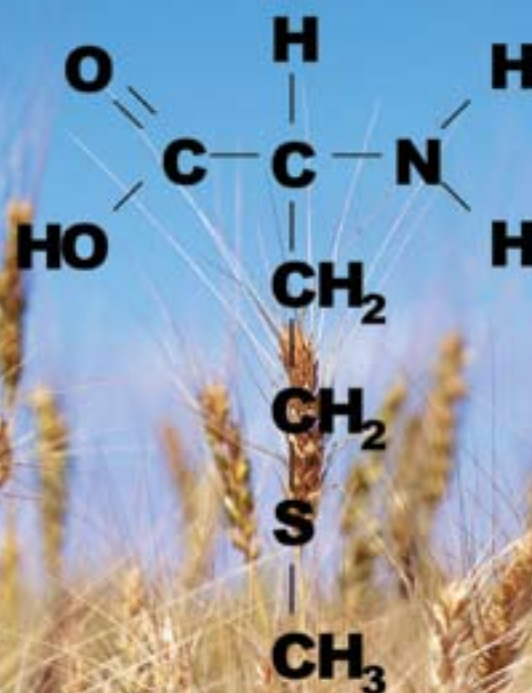
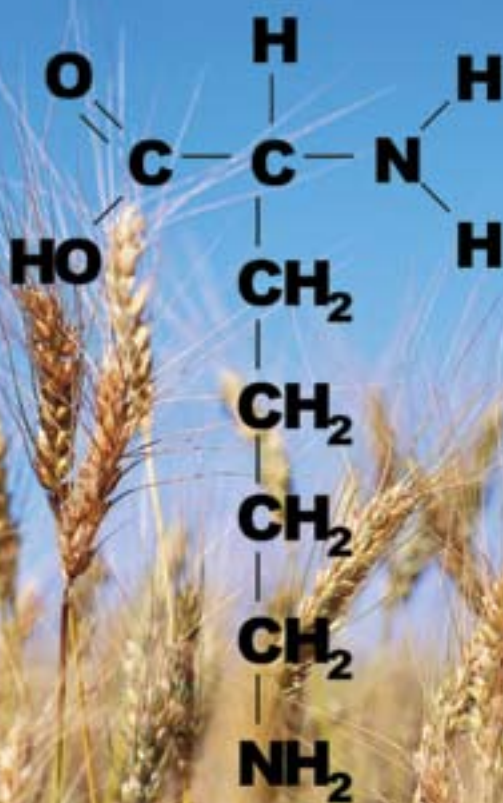




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# Ileal Digestible Amino Acid Values in Feedstuffs for Poultry

RIRDC Publication No. 09/071



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Development Corporation**

# **Ileal Digestible Amino Acid Values in Feedstuffs for Poultry**

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# Foreword

The previous edition of this publication (published in 1998 with the title *Digestible Amino Acids in Poultry Feedstuffs*) was well received by the Australian Stockfeed and Poultry Industries. It has been widely cited by those conducting research in this important aspect of poultry nutrition.

In the early 1970's, the late Professor Charles Payne commenced a systematic analysis of the amino acid composition of Australian feedstuffs and his results and those of others, especially Dr Yasin Mollah, were published by the Poultry Research Foundation, University of Sydney as Occasional Bulletin No. 3 in 1983. The need for a comprehensive set of Australian data initiated a project in 1994 to determine the apparent ileal digestibility of amino acids in local feedstuffs for growing broiler chickens. The results of that project, funded by RIRDC, were published in 1998. There have been a number of related projects funded by RIRDC that have generated additional digestibility data and this publication is a compilation of all the data thus generated. Values for digestible tryptophan and regression equations for digestible amino acid content of most feedstuffs are also included. All of the data was generated using the same procedures as outlined in the following pages, mostly while the authors were members of the University of Sydney. Recent data generated at the University of Queensland is also included.

This publication will be a useful resource for the poultry industry, especially nutritionists and those engaged in poultry protein and amino acid research as differences in amino acid digestibility can be effectively used to improve the precision of feed formulation.

This report, an addition to RIRDC's diverse range of over 1800 research publications, forms part of our Chicken Meat R&D program, which aims to support increased sustainability and profitability in the chicken meat industry through focused research and development.

Most of RIRDC's publications are available for viewing, downloading or purchasing online at [www.rirdc.gov.au](http://www.rirdc.gov.au). Purchases can also be made by phoning 1300 634 313.

**Peter O'Brien**  
Managing Director  
Rural Industries Research and Development Corporation

# Acknowledgments

The project was initiated in response to the need in the Australian poultry industry for information on total and digestible contents of essential amino acids in locally produced feedstuffs. This project was supported by the Chicken Meat Committee of the Rural Industries Research and Development Corporation, the Poultry Research Foundation of the University of Sydney and the School of Animal Studies, University of Queensland. Amino acid digestibility bioassays are laborious and time-consuming and require the involvement of many people. We are indebted to our colleagues who helped to make this documentation possible through their assistance with bioassays, and the collection and analysis of feed and digesta samples; Drs K. Angkanaporn, K. H. Huang, M. Imbeah, A. Kumar, Y. Mollah and D. Zhang with technical support from Ms J. Gill, Ms J. DeHon and Ms M. Hayter, Mr D. Mulley and number of postgraduate students.

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# Executive Summary

## ***What the report is about***

The availability of amino acids in feedstuffs is an important feature of dietary protein quality. Reliable values of this feed ingredient attribute permit more efficient formulation of poultry diets. Many approaches have been made to determine amino acid availability which is defined as that proportion of dietary amino acids that is in a form suitable for digestion, absorption and utilisation. The digestibility assay has become the most favoured technique for estimating availability, largely because the values apply directly to the bird and all amino acids can be measured in the one assay. Digestibility assays are applied assuming that the difference between input and output is a valid indicator of bioavailability and that digestibility is likely to be the rate limiting step in amino acid availability.

## ***Who is the report targeted at?***

This publication will be a valuable resource for the poultry industry, especially commercial nutritionists as differences in amino acid digestibility can be effectively used to improve the precision of feed formulation and reduce the cost of poultry production. Scientists undertaking poultry nutrition research will be able to apply the data in their research programs to improve protein and amino acid utilisation. The information in this publication will be of benefit to plant breeders as they develop new crop varieties.

## ***Background and objectives***

In 1994 a project, funded by RIRDC, was initiated in response to an industry need for a comprehensive set of ileal digestible amino acid data of Australian feedstuffs for broiler chickens. The results of that project were published in 1998 with the title ***Digestible Amino Acids in Poultry Feedstuffs***. Since that time there have been a number of related projects funded by RIRDC that have generated additional digestibility data. The objective of this publication was to compile all the data thus generated.

## ***Methods used***

A series of bioassays were conducted with broiler chickens to evaluate a range of feed ingredients. Different assay diets were used for cereal grains and protein meals with the test feedstuff as the only source of protein in the assay diet. Each assay diet was offered *ad libitum* to three pens of male broilers from 35 to 42 days of age. At the end of the bioassay, all birds in a pen were euthanatized and the contents of the lower half of the ileum were collected and pooled.

Amino acid concentrations in samples of assay diets and ileal digesta were determined using cation-exchange column chromatographic procedures with post-column derivatisation and fluorimetric detection of amino acids using *O*-phthalaldehyde. Tryptophan was determined separately after alkaline hydrolysis with NaOH followed by isocratic ion-exchange chromatography with *O*-phthalaldehyde derivatisation followed by fluorescence detection.

Ileal amino acid digestibility coefficients were calculated using acid insoluble ash (AIA) as an indigestible dietary marker. Digestible amino acid concentrations were calculated from total concentrations and respective digestibility coefficients.



## ***Results/key findings***

The apparent ileal amino acid digestibility values of 137 samples, representing 28 feed ingredients have been determined. Tryptophan data for selective feed ingredients are also included. In addition to individual sample values, a summary of data for total amino acid concentrations, apparent ileal amino acid digestibility coefficients and digestible amino acid concentrations in feed ingredients are presented.

Sufficient data was collected for major feed ingredients to permit calculation of linear regression equations describing total and apparent ileal digestible amino acid content as a function of total and apparent ileal digestible crude protein content.

## ***Implications for relevant stakeholders***

The major advantage of using digestible amino acid values in diet formulation is that it makes it possible to increase the inclusion level of alternate ingredients in poultry diets, in particular, low quality protein sources. In effect, it will increase the range of ingredients that can be incorporated, improve the precision of formulation and ensure more predictable bird performance.

The data in this publication will also provide an opportunity to extend databases on standardised ileal digestibility values of amino acids in feed ingredients following transformation using appropriate figures for endogenous amino acid recovery in ileal digesta.

Importantly, differences in amino acid digestibility of feedstuffs can be effectively used to improve the precision of feed formulation, reduce protein safety margins in diets and nitrogen pollution from poultry production units and increase industry profitability through savings in feed costs.

# Introduction

An important feature of protein quality for the feed industry is knowledge of the availability of amino acids in feedstuffs. Reliable availability values will permit more efficient formulation of diets. Many approaches have been made to determine amino acid availability (defined as that proportion of dietary amino acids that is in a form suitable for digestion, absorption and utilisation) using *in vitro* (enzymatic and chemical assays), indirect (microbiological or plasma amino acids) or direct (growth and digestibility assays) methods. The digestibility assay has become the most favoured technique for estimating availability, largely because the values apply directly to the bird and all amino acids can be measured in the one assay. A number of excellent reviews have been published on this topic, including; Sibbald (1987), McNab (1994), Ravindran and Bryden (1999), Parsons (2002) and Lemme *et al.* (2004).

