.99	.	.	.	1.30	-29.72	-54.94	0.75	1.26	0.85	0.61	11.1	93.6
1654.53	2.05	35.59	-114.36	8.32	.	-16.55	.	0.44	.	0.61	11.3	94.2
-263.88	-5.34	.	-151.54	6.25	.	0.13	-2.68	0.97	.	0.56	12.9	99.2
6227.70	-3.54	.	-179.27	14.02	-17.63	-114.69	-19.48	.	.	0.52	14.3	103.5
6104.96	.	.	-179.35	12.60	-17.07	-112.64	-18.65	.	0.00	0.52	14.3	103.7
5822.35	5.00	.	-150.31	.	-15.41	-124.05	-14.11	.	0.11	0.50	15.1	105.9
2237.32	-1.93	58.96	.	2.60	.	-35.25	.	0.18	-0.20	0.49	15.4	106.7
5501.76	3.09	.	-136.30	6.24	-12.57	-105.86	.	.	-0.03	0.48	15.9	108.3
5727.90	-0.70	.	-208.16	9.57	.	-72.89	-11.64	.	-0.73	0.46	16.7	110.5
-2064.14	-12.71	.	.	-5.66	.	-1.59	17.38	1.18	-0.36	0.41	18.3	114.9
5513.85	0.79	.	-224.47	21.75	-5.09	.	-15.56	.	-0.61	0.39	19.0	116.9
5049.87	1.88	.	.	-5.05	-24.23	-150.92	-0.52	.	0.87	0.35	20.8	121.3

Appendix Table 6c. Six variables prediction equations of ME of DDGS from chemical composition (combined laboratories) and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
1388.17	.	86.18	43.55	15.60	-35.84	-102.96	.	0.47	.	0.77	4.0	71.8
3497.83	.	109.82	57.75	19.19	-34.09	-133.18	4.11	.	.	0.76	4.4	73.8
3669.34	-1.10	108.26	53.53	19.50	-35.68	-137.20	.	.	.	0.76	4.5	74.1
3638.45	.	107.91	53.08	19.10	-35.54	-136.25	.	.	0.00	0.76	4.5	74.1
980.79	.	62.62	46.58	.	-29.76	-102.41	1.84	0.59	.	0.75	4.6	74.5
973.04	.	61.52	44.31	.	-30.42	-101.50	.	0.60	0.02	0.75	4.6	74.6
1007.33	1.61	62.12	43.73	.	-30.46	-102.70	.	0.58	.	0.75	4.6	74.6
990.69	.	72.78	.	15.71	-34.85	-87.91	-2.32	0.62	.	0.75	4.7	74.9
943.28	-1.60	73.64	.	16.38	-34.03	-86.11	.	0.62	.	0.75	4.7	75.0
946.26	.	73.68	.	15.86	-33.86	-85.62	.	0.61	0.00	0.75	4.7	75.0
3371.08	10.19	88.03	60.65	.	-26.00	-134.24	7.31	.	.	0.74	5.1	77.2
565.80	5.20	51.23	.	.	-28.31	-81.98	.	0.70	0.05	0.73	5.2	77.5
577.13	.	47.49	.	.	-29.72	-86.54	-3.20	0.75	0.03	0.73	5.2	77.5
610.84	2.34	48.93	.	.	-29.33	-87.34	-2.13	0.73	.	0.73	5.2	77.6
3640.10	8.08	84.85	53.57	.	-28.47	-137.56	.	.	0.06	0.73	5.3	77.8
3801.86	.	85.13	61.78	.	-27.02	-145.05	3.77	.	0.01	0.73	5.3	78.1
3865.01	3.47	99.42	.	19.56	-32.50	-124.69	.	.	0.02	0.72	5.5	78.9
3931.98	2.32	99.48	.	20.00	-33.02	-127.27	-0.83	.	.	0.72	5.5	78.9
4018.46	.	99.83	.	20.80	-33.55	-129.25	-1.63	.	0.00	0.72	5.5	78.9
-2295.73	.	59.94	21.33	15.07	-34.02	.	.	1.15	0.11	0.71	6.0	81.3
-2442.53	.	62.05	25.22	15.96	-32.73	.	4.57	1.16	.	0.70	6.1	81.8
-2140.93	3.74	56.01	.	14.02	-32.70	.	.	1.13	0.12	0.70	6.2	82.0
-2201.70	.	55.81	.	15.32	-32.95	.	0.45	1.16	0.10	0.70	6.2	82.1
-2498.22	-1.47	58.13	19.42	16.11	-34.51	.	.	1.21	.	0.70	6.2	82.1
3743.31	13.87	76.65	.	.	-24.54	-122.10	1.81	.	0.08	0.70	6.3	82.3
-2348.24	0.83	55.52	.	15.67	-32.66	.	1.89	1.19	.	0.70	6.3	82.7
-2430.16	8.76	41.65	20.67	.	-28.74	.	.	1.16	0.17	0.69	6.4	83.0
-2653.59	.	38.08	25.62	.	-27.82	.	2.61	1.25	0.12	0.69	6.5	83.6
-2255.01	11.51	40.12	.	.	-26.48	.	3.09	1.13	0.16	0.69	6.5	83.6
-2689.29	8.07	42.46	26.84	.	-26.34	.	6.85	1.19	.	0.69	6.6	83.9
-1654.70	-8.31	.	.	-5.30	-31.75	-60.92	-8.35	1.33	.	0.67	7.0	85.7
-1748.37	.	.	7.56	-8.95	-29.47	-58.21	-4.87	1.28	.	0.67	7.1	86.0
-1844.92	-13.56	.	.	.	-34.61	-60.46	-10.04	1.41	-0.04	0.67	7.1	86.0
-1737.30	.	.	.	-8.25	-29.63	-55.04	-5.81	1.29	0.03	0.67	7.1	86.1
-1914.67	-12.71	.	1.05	.	-34.61	-57.30	-10.00	1.41	.	0.67	7.1	86.1
-1922.45	-2.98	.	13.27	-8.84	-27.66	-54.98	.	1.30	.	0.67	7.2	86.4
-1926.94	.	.	12.49	-9.79	-27.28	-53.19	.	1.29	0.02	0.67	7.2	86.4
-1909.54	-2.07	.	.	-7.81	-27.30	-51.16	.	1.31	0.00	0.67	7.3	86.6
-2292.08	.	.	-4.23	.	-33.24	-43.20	-6.61	1.39	0.02	0.66	7.4	87.4
-2365.78	-9.02	.	6.85	.	-30.89	-47.34	.	1.43	-0.04	0.66	7.4	87.5
-3510.33	-0.85	.	.	-4.30	-29.38	.	-3.52	1.56	0.09	0.65	7.8	88.9