## Digestibility assays

Digestibility assays are applied assuming that the difference between input and output is a valid indicator of bioavailability and that digestibility is likely to be the rate limiting step in amino acid availability. Digestibility assays may be divided into excreta / faecal and ileal procedures.

### Excreta digestibility

Excreta digestibility has been used by many workers because of its simplicity. Determination of amino acid digestibility in excreta has been widely criticised because intestinal microflora in the hindgut have a substantial affect on the amount of individual amino acids excreted in faeces. Some estimates put this as high as 25% of excreta protein (Parsons *et al.*, 1982). Caecetomised birds were used to overcome the problem of microbial modification of dietary protein and microbial protein synthesis in the hindgut. However, the influence of caecetomy on apparent amino acid digestibility appears from the literature to be quite variable (Ravindran and Bryden, 1999). Estimates of amino acid absorption made by using excreta of intact birds are also in error because avian urine contains some amino acids (Sibbald, 1987). However, the very low concentrations of amino acids in urine mean that the error is likely to be small. Nevertheless, the excreta method using precision-fed roosters has been widely adopted in Canada, the United States and France and in the latter two countries the birds are caecetomised. In this procedure true amino acid digestibility is determined after correction for endogenous amino acid secretion into the gut (Parsons, 2002).

### Ileal digestibility

Microbial activity is concentrated in the hindgut and as the main sites of absorption of amino acids are the jejunum and ileum, Payne *et al.* (1968) suggested that the analysis of ileal contents rather than excreta might be a reliable method for assessing protein and amino acid digestibility. Ileal digestibility can be determined in two ways depending on the technique of sample collection. The simplest method for the collection of ileal digesta is to kill the bird and the alternative is to use an ileal cannula. Ileal cannulation has been developed for adult cockerels (Raharjo and Farrell, 1984; Gurnsey and James, 1985). Although ileal cannulation seems to provide some theoretical advantages over the other method it is a sophisticated technique for practical application. Some questions may arise such as the rejection of the cannula, the type and placing of the cannula, the free flow of digesta through the cannula and the use of an appropriate marker (see Sauer *et al.*, 1989). Moreover, for the cannulation technique to be cost effective, it must be undertaken with adult birds and there is always the question that digestibility measured with adults may not reflect digestibility in the rapidly growing broiler chicken. It is for these reasons we have developed an ileal digestibility assay with five week old broiler chickens.

## Variation in digestibility values

A number of factors influence amino acid digestibility. The nature and digestion of dietary protein will reflect plant breeding programs, agronomic conditions, presence of anti-nutritive factors and processing. Variation in digestibility values will also arise from difficulties associated with the conduct of assay procedures and the measurement of endogenous amino acid losses. Surprisingly, there are few instances in the literature where the significance of many of these sources of variation has been evaluated.

## Protein digestion, anti-nutritive factors and processing

All dietary sources of protein are heterogeneous mixtures of different proteins. It would be anticipated, therefore, that different proteins would be digested at different rates and this in turn would cause a variation in the rate at which different amino acids were taken up from the gut. However, the situation is more complex than this as proteins, although different in their chemical compositions, are not isolated entities but have various linkages with carbohydrate, lipids and other proteins so that these interactions and the composition of the diet may affect the digestibility of dietary protein (Hughes and Choct, 1999). In addition, digestion and absorption may be inhibited by the presence of anti-nutritive factors in the diet. Protease inhibitors, lectins, polyphenolic compounds, saponins and non-starch polysaccharides are examples of anti-nutritive factors that depress protein digestion and utilisation (Bryden, 1996; Hughes and Choct, 1999). Ironically, those feedstuffs (grain legumes, oil seed meals) which are used extensively as sources of dietary protein also contain the highest concentrations of anti-nutritional factors. For example, soyabean meal contains a range of anti-nutritional factors, many of which are heat labile and destroyed during feedstuff manufacture (Dale, 1996). Heat treatment, essential for inactivation of many anti-nutrients, may reduce protein quality in the presence of carbohydrates by Maillard type reactions.

Processing, especially heat treatment, may contribute to the variability of ingredients such as protein meals and cotton seed meal (Dale, 1996). Lysine is heat sensitive and the low digestibility of lysine in cotton seed meal may reflect heat processing of the meal. The variations in digestibilities of amino acids in meat meals are likely to be due to differences in raw ingredients, time between slaughter and rendering and the duration and temperature of the rendering process (Skurray, 1974). Obviously, optimum processing conditions for all protein meals that do not reduce amino acid digestibilities need to be established. Another aspect of processing, grinding, modifies particle size and shape without causing chemical changes in feedstuffs. It has been shown that grinding improves nutrient digestibility in birds (Hamilton and Proudfoot, 1995). This may reflect the increased surface area available for enzyme attack during digestion.

It has been known for some time that the major influence of anti-nutritive factors on protein nutrition has been a reduction in apparent protein digestibility. It is only recently that the actual cause of the reduction on apparent digestibility has been determined with any certainty. The application of new techniques for the measurement of endogenous amino acid excretion has allowed researchers to separate the effects of reduced digestion of both exogenous and endogenous protein and increased endogenous secretion (Angkanaporn *et al.*, 1994). Both factors would reduce apparent digestibility. The relative importance of these two avenues of amino acid loss by the bird will vary with different anti-nutritive factors (Bryden, 1996). The application of feed enzymes to poultry diets has also demonstrated the impact of anti-nutritive factors on apparent amino acid digestibility. In a series of studies we have shown that the application of xylanase and phytase alone and in combination improves amino acid digestibility by amounts which can be quite significant in terms of overall feed formulation. The positive effect of enzymes on amino acid digestibility again demonstrates the impact of anti-nutritive factors on either reducing protein digestion or increasing endogenous amino acid loss. The net result is a decrease in apparent amino acid digestibility.

## Assay procedures

There are now a number of reference sources of known digestibility values for a range of feedstuffs. However, there is great confusion when one examines these compilations to know how to compare the values obtained by different procedures as listed in Table A. Values have been derived using a number of different assay procedures that vary in terms of the age of the birds used, the collection site of digesta, feeding procedures, basal diet, dietary inclusion level of test ingredients, etc. (see Ravindran and Bryden, 1999) which all add to the uncertainty of the values obtained. Difficulties associated with amino acid analysis can be a major source of variation which is often overlooked (Ravindran and Bryden, 1999). Moreover, the application of rapid techniques such as NIRS is dependent on the reliability of chemical analysis of amino acids.

**Table A Terminology used to describe amino acid digestibility in feedstuffs for poultry – selected examples.**

Reference	Terminology	Type of bird	Method of feeding	Site of sampling	Endogenous output measurement
Raharjo & Farrell (1984)	Apparent ileal digestibility	10-week-old cockerels	Allowance feeding, 100 g	Ileal digesta	-
	Apparent ileal digestibility	Adult cockerels, ileal-cannulated	Allowance feeding, 100 g	Ileal digesta	-
Sibbald (1986)	True digestibility	Adult cockerels, intact	Precision-feeding, 25-40 g	Excreta	Fasting
Green (1987)	True digestibility	Adult cockerels, caecectomised	Precision-feeding, 50 g	Excreta	Protein-free diet
Parsons (1991)	True digestibility	Adult cockerels, caecectomised/ intact	Precision-feeding, 25-50 g	Excreta	Fasting/ protein-free diet
Rhone-Poulenc (1993)	True digestibility	Adult cockerels, caecectomised	Precision-feeding, 50 g	Excreta	Protein-free diet
Rhone-Poulenc (1995)	True ileal digestibility	Adult cockerels,	Precision-feeding, 50 g	Excreta	Protein-free diet
Angkanaporn <i>et al.</i> (1996)	True ileal digestibility	Adult cockerels, caecectomised	Precision-feeding, 30 g	Ileal digesta labeling	Homoarginine
Present study	Apparent ileal digestibility	5-week old broilers	<i>Ad libitum</i>	Ileal digesta	-

Two major areas of contention in digestibility assays are the use of ileal versus excreta collection procedures and correcting digestibility values for endogenous secretions. There have been few direct comparisons of ileal versus excreta digestibility methods but in a series of studies (Ravindran *et al.*, 1999a) it was shown that there is greater variation in excreta values than there is in ileal values. Differences observed between ileal and excreta digestibilities in these studies clearly demonstrated that amino acid metabolism by hindgut microflora in chickens may be substantial and that digestibilities determined at the terminal ileum are more accurate estimates of amino acid availability than those determined in excreta. If feed intake is low, as it is in precision-fed assays, endogenous amino acids become a greater proportion of the amino acids measured in digesta and excreta. Apparent digestibility is depressed accordingly. The problems associated with the quantification of endogenous amine acids are discussed below.

## Endogenous amino acid losses

Most excreta digestibility assays and some ileal digestibility procedures include a correction for endogenous amino acids in an endeavour to provide a more accurate value for comparing different diets or protein sources. Approaches to the estimation of endogenous amino acids in poultry have included the measurement of amino acids in excreta either during starvation, when fed a protein free diet, or by determining endogenous output at zero intake by regression analysis. However, the use of these practices, especially the first two, is intrinsically unsound because starvation or the absence of a nutrient, such as protein, profoundly alters metabolism and the bird can no longer be regarded as physiologically normal. Starvation or feeding a protein free diet are the methods used for endogenous correction in the precision-fed rooster excreta digestibility assay which has been adopted in many laboratories. We have used both the protein free diet and the regression analysis method to measure the entry of endogenous amino acids into the lower ileum of broilers and roosters and have shown that the two methods give different results that vary with the maturity of the bird. We have compared these techniques to the homoarginine method and have shown that both techniques significantly underestimate endogenous amino acid secretion when compared with the latter technique (Siriwan *et al.*, 1994). Bryden *et al.* (1996) and Ravindran and Bryden (1999) have discussed in detail the assumptions that are used when applying the homoarginine technique and these assumptions have been shown to be valid when tested. Interestingly, the values obtained by the homoarginine technique have been reported to be of similar magnitude to those measured using isotope dilution (Roos *et al.*, 1994). Moughan *et al.* (1990) introduced the peptide alimentation method, in which birds are fed a semi-synthetic diet containing enzyme-hydrolysed casein (EHC) as the sole source of nitrogen. Endogenous amino acid values calculated using the EHC method are similar to those determined with the homoarginine method (Ravindran *et al.*, 2004). These techniques have the advantage that they measure endogenous amino acids in birds that can be considered physiologically normal.

## Application of Digestibility Values

During the last two decades a significant number of digestibility values for feedstuffs used in poultry diets have generated in laboratories throughout the world. With the application of these values to feed formulation a number of issues are raised and these are discussed below.

### Low quality protein meals

The major advantage of using digestible amino acids in diet formulation is that it makes it possible to increase the inclusion levels of alternate ingredients (in particular, low quality protein sources) in poultry diets. In effect, it will increase the range of ingredients that can be incorporated, improve the precision of formulation and ensure more predictable bird performance. In a series of studies evaluating canola meal (Ravindran *et al.*, 1998; Li *et al.*, 2002a), cottonseed meal (Ravindran and Bryden, 1999; Li *et al.*, 2002b) and meat and bone meal (Ravindran and Bryden, 1999; Ravindran *et al.*, 2002), the beneficial effects of using apparent ileal digestible amino acids in broiler diet formulations to increase the inclusion levels of poorly digestible ingredients were demonstrated. In these studies, as expected, increasing dietary levels of canola meal, cottonseed meal and meat and bone meal on a total amino acid basis significantly lowered weight gains and feed efficiency of broilers. The observed depressions were, however, largely overcome when the diets were balanced on a digestible amino acid basis. This is in accord with previous studies on cottonseed meal (Fernandez *et al.*, 1995) and several by-product ingredients (Rostagno *et al.*, 1995; Douglas and Parsons, 1999). These results confirm that the inclusion levels of poor quality protein sources in broiler diets can be increased when they are based on amino acid digestibility values.

## **Age and physiological state**

The ability of poultry to digest and absorb dietary protein is known to be influenced by age and physiological state. A concern often raised by commercial nutritionists is the relevance of digestibility values generated with birds of one age (ie. 42 days) to week-old chicks or laying hens. A number of studies have examined this factor using broilers of different ages, laying hens and roosters fed different cereals and protein meals (Wallis and Balnave, 1984; Rostagno *et al.*, 1995; Batal and Parsons, 2002; Huang *et al.*, 2005, 2006, 2007; Garcia *et al.*, 2007). In general, the digestibility coefficients of amino acids increased with age and varied with feedstuff. The differences may in part, reflect differences in endogenous amino acid flows (Ravindran and Hendriks, 2004). The practice of using amino acid digestibility values generated with birds of one age to formulate diets for birds of a younger age or different physiological state should be undertaken with due regard to possible differences.

## **Additivity of values**

Additivity of digestible amino acids, determined in single feedstuffs, is a crucial consideration in the formulation of complete diets. Studies by Angkanaporn *et al.* (1996) and Bryden and Li (2003) found that digestible amino acid supply in a complete diet can be predicted from apparent amino acid digestibilities determined for individual feed ingredients. Investigations with a wide variety of ingredients may be warranted to determine the possibility of associative effects between other feedstuffs.

## **Feed enzymes**

The use of feed enzymes and the application of digestible amino acid values have been the two most significant advances in feed production during the last two decades. Enzymes are added to diets to enable the bird to degrade anti-nutrient feed components (see above), in particular, non-starch polysaccharides and phytate. It has also been demonstrated that addition of feed enzymes improves amino acid digestibility and the metabolisable energy value of the diet. The response to feed enzymes is dependent on diet composition, source and level of enzyme addition (Hew *et al.*, 1998; Ravindran *et al.*, 1999a,b,c; Hew *et al.*, 1999; Ravindran *et al.*, 2000, 2001; Selle *et al.*, 2000; Selle *et al.*, 2003a ,b; Selle *et al.*, 2006; Bryden *et al.*, 2007) and may reflect improved dietary protein digestion *per se* and/or a reduction in endogenous amino acid losses.

## **Apparent or true digestibility values**

A question often posed by commercial nutritionists concerns which digestible amino acid system is most appropriate for use in the formulation of poultry diets - apparent or true digestibility values. Apparent digestibility measures the digestibility of amino acids of both dietary and endogenous origins. True digestibility, on the other hand, includes a correction for endogenous amino acid secretions. The relative merits of these two systems have been discussed in detail by Ravindran and Bryden (1999). It would appear that the choice of the appropriate system of digestible amino acids may depend on the method of formulating diets. If diets are being formulated to least-cost using linear programming, then apparent ileal digestibility values are the most appropriate as they take into account the endogenous cost of digestion. On the other hand, if diets are being formulated with computer simulation models, then true digestibility values will be relevant if the model corrects for the endogenous cost of digestion. It should be appreciated, however, that both digestible amino systems are superior to the total amino acid system currently employed in practical feed formulations and that all current methods of amino acid evaluation have specific applications and shortcomings.

## Standardised ileal digestibility values

Debate will continue regarding the need to correct amino acid digestibility values for endogenous losses and has been discussed comprehensively (Ravindran and Bryden., 1999; Parsons., 2002; Lemme *et al.*, 2004). Correcting apparent digestibility for endogenous losses can introduce artefacts and mask important differences between feed ingredients. Although digestibility is often considered to be a characteristic of a diet or feed ingredient, it is, in reality, the property of the ingredient in relation to the animal to which the diet is given (McNab, 1994). It may be argued that if a feed ingredient increases endogenous amino acid flow out of the small intestine, that represents a loss to the animal and must be realistically 'charged' against the feed ingredient as lowered amino acid digestibility. However, it is now recognised that endogenous amino acid losses are influenced primarily by dry matter intake and secondarily by the inherent composition of the feed ingredient or diet (ie. fibre level, presence of anti-nutritional factors etc). These two fractions are referred to as basal (or non-specific) and specific endogenous amino acid losses, respectively.

The limitations of apparent ileal digestibility values could be overcome by standardising these estimates through corrections for basal endogenous losses, as suggested by Boisen (1998) and Rademacher *et al.* (1999). The basal endogenous amino acid loss is defined as the minimal loss of endogenous amino acids. As noted above, the basal loss is proportional to dry matter intake and is dependant of the composition of the ingredient or diet. The obvious advantage of this system is that apparent digestibility and basal endogenous losses need not be determined in the same experiment and standardised ileal digestibility values can be calculated for published apparent digestibility values. Databases on standardised ileal digestibility values of amino acids in feed ingredients are now available, wherein published apparent digestibility values have been transformed to standardised values using existing literature data on endogenous amino acid recovery in ileal digesta (see Lemme *et al.*, 2004).

# Bioassay and analytical procedures

In a series of bioassays, apparent ileal amino acid digestibility values of 137 samples representing 28 feed ingredients have been determined using five-week old broilers.

## Diets

Different assay diets were used for cereal grains and protein meals (Table B). In the case of cereals, assay diets contained per kg: 918 g of test cereal, 20 g of vegetable oil and, 42 g of mineral and vitamin supplements. For protein meals, assay diets were based on dextrose and contained the test feedstuff as the only source of protein. The proportions of dextrose and the test feedstuff were varied in each diet to obtain 200 g crude protein/kg. Diets containing ingredients of plant origin, blood meal and feather meal had identical calcium and phosphorus supplementation. These supplements were not included in diets containing fish meal, meat meal or, meat and bone meal. Solkafloc (30 g/kg) was added as a source of fibre in diets containing animal protein meals. Celite (20 g/kg) was added to all diets as a source of acid-insoluble ash (AIA) which was used as an indigestible marker in the calculation of digestibility coefficients.

## Birds

Each assay diet was offered *ad libitum* to three pens (four birds/pen) of male broilers from 35 to 42 days of age. At the end of the bioassay, all birds were euthanatised by an intracardial injection of sodium pentobarbitone solution, and the contents of the lower half of the ileum were collected by gently flushing with distilled water into plastic containers. The ileum was defined as that portion of the small intestine extending from the vitelline diverticulum (formerly Meckel's diverticulum) to a point 40 mm proximal to the ileo-caecal junction. Ileal digesta of birds within a pen were pooled, frozen immediately after collection and subsequently freeze-dried. Dried ileal digesta samples were ground to pass through a 0.5 mm sieve and stored in airtight containers at - 20 °C for chemical analyses.