-3510.90	.	.	1.31	-4.77	-29.14	.	-3.17	1.55	0.09	0.65	7.8	88.9
-3528.46	1.40	.	4.45	-5.90	-27.58	.	.	1.53	0.09	0.65	7.8	89.0
-3613.82	-4.87	.	-2.72	.	-31.66	.	-5.16	1.62	0.06	0.65	7.8	89.1
-3667.91	-3.81	.	0.69	-2.58	-30.04	.	-3.32	1.61	.	0.65	7.9	89.3
1253.84	40.26	98.24	49.68	.	-14.57	.	21.34	.	0.35	0.60	9.3	95.0
1819.54	32.11	107.19	.	16.58	-20.63	.	14.36	.	0.30	0.59	9.6	96.0
2109.64	24.70	73.88	51.95	-13.37	.	-83.80	27.79	.	.	0.58	9.8	96.9
1481.32	26.05	121.83	47.78	21.55	-20.92	.	22.15	.	.	0.58	10.1	97.7
2076.12	24.34	111.37	25.58	19.68	-27.79	.	.	.	0.35	0.57	10.1	98.1
1663.84	23.76	90.65	45.93	.	.	-58.89	30.87	.	0.10	0.57	10.3	98.7
2132.60	21.58	92.47	48.72	.	.	-72.72	31.10	-0.07	.	0.56	10.4	99.1
2363.77	29.43	65.40	.	-12.91	.	-69.04	22.02	.	0.15	0.56	10.4	99.2
1197.65	22.60	51.60	.	-14.15	.	-61.84	21.93	0.29	.	0.56	10.5	99.4
2260.67	.	126.58	46.76	30.70	-25.97	.	12.48	.	0.21	0.55	10.7	100.2
-808.65	30.89	44.79	.	-15.11	.	.	23.28	0.58	0.21	0.55	10.8	100.5
1646.72	.	57.81	45.39	-12.06	.	-81.44	21.93	0.27	.	0.55	10.8	100.5
2934.44	.	71.50	52.11	-9.57	.	-100.55	22.60	.	0.00	0.55	11.0	101.1
1657.59	23.63	77.94	.	.	.	-50.51	25.72	0.09	0.11	0.55	11.0	101.2
-1294.66	25.74	50.73	33.30	-12.99	.	.	28.38	0.64	.	0.55	11.0	101.2
-273.94	28.88	80.63	35.73	.	.	.	31.56	0.32	0.18	0.54	11.1	101.6
910.79	42.47	87.05	46.01	-8.25	.	.	31.43	.	0.30	0.54	11.2	102.1
2104.68	.	79.55	45.40	.	.	-78.45	25.67	0.10	-0.01	0.54	11.3	102.2
1255.53	.	42.90	.	-12.13	.	-66.63	17.04	0.43	0.02	0.53	11.4	102.7
-936.24	21.55	.	.	-29.24	.	-33.26	16.01	0.82	0.13	0.53	11.6	103.3
-866.14	17.24	.	17.61	-29.60	.	-45.96	17.67	0.83	.	0.52	11.7	103.6
-2145.17	24.65	.	12.93	-28.79	.	.	18.77	0.98	0.18	0.52	11.8	103.9
-1311.65	.	38.83	28.54	-11.08	.	.	21.66	0.82	0.09	0.51	12.1	105.0
-566.21	.	.	18.25	-26.26	.	-51.55	14.46	0.87	0.03	0.51	12.2	105.5
1588.71	15.82	29.13	.	-24.53	.	-68.38	.	0.35	0.16	0.50	12.5	106.6
3171.20	17.51	45.98	14.35	-22.78	.	-93.19	.	.	0.17	0.49	12.7	107.2
1848.07	10.04	29.72	8.17	-23.70	.	-83.66	.	0.34	.	0.49	12.8	107.5
1760.36	.	28.69	10.80	-21.85	.	-79.72	.	0.40	0.08	0.48	12.9	107.9
245.37	14.19	.	-1.46	-31.63	.	-53.69	.	0.68	0.15	0.48	13.0	108.1
4588.87	14.46	.	16.26	-27.48	-14.34	-143.35	.	.	0.09	0.48	13.0	108.3
4797.48	12.92	.	.	-25.28	-15.67	-144.32	-3.55	.	0.09	0.48	13.1	108.5
4867.23	9.76	.	14.80	-25.59	-16.06	-154.30	-2.59	.	.	0.48	13.1	108.5
5243.29	.	.	14.52	-22.88	-18.05	-162.04	-6.20	.	0.02	0.47	13.2	109.0
-873.63	19.75	15.54	-6.64	-24.82	.	.	.	0.77	0.25	0.47	13.4	109.7
3624.21	26.05	.	18.71	-36.97	.	-110.86	11.63	.	0.15	0.44	14.3	112.6
2806.14	5.68	66.49	-3.30	.	.	-70.87	.	0.05	0.11	0.43	14.5	113.3
5809.55	-9.00	.	-13.88	.	-27.05	-162.62	-12.94	.	-0.04	0.40	15.6	116.7
-2049.98	1.60	.	-21.84	.	.	2.97	18.72	1.09	0.00	0.38	16.0	118.0
2459.05	47.74	.	0.37	-33.10	0.13	.	13.79	.	0.43	0.30	18.5	125.5

Appendix Table 7a. Seven variable prediction equations of ME of DDGS from chemical composition by laboratory 1 and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
-2945.31	15.00	-54.87	.	-38.23	-24.52	.	-18.79	1.46	0.88	0.82	6.2	67.3
-1753.74	.	-48.30	.	-35.13	-26.53	-28.76	-22.63	1.36	0.64	0.81	6.6	69.2
-2945.03	.	-52.89	2.90	-34.46	-26.93	.	-21.40	1.56	0.64	0.80	6.8	70.2
-1231.70	.	.	21.36	-20.60	-31.34	-54.84	-18.13	1.17	0.24	0.80	6.9	70.7
-1709.32	7.26	.	23.80	-18.78	-30.72	-47.61	-14.10	1.21	.	0.80	6.9	70.8
-1543.89	.	-10.45	19.74	-21.07	-30.48	-48.13	-16.82	1.25	.	0.80	7.0	71.3
-3558.43	17.07	.	21.03	-19.62	-31.03	.	-12.62	1.44	0.45	0.80	7.1	71.4
-3298.65	20.78	-33.24	15.90	-31.96	-18.34	.	.	1.38	0.65	0.79	7.2	72.0
-2184.77	18.16	.	26.78	-22.74	-22.26	-34.95	.	1.15	0.37	0.79	7.3	72.4
-1648.02	11.81	.	.	-21.35	-31.11	-40.58	-18.18	1.18	0.47	0.79	7.4	72.7
-3556.66	8.72	-18.04	17.41	-20.20	-30.31	.	-13.03	1.55	.	0.79	7.4	73.0
-1947.48	3.48	-24.95	.	-23.48	-29.58	-33.46	-17.87	1.36	.	0.78	7.5	73.5
-2854.96	20.12	-46.70	.	-36.57	-15.32	-4.61	.	1.34	0.77	0.78	7.6	73.5
-2159.80	12.75	-0.10	27.88	-19.42	-23.48	-38.27	.	1.20	.	0.78	7.7	74.0
-1819.88	.	-17.38	21.48	-25.23	-19.67	-38.37	.	1.23	0.21	0.77	8.1	76.0
-2522.14	9.94	35.86	31.09	.	-39.56	-43.93	-13.04	1.26	.	0.76	8.6	78.0
-2018.76	.	34.16	30.91	.	-39.72	-54.23	-14.86	1.26	-0.22	0.75	8.8	78.5
-1280.55	19.93	-81.90	.	-56.70	.	-12.63	-4.28	1.06	1.18	0.75	9.1	79.9
-1756.54	20.81	-87.28	-2.56	-57.60	.	.	-4.47	1.15	1.24	0.74	9.1	80.0
-2599.35	12.84	40.53	37.39	.	-32.95	-43.73	.	1.21	-0.18	0.74	9.1	80.1
-4263.24	11.66	24.12	26.78	.	-39.61	.	-11.51	1.57	-0.03	0.74	9.1	80.1
-1475.75	21.13	-74.41	3.20	-53.69	.	-12.23	.	1.07	1.10	0.74	9.2	80.2
-3838.16	4.73	.	18.19	.	-40.76	-12.83	-15.67	1.62	-0.09	0.73	9.8	82.7
-2924.42	5.61	17.75	.	.	-40.89	-27.34	-17.82	1.45	-0.02	0.72	10.0	83.5
-399.23	.	-84.54	-2.42	-55.48	.	-28.94	-7.86	1.05	0.94	0.72	10.2	84.0
4451.46	14.43	.	25.22	-35.28	-16.12	-131.45	-14.29	.	0.62	0.69	11.2	87.9
246.18	20.96	.	28.08	-35.24	.	-60.70	8.72	0.58	0.56	0.68	11.6	89.3
4398.49	9.17	32.75	36.96	-21.30	-21.37	-145.26	-11.25	.	.	0.68	11.6	89.4
4935.32	.	12.90	28.31	-28.87	-19.65	-147.00	-16.88	.	0.31	0.68	11.7	89.6
-298.94	9.32	-36.53	18.79	-38.06	.	-46.88	6.14	0.87	.	0.68	11.8	89.8
3827.13	18.48	20.27	35.50	-28.34	-12.84	-127.66	.	.	0.40	0.68	11.8	90.0
4810.09	13.92	-19.89	.	-41.57	-13.94	-125.21	-18.48	.	0.84	0.67	12.2	91.2
4128.84	18.78	-27.84	18.60	-48.35	.	-110.83	-4.24	.	0.89	0.65	12.8	93.3
3920.36	9.29	78.09	48.70	.	-30.57	-151.83	-8.92	.	-0.26	0.64	13.3	95.2
-588.31	15.01	49.63	42.88	.	.	-57.83	26.63	0.61	-0.37	0.48	19.7	114.4
3005.03	39.07	-37.70	10.22	-50.09	0.67	.	-3.97	.	1.42	0.45	20.7	117.1