## Chemical analysis

Amino acid concentrations in the diet and ileal digesta samples were determined using cation-exchange column chromatographic procedures with post-column derivatisation and fluorimetric detection of amino acids using O-phthalaldehyde as described by Siriwan *et al.* (1993) and Li *et al.* (2006). Tryptophan was determined separately after alkaline hydrolysis with NaOH followed by isocratic ion-exchange chromatography with O-phthalaldehyde derivatisation followed by fluorescence detection using the method of Ravindran and Bryden (2005). Nitrogen (N) content was determined by the method of Sweeney (1989) using a nitrogen determinator (LECO® Corporation, St. Joseph, Michigan, USA). Crude protein contents of the ingredients were calculated as N x 6.25. The only exception was wheat, for which a conversion factor of 5.89 was used (Tkachuk, 1969). The AIA contents of the diet and ileal digesta samples were measured after ashing the samples and treating the ash with boiling 4 M hydrochloric acid (Mollah *et al.*, 1983).



**Table B      Composition (g/kg air dry basis) of diets used in amino acid digestibility assays selected examples.**

Ingredient	Cereals	Plant protein sources	Animal protein sources	
Wheat	918	-	-	-
Soyabean meal (48%)	-	416.7	-	-
Meat meal	-	-	363.6	-
Feather meal	-	-	-	285.7
Dextrose	-	452.3	555.4	563.3
Soyabean oil	20.0	60.0	20.0	60.0
Solkafloc <sup>a</sup>	-	10.0	30.0	30.0
Celite	20.0	20.0	20.0	20.0
Dicalcium phosphate	17.0	19.0	-	19.0
Limestone	13.0	10.0	-	10.0
Choline chloride	3.0	3.0	2.0	3.0
Salt	2.0	2.0	2.0	2.0
Vitamin and mineral Premix <sup>b</sup>	7.0	7.0	7.0	7.0
Total	1000.0	1000.0	1000.0	1000.0

<sup>a</sup> James River Co., New Jersey, USA.

<sup>b</sup> Each kg of premix contained the following : vitamin A, 2,200 IU; vitamin D3, 700 IU; vitamin E, 4 g; vitamin K3, 0.4 g; riboflavin (vitamin B2) 1.6 g; pyridoxine HCl (vitamin B6) 1 g; cyanocobalamin (vitamin B12), 3 g; biotin, 0.02 g; niacin, 6 g; thiamine (vitamin B1), 0.3 g; calcium pantothenate, 3 g; folic acid, 0.4 g; antioxidant, 25 g; manganese (MnO), 15 g; zinc (ZnO), 10 g; iron (FeSO4.H2O), 4 g; copper (CuSO4.H2O), 1 g; iodine (Ca(IO3)2) 0.2 g; cobalt (CoCO3), 0.06 g; selenium (Na2SeO3), 0.02 g; molybdenum (Na2MoO4), 0.32 g. Choline chloride and salt were obtained locally.

## Digestibility calculations

Apparent ileal amino acid digestibilities was calculated as follows:

$$\text{Amino acid digestibility coefficient} = \frac{(\text{AA} / \text{AIA})_d - (\text{AA} / \text{AIA})_i}{(\text{AA} / \text{AIA})_d}$$

Where,  $(\text{AA} / \text{AIA})_d$  = ratio of amino acid to acid-insoluble ash in the diet,

and  $(\text{AA} / \text{AIA})_i$  = ratio of amino acid to acid-insoluble ash in ileal digesta.

Digestible amino acid concentrations were calculated from total concentrations and respective digestibility coefficients.

Digestible amino acid content = Total amino acid content x digestibility coefficient.

## **Presentation of data**

In the Tables, the total (Table 1) and digestible amino acid concentrations (Table 5) of feed ingredients are expressed as g/100 g on an 'as-received' basis. For anyone interested in converting the data to a dry matter basis, the dry matter contents of the individual samples are also presented. Digestibility coefficients are presented in Table 3. An estimate for cystine is not included, since this amino acid is destroyed during acid hydrolysis. It is possible that values for methionine may be underestimated owing to possible partial destruction during acid hydrolysis.

In addition to individual sample values, a summary of data for total amino acid concentrations (Table 2), apparent ileal amino acid digestibility coefficients (Table 4) and digestible amino acid concentrations in feed ingredients (Table 6) are presented.

A standard deviation is given for each constituent for which there were analyses for two or more samples. By expressing the standard deviation as a percentage of the mean, coefficients of variation may be calculated.

To measure assay- to- assay variation a soyabean meal sample was purchased in bulk and included in 3 out of 4 bioassays. The coefficient of variation for the digestibilities of individual essential amino acids in this soyabean meal sample (across different assays) was less than 4% suggesting that assay-to-assay variation was reasonably small.

The linear regression equations describing total and apparent ileal digestible amino acid content as function of total and apparent ileal digestible crude protein content were calculated for some ingredients (Tables 7-13).

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**TABLE 1    Total amino acid concentrations in feedstuffs**

Dry matter (DM), total crude protein (TCP) and amino acid concentrations in feedstuffs (g/100 g as received)

Code	Feedstuff	DM	TCP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
<i>Cereals</i>																			
B01	Barley	89.6	8.50	0.41	0.49	0.57	2.26	0.39	0.23	0.34	0.69	0.36	0.13	0.48	0.44	0.31	0.11	0.27	0.48
M01	Maize	89.1	7.60	0.58	0.38	0.50	1.46	0.29	0.21	0.26	1.00	0.26	0.14	0.39	0.40	0.49	0.05	0.25	0.36
M02	Maize	88.1	7.80	0.61	0.40	0.56	1.59	0.33	0.23	0.30	1.02	0.25	0.17	0.41	0.30	0.27	-	0.23	0.41
M03	Maize	90.5	7.80	0.66	0.37	0.60	1.51	0.36	0.23	0.33	0.99	0.20	0.12	0.40	0.47	0.32	0.06	0.29	0.43
M04	Maize	90.2	7.90	0.65	0.39	0.55	1.77	0.32	0.25	0.32	1.17	0.26	0.13	0.46	0.40	0.36	0.06	0.25	0.46
M05	Maize	88.5	8.10	0.73	0.42	0.58	1.69	0.38	0.28	0.36	1.14	0.28	0.14	0.45	0.51	0.34	0.06	0.32	0.47
M06	Maize	91.9	8.10	0.74	0.41	0.63	1.67	0.39	0.25	0.36	1.13	0.26	0.16	0.44	0.51	0.34	0.06	0.32	0.46
M07	Maize	88.3	8.70	0.66	0.41	0.57	1.69	0.33	0.25	0.32	1.11	0.26	0.16	0.44	0.32	0.28	-	0.22	0.44
M08	Maize, high lysine	92.0	9.80	0.71	0.66	0.94	1.73	0.55	0.37	0.39	0.96	0.42	0.14	0.44	0.57	0.41	0.09	0.33	0.59
S01	Sorghum	90.6	7.10	0.68	0.36	0.54	1.66	0.26	0.19	0.32	1.09	0.20	0.14	0.43	0.35	0.26	0.07	0.31	0.41
S02	Sorghum	90.1	8.02	0.61	0.25	0.43	1.46	0.21	0.17	0.27	0.92	0.14	0.11	0.34	0.35	0.24	-	0.19	0.34
S03	Sorghum	91.1	8.10	0.82	0.42	0.57	1.78	0.31	0.22	0.39	1.19	0.24	0.18	0.49	0.38	0.28	0.09	0.38	0.48
S04	Sorghum	90.2	8.75	0.70	0.27	0.48	1.61	0.23	0.19	0.30	1.03	0.15	0.11	0.38	0.38	0.25	-	0.23	0.37
S05	Sorghum	89.3	9.29	0.68	0.28	0.48	1.62	0.24	0.19	0.29	1.04	0.17	0.12	0.39	0.40	0.27	-	0.21	0.37
S06	Sorghum	89.2	9.82	0.69	0.28	0.50	1.61	0.24	0.19	0.31	1.03	0.16	0.12	0.39	0.39	0.26	-	0.21	0.38

**TABLE 1 (Cont)**  
 Dry matter (DM), total crude protein (TCP) and amino acid concentrations in feedstuffs (g/100 g as received)