Appendix Table 7b. Seven variable prediction equations of ME of DDGS from chemical composition by laboratory 2 and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
1567.61	.	51.87	-44.36	18.15	-26.60	-58.66	.	0.51	0.54	0.80	6.3	70.9
825.72	-13.72	40.13	-73.69	22.74	-22.83	-37.15	.	0.78	.	0.80	6.3	71.0
1771.95	.	63.29	.	16.86	-27.89	-67.02	6.21	0.39	0.71	0.80	6.4	71.5
-655.79	-21.74	21.83	-118.92	28.51	-24.62	.	-11.13	1.18	.	0.80	6.4	71.6
1482.51	-7.95	58.15	.	19.26	-30.83	-69.14	.	0.52	0.75	0.79	6.5	71.9
-725.85	-28.22	.	-154.78	27.48	-27.06	-24.87	-20.21	1.38	.	0.79	6.6	72.3
-1199.96	-29.75	.	-165.47	29.95	-24.71	.	-19.70	1.46	-0.21	0.79	6.7	72.8
-376.73	-14.39	37.22	-75.48	25.30	-23.10	.	.	0.97	0.12	0.79	6.7	72.8
1382.98	.	44.21	-80.20	18.53	-21.19	-41.95	-0.73	0.59	.	0.79	6.8	73.2
3575.04	4.01	74.93	.	17.16	-26.26	-85.31	7.64	.	0.72	0.78	6.9	73.9
3682.18	.	75.39	3.33	18.52	-26.72	-87.22	7.30	.	0.71	0.78	7.0	74.1
3962.23	1.42	70.01	-22.48	19.11	-27.33	-90.49	.	.	0.69	0.78	7.1	74.9
-17.16	.	43.26	-72.68	21.27	-22.45	.	0.12	0.80	0.26	0.78	7.2	75.1
1358.91	-9.75	60.68	.	18.64	-22.45	-48.69	9.20	0.51	.	0.77	7.5	76.3
-354.50	-8.41	57.19	.	22.25	-25.54	.	7.85	0.78	0.49	0.76	7.6	76.9
3995.40	-0.41	68.44	-42.77	19.61	-19.62	-71.91	5.63	.	.	0.76	7.8	77.9
1790.63	7.50	54.89	.	.	-23.52	-82.09	7.76	0.38	0.70	0.76	7.9	78.1
1400.82	.	47.50	-7.17	.	-23.63	-80.07	5.30	0.53	0.61	0.75	8.0	78.7
3063.86	14.44	74.73	39.69	.	-24.18	-98.34	14.33	.	0.91	0.75	8.0	78.9
1487.52	3.51	43.42	-27.18	.	-24.10	-80.65	.	0.54	0.62	0.75	8.1	79.0
-1419.96	-21.70	.	-114.15	19.73	-21.02	-14.06	.	1.38	-0.12	0.74	8.3	80.1
-368.20	.	.	-153.31	15.26	-22.98	-30.39	-14.60	1.14	0.11	0.74	8.5	80.9
1183.08	0.42	37.09	-52.82	.	-17.56	-61.67	3.02	0.64	.	0.74	8.6	81.3
-433.51	-9.17	.	-107.22	.	-21.24	-54.20	-10.26	1.18	0.16	0.71	9.5	85.0
2725.04	8.32	83.09	-7.60	22.53	-18.49	.	13.93	.	0.40	0.71	9.5	85.2
-842.12	3.18	34.48	-43.43	.	-16.98	.	5.63	0.92	0.25	0.71	9.7	86.0
778.08	-10.99	23.53	-150.98	16.11	.	5.55	.	0.77	-0.85	0.66	11.4	92.6
978.28	-9.81	25.79	-145.06	15.29	.	.	0.98	0.72	-0.82	0.66	11.5	92.6
-2205.94	-25.69	.	.	12.09	-32.65	-48.18	-3.61	1.48	0.67	0.65	11.6	93.1
1375.58	.	36.71	-119.22	11.94	.	-5.29	6.10	0.53	-0.64	0.65	11.6	93.1
-200.13	-20.20	.	-202.43	19.09	.	19.89	-9.00	1.14	-1.09	0.65	11.7	93.5
3314.00	7.05	61.08	-69.03	9.65	.	-32.79	14.19	.	-0.40	0.64	12.2	95.5
1562.99	5.24	40.38	-81.63	.	.	-25.83	10.79	0.43	-0.44	0.63	12.3	95.8
2114.18	8.97	56.65	-54.19	5.84	.	-23.83	15.85	0.18	.	0.63	12.6	96.8
2359.58	9.66	71.78	.	4.41	.	-28.60	24.58	0.03	-0.19	0.62	12.8	97.6
6239.65	-3.76	.	-180.99	14.19	-17.29	-113.76	-19.49	.	-0.04	0.52	16.3	109.1