Code	Feedstuff	DM	TCP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
S07	Sorghum	88.4	10.3	1.12	0.46	0.74	2.43	0.34	0.26	0.50	1.61	0.25	0.19	0.64	0.48	0.34	0.10	0.47	0.58
S08	Sorghum	87.4	10.5	1.01	0.41	0.76	2.26	0.35	0.24	0.47	1.53	0.25	0.17	0.59	0.38	0.32	-	0.31	0.60
S09	Sorghum	90.0	10.9	0.83	0.32	0.58	1.95	0.28	0.22	0.36	1.25	0.18	0.13	0.46	0.47	0.31	-	0.25	0.43
S10	Sorghum	90.3	10.9	1.13	0.37	0.79	2.29	0.41	0.28	0.51	1.56	0.25	0.19	0.65	0.41	0.34	-	0.34	0.65
S11	Sorghum	87.9	11.0	1.16	0.48	0.80	2.58	0.36	0.28	0.53	1.69	0.24	0.20	0.66	0.59	0.40	0.10	0.48	0.62
S12	Sorghum	90.4	11.0	0.88	0.39	0.74	2.59	0.32	0.20	0.44	1.55	0.20	0.12	0.57	0.56	0.37	-	0.31	0.53
S13	Sorghum	89.9	11.1	1.19	0.51	0.79	2.63	0.37	0.25	0.54	1.70	0.26	0.21	0.67	0.51	0.36	0.12	0.54	0.62
S14	Sorghum	87.1	11.4	1.07	0.43	0.79	2.25	0.35	0.26	0.49	1.57	0.24	0.20	0.63	0.39	0.33	-	0.34	0.63
S15	Sorghum	90.5	11.6	0.89	0.33	0.60	2.08	0.28	0.22	0.38	1.35	0.17	0.14	0.49	0.49	0.32	-	0.27	0.46
S16	Sorghum	90.8	11.6	1.15	0.45	0.85	2.63	0.39	0.31	0.54	1.67	0.25	0.21	0.64	0.67	0.43	0.11	0.41	0.64
S17	Sorghum	89.5	11.8	0.88	0.32	0.59	2.02	0.26	0.23	0.37	1.29	0.17	0.13	0.47	0.47	0.30	-	0.27	0.45
T01	Triticale	90.5	10.2	0.42	0.57	0.65	2.79	0.41	0.27	0.35	0.73	0.37	0.15	0.51	0.50	0.35	0.10	0.30	0.46
T02	Triticale	90.1	10.6	0.43	0.55	0.65	2.71	0.45	0.27	0.39	0.71	0.37	0.15	0.49	0.55	0.36	0.09	0.27	0.50
T03	Triticale	91.2	10.7	0.43	0.51	0.60	2.63	0.45	0.25	0.41	0.67	0.37	0.16	0.46	0.48	0.33	0.10	0.24	0.52
W01	Wheat, Triller	89.9	8.80	0.38	0.46	0.53	2.64	0.41	0.25	0.36	0.65	0.34	0.10	0.42	0.51	0.31	0.12	0.21	0.44
W02	Wheat, Taillem bent	93.6	9.00	0.37	0.43	0.51	2.95	0.41	0.25	0.35	0.67	0.30	0.12	0.45	0.57	0.31	-	0.23	0.42
W03	Wheat	90.7	9.20	0.36	0.51	0.55	2.74	0.47	0.24	0.37	0.67	0.29	0.15	0.47	0.5	0.32	0.12	0.3	0.46



**TABLE 1 (Cont)**  
Dry matter (DM), total crude protein (TCP) and amino acid concentrations in feedstuffs (g/100 g as received)

Code	Feedstuff	DM	TCP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
W04	Wheat	92.7	9.30	0.39	0.46	0.54	3.03	0.43	0.27	0.38	0.70	0.33	0.11	0.47	0.57	0.33	-	0.23	0.46
W05	Wheat	90.1	9.40	0.38	0.47	0.53	2.85	0.42	0.27	0.38	0.69	0.29	0.15	0.45	0.58	0.32	0.10	0.21	0.45
W06	Wheat, Meering	88.9	9.60	0.41	0.47	0.56	3.13	0.45	0.28	0.39	0.78	0.31	0.12	0.48	0.61	0.32	-	0.24	0.45
W07	Wheat	88.4	9.70	0.39	0.49	0.54	2.31	0.45	0.25	0.40	0.76	0.32	0.17	0.48	0.38	0.29	-	0.19	0.50
W08	Wheat, Currawong	91.5	10.1	0.42	0.53	0.59	3.11	0.46	0.29	0.40	0.73	0.38	0.13	0.49	0.60	0.34	-	0.27	0.49
W09	Wheat, Lowan	90.1	10.1	0.37	0.47	0.52	2.95	0.41	0.26	0.35	0.67	0.33	0.14	0.46	0.57	0.32	-	0.29	0.43
W10	Wheat	88.0	10.4	0.43	0.54	0.59	2.17	0.53	0.29	0.44	0.81	0.36	0.15	0.55	0.42	0.32	-	0.27	0.55
W11	Wheat, Harvey	91.0	10.4	0.41	0.51	0.58	3.36	0.46	0.27	0.39	0.75	0.34	0.15	0.51	0.64	0.35	-	0.33	0.47
W12	Wheat, Murray Bridge	93.2	10.5	0.41	0.53	0.56	3.40	0.46	0.27	0.39	0.76	0.32	0.15	0.51	0.64	0.35	-	0.34	0.47
W13	Wheat, Lawson	92.3	10.7	0.43	0.57	0.6	3.42	0.45	0.29	0.40	0.79	0.36	0.15	0.54	0.65	0.35	-	0.34	0.49
W14	Wheat	90.4	10.8	0.43	0.57	0.59	3.43	0.50	0.29	0.43	0.83	0.32	0.16	0.56	0.56	0.35	0.11	0.33	0.52
W15	Wheat	89.9	10.9	0.44	0.56	0.59	3.50	0.43	0.32	0.46	0.85	0.31	0.15	0.58	0.63	0.38	-	0.33	0.54
W16	Wheat	88.9	11.6	0.48	0.64	0.69	2.74	0.57	0.31	0.52	0.94	0.38	0.19	0.62	0.46	0.36	-	0.29	0.62
W17	Wheat	92.1	11.8	0.50	0.63	0.59	3.80	0.50	0.33	0.42	0.81	0.37	0.17	0.58	0.53	0.35	0.13	0.33	0.54
W18	Wheat, Broadbent	92.6	11.8	0.46	0.57	0.63	3.96	0.53	0.31	0.44	0.85	0.38	0.14	0.58	0.74	0.39	-	0.33	0.54
W19	Wheat	92.4	12.1	0.46	0.57	0.64	3.91	0.51	0.32	0.46	0.85	0.39	0.13	0.61	0.71	0.39	-	0.29	0.55
W20	Wheat, Bouchier	91.0	12.3	0.46	0.57	0.63	4.39	0.54	0.33	0.48	0.91	0.35	0.15	0.63	0.78	0.41	-	0.34	0.57
W21	Wheat, old season	92.0	12.5	0.43	0.53	0.58	3.97	0.52	0.29	0.48	0.84	0.32	0.19	0.59	0.63	0.37	0.15	0.34	0.56
W22	Wheat, new season	91.7	13.7	0.49	0.62	0.66	4.34	0.58	0.32	0.54	0.93	0.36	0.22	0.66	0.69	0.41	0.17	0.39	0.63

**TABLE 1 (Cont)**  
Dry matter (DM), total crude protein (TCP) and amino acid concentrations in feedstuffs (g/100 g as received)

Code	Feedstuff	DM	TCP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
W23	Wheat	90.5	14.9	0.53	0.67	0.75	5.25	0.62	0.40	0.60	1.07	0.44	0.17	0.77	0.88	0.46	-	0.46	0.68
W24	Wheat	90.6	15.1	0.54	0.70	0.74	5.49	0.62	0.41	0.63	1.10	0.41	0.20	0.84	0.88	0.47	-	0.45	0.70
W25	Wheat	92.0	15.2	0.55	0.69	0.76	5.47	0.64	0.41	0.62	1.11	0.44	0.18	0.79	0.90	0.47	-	0.45	0.70
W26	Wheat	93.3	15.8	0.56	0.73	0.79	5.59	0.66	0.42	0.63	1.13	0.47	0.20	0.81	0.94	0.49	0.16	0.50	0.72
W27	Wheat, Warbler	93.4	16.2	0.56	0.76	0.91	5.30	0.75	0.42	0.65	1.13	0.46	0.20	0.79	1.01	0.55	-	0.45	0.72
<i>Cereal by-products</i>																			
MM01	Millmix	87.4	14.9	0.69	0.98	1.02	2.76	0.77	0.44	0.46	0.90	0.67	0.10	0.53	0.72	0.52	-	0.31	0.66
MM02	Millrun	92.1	15.1	0.68	0.92	0.97	3.07	0.76	0.40	0.51	0.89	0.57	0.21	0.58	0.69	0.49	0.21	0.40	0.70
RP01	Rice pollard	90.5	12.9	0.76	1.03	1.26	1.71	0.71	0.46	0.49	0.93	0.68	0.24	0.57	0.77	0.57	0.15	0.42	0.70
<i>Oilseed Meals</i>																			
CM01	Canola meal, full-fat	91.7	26.6	1.28	1.76	2.10	4.99	1.39	1.07	1.18	2.00	1.93	0.31	1.15	1.48	1.29	0.36	0.87	1.48
CM02	Canola meal	90.6	27.7	1.30	1.66	2.00	4.87	1.53	0.88	1.27	2.09	1.70	0.38	1.24	0.97	1.20	-	1.00	1.66
CM03	Canola meal	92.3	29.1	1.36	1.84	2.29	5.32	1.51	1.06	1.31	2.15	1.99	0.37	1.23	1.60	1.41	0.50	0.99	1.62
CM04	Canola Meal	89.2	29.7	1.25	1.88	2.21	5.09	1.54	1.04	1.27	2.14	1.91	0.44	1.20	1.72	1.55	0.44	0.98	1.52

**TABLE 1 (Cont)**  
Dry matter (DM), total crude protein (TCP) and amino acid concentrations in feedstuffs (g/100 g as received)

	Code	Feedstuff	DM	TCP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
18	CM05	Canola meal	88.7	31.2	1.33	1.92	2.18	5.52	1.51	0.86	1.32	2.19	2.07	0.41	1.25	1.02	1.23	-	1.01	1.68
	CM06	Canola meal	88.5	34.0	1.57	2.13	2.49	6.31	1.82	1.01	1.50	2.54	2.25	0.41	1.41	1.17	1.42	-	1.11	1.95
	CM07	Canola meal	91.7	35.0	1.47	1.92	2.29	5.82	1.71	1.04	1.20	2.34	1.94	0.56	1.42	1.81	1.51	0.45	1.12	1.61
	CM08	Canola meal	92.9	35.1	1.55	2.17	2.54	6.11	1.85	1.31	1.54	2.47	1.95	0.58	1.41	1.79	1.73	0.39	1.11	1.90
	CM09	Canola meal	90.6	35.5	1.57	2.05	2.50	6.32	1.77	1.00	1.51	2.52	1.96	0.55	1.42	1.87	1.69	0.37	1.08	1.89
	CM10	Canola meal	89.7	36.5	1.67	2.28	2.68	6.85	1.94	1.19	1.60	2.73	2.23	0.48	1.57	1.23	1.49	-	1.15	2.08
	CM11	Canola meal	88.9	37.0	1.70	2.41	2.77	7.03	1.99	1.11	1.65	2.79	2.34	0.49	1.55	1.26	1.53	-	1.20	2.15
	CM12	Canola meal	94.0	37.9	1.64	2.43	2.63	7.07	1.76	1.14	1.51	2.68	2.37	0.57	1.44	1.82	1.75	-	1.08	1.88
	CM13	Canola meal	92.3	38.8	1.78	2.49	2.83	7.16	2.00	1.18	1.50	2.84	2.05	0.60	1.59	1.78	1.76	0.52	1.20	1.98
	CM14	Canola meal	90.8	39.4	1.64	2.26	2.59	7.04	1.85	1.13	1.51	2.68	2.09	0.57	1.42	1.85	1.77	-	1.05	1.89
	CNM01	Copra meal	90.3	21.7	1.04	3.05	1.99	4.67	0.93	0.57	0.81	1.59	0.55	0.33	1.03	1.20	0.84	-	0.45	1.02
	CSM01	Cottonseed meal	90.1	38.1	1.57	4.64	3.68	7.79	1.62	1.13	1.24	2.35	1.59	0.52	2.12	1.75	1.31	0.51	1.22	1.79
	CSM02	Cottonseed meal	92.6	38.4	1.58	4.44	3.75	7.60	1.71	1.32	1.37	2.32	1.81	0.56	2.06	2.00	1.41	0.50	1.21	1.82
	CSM03	Cottonseed meal	91.6	39.6	1.70	5.07	4.02	8.62	1.78	1.42	1.37	2.46	2.10	0.61	2.40	1.82	1.40	0.46	1.30	1.91
	CSM04	Cottonseed meal	93.2	40.0	1.78	4.76	3.83	8.08	1.94	1.28	1.41	2.48	1.82	0.66	2.41	2.08	1.43	0.48	1.38	1.99
	CSM05	Cottonseed meal	90.7	40.4	1.69	4.65	4.02	8.49	1.90	1.36	1.51	2.59	2.00	0.52	2.36	1.40	1.28	-	1.38	2.10

**TABLE 1 (Cont)**  
Dry matter (DM), total crude protein (TCP) and amino acid concentrations in feedstuffs (g/100 g as received)

Code	Feedstuff	DM	TCP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
CSM06	Cottonseed meal	87.9	44.7	1.81	5.26	4.20	8.12	1.96	1.34	1.57	2.79	2.12	0.51	2.46	1.51	1.36	-	1.42	2.24
CSM07	Cottonseed meal	87.7	45.0	1.81	5.19	4.17	8.65	1.96	1.31	1.56	2.77	2.12	0.56	2.42	1.49	1.36	-	1.43	2.22
PKM01	Palm kernel meal	94.4	13.6	0.62	1.92	1.25	3.00	0.65	0.32	0.55	1.04	0.40	0.17	0.64	0.78	0.53	-	0.24	0.77
SBM01	Soyabean meal, full-fat	93.5	39.0	1.61	2.96	4.30	7.20	1.59	1.10	1.74	2.98	2.60	0.42	1.85	2.24	1.63	-	1.33	1.84
SBM02	Soyabean meal	89.8	44.8	1.94	3.16	5.06	8.21	1.91	1.23	2.17	3.46	2.60	0.55	2.27	2.75	1.89	0.59	1.66	2.23
SMB03	Soyabean meal	90.7	46.1	1.89	3.43	5.10	8.69	1.87	1.27	2.04	3.45	2.75	0.61	2.15	2.64	1.91	-	1.56	2.15
SBM04	Soyabean meal	90.2	46.3	2.01	3.61	5.37	8.33	1.93	1.35	1.97	3.61	3.06	0.62	2.32	3.00	1.89	0.61	1.71	2.10
SBM05	Soyabean meal	92.1	46.4	2.04	3.49	5.26	8.55	1.96	1.29	2.11	3.58	3.03	0.57	2.22	2.79	1.92	0.62	1.86	2.18
SBM06	Soyabean meal	92.8	46.7	2.01	3.59	5.17	8.42	1.93	1.36	1.82	3.54	2.99	0.61	2.40	2.51	1.86	0.58	1.82	2.09
SBM07	Soyabean meal	90.1	47.3	2.26	3.15	5.15	7.78	2.26	1.40	2.45	3.91	2.64	0.65	2.60	1.92	1.78	-	1.83	2.66
SBM08	Soyabean meal	90.2	47.7	2.07	3.68	5.64	8.72	1.99	1.34	2.23	3.80	2.91	0.60	2.49	2.49	1.95	0.61	1.89	2.38
SBM09	Soyabean meal	87.9	48.0	2.05	3.44	5.36	8.89	1.94	1.44	2.21	3.74	2.91	0.65	2.32	2.74	2.05	-	1.67	2.28
SBM10	Soyabean meal	95.6	48.1	2.04	3.66	5.49	9.22	2.17	1.50	2.17	3.63	2.79	0.74	2.23	2.91	2.06	-	1.57	2.29
SBM11	Soyabean meal	91.5	48.3	2.03	3.58	5.43	8.73	2.01	1.38	1.85	3.63	2.78	0.65	2.46	2.56	1.91	0.64	1.89	2.05
SBM12	Soyabean meal	88.1	48.7	2.10	3.54	5.47	8.96	2.02	1.45	2.24	3.80	3.02	0.66	2.35	2.79	2.07	-	1.67	2.32
SBM13	Soyabean meal	92.6	48.7	2.31	3.68	5.89	8.90	2.17	1.50	2.18	3.72	2.94	0.69	2.51	2.63	2.15	0.69	1.90	2.39

**TABLE 1 (Cont)**  
Dry matter (DM), total crude protein (TCP) and amino acid concentrations in feedstuffs (g/100 g as received)

Code	Feedstuff	DM	TCP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
SBM14	Soyabean meal	90.9	49.0	2.32	3.92	6.25	9.60	2.24	1.56	2.44	3.92	3.41	0.72	2.79	2.53	2.11	0.71	2.02	2.60
SBM15	Soyabean meal	92.3	49.1	2.41	3.83	5.95	8.84	2.38	1.40	2.51	4.07	3.20	0.70	2.79	2.83	2.28	0.71	2.16	2.58
SBM16	Soyabean meal	90.9	49.8	2.31	3.73	5.77	9.52	2.17	1.51	2.35	3.96	3.14	0.67	2.44	2.98	2.22	-	1.77	2.44
SM01	Sunflower meal	90.6	31.0	1.28	2.42	2.68	5.88	1.71	0.78	1.20	2.03	1.08	0.71	1.41	1.34	1.19	0.34	0.89	1.51
SM02	Sunflower meal	91.0	34.6	1.46	2.90	3.16	6.68	1.95	0.81	1.27	2.20	1.19	0.85	1.55	1.57	1.32	0.36	0.92	1.60
SM03	Sunflower meal	94.6	36.3	1.45	2.87	3.06	7.17	1.85	0.97	1.44	2.22	1.09	0.44	1.54	1.65	1.32	-	0.86	1.72
SM04	Sunflower meal	93.5	36.6	1.53	2.97	3.20	6.59	2.07	0.88	1.38	2.22	1.27	0.83	1.63	1.54	1.31	0.39	0.91	1.70
<i>Grain Legumes</i>																			
CP01	Chickpea	93.0	21.3	0.92	2.32	2.43	3.42	0.85	0.61	1.01	1.61	1.35	0.19	1.22	1.22	0.77	0.18	0.58	1.05
FB01	Faba bean	92.3	23.8	1.04	2.33	2.58	3.79	1.05	0.62	1.08	1.80	1.50	0.15	1.02	1.29	0.89	0.19	0.76	1.22
FP01	Field Pea	91.1	21.6	1.00	2.07	2.50	3.64	0.98	0.55	0.98	1.58	1.48	0.16	1.04	1.18	0.86	0.2	0.61	1.14
FP02	Field Pea	90.6	22.9	1.01	2.49	2.69	3.86	0.99	0.61	0.86	1.65	1.57	0.17	1.04	1.12	0.86	0.18	0.72	1.03
FP03	Field pea	89.5	22.9	1.03	2.42	2.91	4.12	1.07	0.61	1.12	1.84	1.71	0.22	1.24	0.86	0.82	-	0.92	1.24
L01	Lupin, <i>angustifolius</i>	90.7	28.8	1.03	3.44	3.08	6.38	1.27	0.87	1.30	2.15	1.70	0.22	1.16	1.52	0.99	0.28	1.17	1.27