Appendix Table 7c. Seven variables prediction equations of ME of DDGS from chemical composition (combined laboratories) and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
1381.94	-3.98	86.39	44.78	16.83	-36.29	-103.87	.	0.49	.	0.77	6.0	75.5
1376.90	.	88.08	46.72	15.76	-34.94	-102.07	2.50	0.45	.	0.77	6.0	75.5
1380.08	.	86.15	43.58	15.55	-35.81	-102.39	.	0.47	0.01	0.77	6.0	75.7
3430.81	1.80	109.53	57.67	18.57	-33.68	-131.56	4.71	.	.	0.76	6.4	77.7
3500.63	.	109.86	57.79	19.23	-34.10	-133.60	4.18	.	-0.01	0.76	6.4	77.7
3673.57	-1.19	108.29	53.56	19.55	-35.70	-137.43	.	.	0.00	0.76	6.5	78.1
1006.50	3.60	65.08	47.13	.	-29.22	-101.10	3.18	0.55	.	0.75	6.6	78.4
986.78	2.74	62.80	43.47	.	-30.37	-99.88	.	0.58	0.04	0.75	6.6	78.5
966.49	.	62.59	46.42	.	-29.78	-101.22	1.67	0.59	0.02	0.75	6.6	78.5
996.36	-4.40	72.02	.	16.97	-35.91	-89.68	-3.84	0.65	.	0.75	6.6	78.8
980.96	.	72.69	.	15.64	-34.84	-87.20	-2.42	0.62	0.01	0.75	6.7	78.9
947.96	-1.79	73.65	.	16.47	-34.08	-86.52	.	0.62	-0.01	0.75	6.7	79.0
3259.05	12.10	88.66	59.96	.	-25.88	-128.12	7.36	.	0.06	0.74	7.1	81.2
587.58	3.79	49.92	.	.	-29.18	-83.95	-1.99	0.71	0.04	0.73	7.2	81.6
3902.76	2.91	99.33	.	19.72	-32.88	-125.83	-0.77	.	0.02	0.72	7.5	83.1
-2281.39	.	62.71	25.75	15.35	-32.83	.	3.42	1.12	0.10	0.71	8.0	85.6
-2241.70	2.99	60.20	20.85	14.07	-33.65	.	.	1.12	0.13	0.71	8.0	85.7
-2415.64	2.03	62.68	25.67	15.38	-32.25	.	5.28	1.14	.	0.70	8.1	86.2
-2099.28	5.09	57.19	.	13.74	-31.79	.	1.88	1.10	0.12	0.70	8.2	86.4
-2304.37	12.98	48.91	28.82	.	-26.15	.	6.85	1.06	0.17	0.70	8.3	86.9
-1683.40	-8.23	.	7.15	-6.09	-31.57	-62.05	-7.69	1.33	.	0.67	9.0	90.2
-1647.14	-8.65	.	.	-5.16	-31.83	-61.60	-8.40	1.34	-0.01	0.67	9.0	90.3
-1765.97	.	.	7.43	-9.04	-29.47	-56.31	-5.15	1.28	0.03	0.67	9.1	90.6
-1859.07	-13.72	.	1.74	.	-34.67	-60.71	-9.94	1.41	-0.04	0.67	9.1	90.7
-1923.67	-2.91	.	13.26	-8.86	-27.65	-54.85	.	1.30	0.00	0.67	9.2	91.0
-3521.23	-0.81	.	1.22	-4.43	-29.34	.	-3.39	1.56	0.09	0.65	9.8	93.7
1351.86	32.32	115.87	47.53	15.49	-20.84	.	19.43	.	0.30	0.62	10.8	98.2
1909.95	29.07	73.70	51.09	-14.65	.	-72.76	27.36	.	0.14	0.59	11.6	101.3
1600.63	23.87	68.09	49.15	-14.29	.	-76.34	27.33	0.11	.	0.58	11.8	102.0
1058.44	27.19	52.29	.	-15.35	.	-51.59	21.62	0.28	0.14	0.57	12.3	103.9
2062.36	24.69	94.28	48.30	.	.	-65.12	31.05	-0.09	0.10	0.57	12.3	104.0
-903.54	32.48	55.21	35.82	-15.13	.	.	27.57	0.51	0.22	0.56	12.4	104.4
1639.07	.	57.73	45.31	-12.10	.	-80.90	21.85	0.27	0.01	0.55	12.8	106.0
-1011.96	21.31	.	16.91	-30.78	.	-36.39	17.27	0.82	0.13	0.53	13.5	108.6
1678.76	15.53	30.91	8.19	-24.93	.	-71.56	.	0.32	0.16	0.50	14.5	112.2
4701.00	12.92	.	14.51	-26.74	-15.42	-146.19	-2.24	.	0.09	0.48	15.0	114.1