**TABLE 1 (Cont)**  
Dry matter (DM), total crude protein (TCP) and amino acid concentrations in feedstuffs (g/100 g as received)

Code	Feedstuff	DM	TCP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
L02	Lupin, <i>angustifolius</i>	92.9	29.9	1.09	3.21	3.00	6.29	1.29	0.83	1.36	2.10	1.60	0.19	1.22	1.68	1.10	0.25	1.12	1.33
L03	Lupin, <i>angustifolius</i>	92.0	30.4	1.09	3.63	3.25	6.93	1.34	0.88	1.30	2.10	1.68	0.25	1.37	1.53	1.14	0.26	1.25	1.31
L04	Lupin, <i>angustifolius</i>	93.3	30.4	1.14	3.40	3.25	6.07	1.45	0.94	1.45	2.28	1.78	0.22	1.33	1.20	1.01	-	1.24	1.41
L05	Lupin, <i>angustifolius</i>	92.6	34.0	1.30	4.05	3.45	7.39	1.39	0.99	1.34	2.39	1.79	0.23	1.33	1.72	1.19	0.27	1.26	1.30
L06	Lupin, <i>albus</i>	93.5	34.7	1.22	3.85	3.56	6.73	1.41	0.81	1.64	2.51	1.61	0.21	1.36	1.99	1.33	0.28	1.59	1.55
<i>Animal Protein Meals</i>																			
BM01	Blood meal	91.9	89.7	7.32	3.78	9.86	8.32	3.91	6.11	0.88	11.8	9.78	1.33	6.57	5.67	5.17	1.28	2.93	8.50
BM02	Blood meal	92.7	91.3	6.91	3.87	9.95	8.09	3.90	5.97	0.89	11.8	8.40	1.36	6.55	5.68	5.28	1.35	2.84	8.29
FTM01	Feather meal	92.9	87.1	4.19	5.79	6.07	9.53	6.52	1.03	4.71	7.26	2.33	0.70	4.23	10.6	4.39	0.45	2.73	6.87
FM01	Fish meal	90.8	58.9	3.52	3.62	5.26	6.97	4.69	1.55	2.52	4.07	4.22	1.68	2.26	3.15	2.83	0.50	1.94	2.83
FM02	Fish meal	92.1	61.6	4.04	3.47	5.26	7.18	4.25	1.54	2.77	4.46	5.18	1.63	2.46	2.88	2.74	0.64	2.01	3.13
FM03	Fish meal	92.9	63.8	4.05	4.46	5.71	8.61	5.29	1.39	2.44	4.73	4.12	1.83	2.56	3.53	2.81	0.51	1.99	3.04
MBM01	Meat and bone meal	92.0	47.8	3.70	3.19	3.34	5.38	6.40	1.22	1.57	2.89	2.08	0.65	1.42	2.09	1.69	0.26	1.21	2.39
MBM02	Meat and bone meal	91.8	49.0	3.96	3.47	3.51	5.99	7.31	0.99	1.54	2.97	2.26	0.77	1.55	2.09	1.61	0.19	1.10	2.24
MBM03	Meat and bone meal	92.9	49.9	3.73	3.61	3.87	6.31	6.72	1.11	1.45	3.15	2.28	0.81	1.72	2.02	1.71	0.26	1.21	2.12

**TABLE 1 (Cont)**  
Dry matter (DM), total crude protein (TCP) and amino acid concentrations in feedstuffs (g/100 g as received)

Code	Feedstuff	DM	TCP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
MBM04	Meat and bone meal	92.6	54.0	3.90	3.45	4.48	6.79	6.88	1.50	1.64	4.11	2.81	0.81	3.16	2.27	1.93	0.30	1.39	2.88
MBM05	Meat and bone meal	92.6	54.6	4.09	3.69	3.93	6.46	7.54	1.11	1.76	3.23	2.76	0.88	3.23	2.50	1.84	0.24	1.18	2.48
MBM06	Meat and bone meal	92.4	54.8	4.17	3.88	4.15	6.90	6.99	1.26	1.70	3.38	2.72	0.81	2.09	1.52	1.61	-	1.33	2.42
MBM07	Meat and bone meal	91.6	55.0	4.20	3.87	4.14	6.84	7.32	1.24	1.70	3.36	2.51	0.78	2.07	1.51	1.59	-	1.30	2.42
MBM08	Meat and bone meal	91.2	55.7	3.88	3.87	4.15	7.03	6.85	1.16	1.86	3.62	2.46	0.81	3.62	2.56	2.06	0.27	1.46	2.69
MBM09	Meat and bone meal	94.6	56.5	4.30	3.67	4.25	6.97	6.83	1.39	1.76	3.55	2.74	0.91	2.22	1.55	1.66	-	1.34	2.58
MBM10	Meat and bone meal	95.5	58.6	3.87	3.9	4.21	7.21	6.73	1.55	1.71	3.75	3.04	1.00	1.86	2.69	2.15	-	1.38	2.44
PM01	Poultry meal	93.5	63.0	3.81	4.19	4.92	7.89	5.74	1.72	2.27	4.29	3.86	1.35	2.23	2.82	2.55	-	1.75	2.75
<i>Miscellaneous</i>																			
MIS01	Biscuit meal	92.9	10.4	0.55	0.52	0.70	2.54	0.46	0.30	0.41	0.88	0.27	0.16	0.51	0.61	0.37	-	0.30	0.53
MIS02	Casein	93.1	87.0	3.28	3.57	7.86	20.1	17.9	2.63	5.54	8.90	9.46	3.08	4.98	5.74	4.47	1.18	5.72	6.60
MIS03	Casein	92.9	87.6	3.34	3.65	7.91	20.7	18.1	2.80	5.24	9.08	8.48	2.71	4.95	5.86	4.44	1.06	5.38	6.60
MIS04	Casein	92.0	87.9	3.31	3.58	7.96	20.5	17.9	2.81	5.39	9.12	8.61	2.68	4.90	5.82	4.39	1.04	5.41	6.31
MIS05	Dogfood scrap meal	92.7	23.1	1.35	1.30	1.62	4.55	1.51	0.56	0.93	1.90	1.03	0.35	1.06	1.47	0.88	-	0.75	1.12
MIS06	Gelatin	92.1	88.2	8.62	7.20	5.35	9.79	21.7	0.69	1.43	2.76	3.23	0.82	1.81	3.66	1.83	0	0.46	2.20
MIS07	Maize gluten	91.9	64.3	5.83	2.12	4.16	14.3	1.75	1.36	2.74	11.29	1.08	1.37	4.17	3.04	2.10	-	3.53	3.21

**TABLE 2   Summary: Total amino acid concentrations in feedstuffs**

  Dry matter (DM), total crude protein (TCP) and amino acid concentrations in feedstuffs (g/100 g as received). Values in parentheses refer to standard deviation of mean estimates.