Appendix Table 8a. Eight variable prediction equations of ME of DDGS from chemical composition by laboratory 1 and particle size.

Intercept	Crude Protein	Crude Fat	Crude Fiber	ADF	NDF	Ash	Starch	GE	Particle Size	R^2	C(p)	RSD
-2279.46	13.47	-50.63	.	-37.78	-24.67	-16.65	-19.50	1.36	0.84	0.82	8.1	71.0
-3043.82	15.45	-49.20	5.66	-36.44	-25.00	.	-17.61	1.46	0.83	0.82	8.1	71.2
-1712.37	12.94	.	22.31	-22.46	-29.77	-44.41	-14.92	1.16	0.41	0.81	8.5	72.9
-1642.25	.	-37.59	8.99	-32.09	-27.37	-35.45	-21.06	1.31	0.53	0.81	8.5	72.9
-1782.88	6.64	-6.42	21.89	-20.30	-30.15	-44.62	-14.47	1.24	.	0.80	8.9	75.0
-2523.51	19.18	-24.43	19.32	-30.30	-18.72	-20.89	.	1.24	0.57	0.80	9.1	75.9
-2355.50	8.24	36.45	32.19	.	-39.19	-47.89	-12.61	1.25	-0.14	0.76	10.6	82.5
-1292.07	19.91	-82.69	-0.74	-56.89	.	-12.10	-4.45	1.07	1.19	0.75	11.1	84.7
4357.03	14.20	10.68	28.62	-31.54	-17.76	-134.03	-13.53	.	0.52	0.69	13.2	93.1

Appendix Table 8b. Eight variable prediction equations of ME of DDGS from chemical composition by laboratory 2 and particle size.

Intercept	Crude Protein	Crude Fat	Crude Fiber	ADF	NDF	Ash	Starch	GE	Particle Size	R^2	C(p)	RSD
1107.24	-10.09	46.58	-49.79	21.38	-26.51	-50.93	.	0.67	0.40	0.81	8.1	74.0
456.38	-19.60	27.34	-107.55	25.70	-25.04	-34.57	-9.96	0.97	.	0.80	8.1	74.1
1591.74	.	53.73	-37.95	17.96	-26.50	-59.12	1.58	0.49	0.55	0.80	8.3	75.2
1564.33	-5.08	60.89	.	18.40	-28.54	-65.23	5.14	0.47	0.68	0.80	8.4	75.6
-653.94	-22.13	21.12	-121.39	28.62	-24.45	.	-11.43	1.19	-0.03	0.80	8.4	75.9
-700.16	-28.97	.	-160.38	28.07	-25.98	-21.65	-20.22	1.39	-0.12	0.79	8.6	76.5
3505.20	4.27	76.14	7.00	16.77	-26.56	-85.69	8.51	.	0.75	0.78	8.9	78.3
1882.94	8.31	58.28	10.18	.	-23.91	-84.04	9.17	0.34	0.75	0.76	9.9	82.9
791.86	-10.78	23.97	-149.70	16.01	.	5.28	0.27	0.77	-0.85	0.66	13.4	98.2

Appendix Table 8c. Eight variables prediction equations of ME of DDGS from chemical composition (combined laboratories) and particle size.

Intercept	Crude Protein	Crude Fat	Crude Fiber	ADF	NDF	Ash	Starch	GE	Particle Size	R^2	C(p)	RSD
1377.08	-3.03	87.41	46.27	16.63	-35.67	-103.15	1.41	0.48	.	0.77	8.0	80.1
1397.73	-4.60	86.48	44.91	17.11	-36.43	-105.20	.	0.49	-0.02	0.77	8.0	80.1
1375.53	.	88.06	46.71	15.75	-34.94	-101.97	2.49	0.45	0.00	0.77	8.0	80.1
3427.58	1.87	109.52	57.65	18.54	-33.67	-131.39	4.72	.	0.00	0.76	8.4	82.4
984.58	4.88	65.90	46.97	.	-29.09	-98.05	3.29	0.54	0.04	0.75	8.5	83.1
1006.80	-4.85	72.03	.	17.16	-36.03	-90.58	-3.90	0.65	-0.01	0.75	8.6	83.5
-2151.51	6.70	64.97	27.38	13.27	-31.29	.	5.49	1.04	0.13	0.71	9.9	90.5
-1675.44	-8.59	.	7.17	-5.94	-31.66	-62.77	-7.73	1.33	-0.01	0.67	11.0	95.7
1462.07	28.28	68.58	48.62	-15.44	.	-66.30	26.96	0.10	0.14	0.59	13.6	107.3

Appendix Table 9a. Nine variable prediction equations of ME of DDGS from chemical composition by laboratory 1 and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
-2167.57	13.58	-39.49	9.37	-34.63	-25.52	-23.52	-17.84	1.31	0.73	0.82	10.0	75.4

Appendix Table 9b. Nine variable prediction equations of ME of DDGS from chemical composition by laboratory 2 and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
779.60	-15.06	36.19	-79.27	23.74	-26.91	-45.20	-6.62	0.83	0.29	0.81	10.0	78.7

Appendix Table 9c. Nine variables prediction equations of ME of DDGS from chemical composition (combined laboratories) and particle size.

Intercept	*Crude Protein*	*Crude Fat*	*Crude Fiber*	*ADF*	*NDF*	*Ash*	*Starch*	*GE*	*Particle Size*	R^2	*C(p)*	*RSD*
1391.59	-3.64	87.44	46.32	16.89	-35.83	-104.38	1.34	0.48	-0.02	0.77	10.0	85.6