Feedstuff	N	DM	TCP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
<i>Cereals</i>																			
Barley	1	89.6	8.50	0.41	0.49	0.57	2.26	0.39	0.23	0.34	0.69	0.36	0.13	0.48	0.44	0.31	0.11	0.27	0.48
Maize	7	89.5 (1.40)	8.00 (0.36)	0.66 (0.06)	0.40 (0.02)	0.57 (0.04)	1.63 (0.11)	0.34 (0.04)	0.24 (0.02)	0.32 (0.03)	1.08 (0.07)	0.25 (0.02)	0.15 (0.02)	0.43 (0.03)	0.42 (0.09)	0.34 (0.07)	0.06 (0)	0.27 (0.04)	0.43 (0.04)
Maize, high lysine	1	92.0	9.80	0.71	0.66	0.94	1.73	0.55	0.37	0.39	0.96	0.42	0.14	0.44	0.57	0.41	0.09	0.33	0.59
Sorghum, 7%	1	90.6	7.10	0.68	0.36	0.54	1.66	0.26	0.19	0.32	1.09	0.20	0.14	0.43	0.35	0.26	0.07	0.31	0.41
Sorghum 8%	2	90.6 (0.71)	8.06 (0.06)	0.72 (0.15)	0.34 (0.12)	0.50 (0.10)	1.62 (0.22)	0.26 (0.07)	0.20 (0.03)	0.33 (0.08)	1.06 (0.19)	0.19 (0.07)	0.14 (0.05)	0.42 (0.10)	0.36 (0.02)	0.26 (0.03)	0.09	0.28 (0.13)	0.41 (0.10)
Sorghum 9%	2	89.8 (0.64)	9.02 (0.38)	0.69 (0.01)	0.27 (0)	0.48 (0)	1.61 (0.01)	0.23 (0.01)	0.19 (0.01)	0.30 (0.01)	1.03 (0)	0.16 (0.01)	0.11 (0)	0.38 (0.01)	0.39 (0.01)	0.26 (0.01)	-	0.22 (0.02)	0.37
Sorghum 10%	3	88.3 (0.90)	10.2 (0.35)	0.94 (0.22)	0.38 (0.09)	0.67 (0.14)	2.10 (0.44)	0.31 (0.06)	0.23 (0.04)	0.43 (0.10)	1.39 (0.32)	0.22 (0.05)	0.16 (0.04)	0.54 (0.13)	0.42 (0.05)	0.31 (0.04)	0.10	0.33 (0.13)	0.52
Sorghum, 11%	6	89.3 (1.40)	11.1 (0.20)	1.04 (0.15)	0.42 (0.07)	0.75 (0.08)	2.38 (0.27)	0.35 (0.04)	0.25 (0.03)	0.48 (0.07)	1.55 (0.16)	0.23 (0.03)	0.18 (0.04)	0.61 (0.08)	0.49 (0.08)	0.35 (0.03)	0.11 (0.01)	0.38 (0.11)	0.58 (0.08)
Sorghum, 12%	3	90.3 (0.68)	11.7 (0.09)	0.97 (0.15)	0.37 (0.07)	0.68 (0.15)	2.13 (0.15)	0.31 (0.07)	0.25 (0.05)	0.43 (0.09)	1.44 (0.20)	0.20 (0.05)	0.16 (0.04)	0.53 (0.09)	0.54 (0.11)	0.35 (0.07)	0.11	0.32 (0.08)	0.52
Triticale	3	90.6 (0.56)	10.5 (0.26)	0.43 (0.01)	0.54 (0.03)	0.63 (0.03)	2.71 (0.08)	0.44 (0.02)	0.26 (0.01)	0.38 (0.03)	0.70 (0.03)	0.37 (0)	0.15 (0.01)	0.49 (0.03)	0.51 (0.04)	0.35 (0.02)	0.10 (0.01)	0.27 (0.03)	0.49 (0.03)



TABLE 2 (cont)

Summary: Dry matter (DM), total crude protein (TCP) and amino acid concentrations in feedstuffs (g/100 g as received). Values in parentheses refer to standard deviation of mean estimates

Feedstuff	N	DM	TCP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
Wheat, 9%	5	91.4 (1.66)	9.10 (0.24)	0.38 (0.01)	0.47 (0.03)	0.53 (0.01)	2.84 (0.16)	0.43 (0.02)	0.26 (0.01)	0.37 (0.01)	0.68 (0.02)	0.31 (0.02)	0.13 (0.02)	0.45 (0.02)	0.55 (0.04)	0.32 (0.01)	0.11 (0.01)	0.24 (0.04)	0.45 (0.02)
Wheat, 10%	7	90.2 (1.88)	10.1 (0.35)	0.41 (0.02)	0.51 (0.03)	0.56 (0.03)	2.92 (0.49)	0.46 (0.04)	0.27 (0.01)	0.39 (0.03)	0.75 (0.04)	0.34 (0.03)	0.14 (0.01)	0.50 (0.030)	0.55 (0.11)	0.33 (0.02)	-	0.28 (0.05)	0.48 (0.04)
Wheat, 11%	3	90.9 (1.27)	10.8 (0.10)	0.43 (0.01)	0.57 (0.01)	0.59 (0.01)	3.45 (0.04)	0.46 (0.04)	0.30 (0.02)	0.43 (0.03)	0.82 (0.03)	0.33 (0.03)	0.15 (0.01)	0.56 (0.02)	0.61 (0.05)	0.36 (0.02)	0.11	0.33 (0.01)	0.52 (0.03)
Wheat, 12%	5	91.4 (1.53)	11.9 (0.28)	0.47 (0.02)	0.60 (0.04)	0.64 (0.04)	3.76 (0.61)	0.53 (0.03)	0.32 (0.01)	0.46 (0.04)	0.87 (0.05)	0.37 (0.02)	0.16 (0.03)	0.60 (0.02)	0.64 (0.14)	0.38 (0.03)	0.13	0.32 (0.02)	0.56 (0.03)
Wheat, 13%	1	92.0	12.5	0.43	0.53	0.58	3.97	0.52	0.29	0.48	0.84	0.32	0.19	0.59	0.63	0.37	0.15	0.34	0.56
Wheat, 14%	1	91.7	13.7	0.49	0.62	0.66	4.34	0.58	0.32	0.54	0.93	0.36	0.22	0.66	0.69	0.41	0.17	0.39	0.63
Wheat, 15%	3	91.0 (0.84)	15.1 (0.15)	0.54 (0.01)	0.69 (0.02)	0.75 (0.01)	5.40 (0.13)	0.63 (0.01)	0.41 (0.01)	0.62 (0.02)	1.09 (0.02)	0.43 (0.02)	0.18 (0.02)	0.80 (0.04)	0.89 (0.01)	0.47 (0.01)	-	0.45 (0.01)	0.69 (0.01)
Wheat, 16%	2	93.4 (0.07)	16.0 (0.28)	0.56 (0)	0.75 (0.02)	0.85 (0.08)	5.45 (0.21)	0.71 (0.06)	0.42 (0)	0.64 (0.01)	1.13 (0)	0.47 (0.01)	0.20 (0)	0.80 (0.01)	0.98 (0.05)	0.52 (0.04)	0.16	0.48 (0.04)	0.72 (0)
Cereal by-products																			
Millmix	1	87.4	14.9	0.69	0.98	1.02	2.76	0.77	0.44	0.46	0.90	0.67	0.10	0.53	0.72	0.52	-	0.31	0.66
Millrun	1	92.1	15.1	0.68	0.92	0.97	3.07	0.76	0.40	0.51	0.89	0.57	0.21	0.58	0.69	0.49	0.21	0.40	0.70
Rice pollard	1	90.5	12.9	0.76	1.03	1.26	1.71	0.71	0.46	0.49	0.93	0.68	0.24	0.57	0.77	0.57	0.15	0.42	0.70

**TABLE 2 (cont)**

**Summary:** Dry matter (DM), total crude protein (TCP) and amino acid concentrations in feedstuffs (g/100 g as received). Values in parentheses refer to standard deviation of mean estimates

Feedstuff	N	DM	TCP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
<i><b>Oilseed Meals</b></i>																			
Canola meal, full-fat	1	91.7	26.6	1.28	1.76	2.10	4.99	1.39	1.07	1.18	2.00	1.93	0.31	1.15	1.48	1.29	0.36	0.87	1.48
Canola meal, 28%	1	90.6	27.7	1.30	1.66	2.00	4.87	1.53	0.88	1.27	2.09	1.70	0.38	1.24	0.97	1.20	-	1.00	1.66
Canola meal, 29%	1	92.3	29.1	1.36	1.84	2.29	5.32	1.51	1.06	1.31	2.15	1.99	0.37	1.23	1.60	1.41	0.50	0.99	1.62
Canola meal, 30%	1	89.2	29.7	1.25	1.88	2.21	5.09	1.54	1.04	1.27	2.14	1.91	0.44	1.20	1.72	1.55	0.44	0.98	1.52
Canola meal, 31%	1	88.7	31.2	1.33	1.92	2.18	5.52	1.51	0.86	1.32	2.19	2.07	0.41	1.25	1.02	1.23	-	1.01	1.68
Canola meal, 34%	1	88.5	34.0	1.57	2.13	2.49	6.31	1.82	1.01	1.50	2.54	2.25	0.41	1.41	1.17	1.42	-	1.11	1.95
Canola meal, 35%	3	91.7 (1.15)	35.2 (0.26)	1.53 (0.05)	2.05 (0.13)	2.44 (0.13)	6.08 (0.25)	1.78 (0.07)	1.12 (0.17)	1.42 (0.19)	2.44 (0.09)	1.95 (0.01)	0.56 (0.02)	1.42 (0.01)	1.82 (0.04)	1.64 (0.12)	0.40 (0.04)	1.10 (0.02)	1.80 (0.16)
Canola meal, 37%	2	89.3 (0.57)	36.8 (0.36)	1.68 (0.02)	2.34 (0.09)	2.72 (0.06)	6.94 (0.13)	1.96 (0.04)	1.15 (0.06)	1.63 (0.03)	2.76 (0.04)	2.28 (0.08)	0.48 (0.01)	1.56 (0.01)	1.25 (0.02)	1.51 (0.03)	-	1.17 (0.03)	2.12 (0.05)
Canola meal, 38%	1	94.0	37.9	1.64	2.43	2.63	7.07	1.76	1.14	1.51	2.68	2.37	0.57	1.44	1.82	1.75	-	1.08	1.88
Canola meal, 39%	2	91.6 (1.06)	39.1 (0.42)	1.71 (0.10)	2.38 (0.16)	2.71 (0.17)	7.10 (0.08)	1.93 (0.11)	1.16 (0.04)	1.51 (0.01)	2.76 (0.11)	2.07 (0.03)	0.59 (0.02)	1.51 (0.12)	1.82 (0.05)	1.77 (0.01)	0.52	1.13 (0.11)	1.94 (0.06)
Copra meal	1	90.3	21.7	1.04	3.05	1.99	4.67	0.93	0.57	0.81	1.59	0.55	0.33	1.03	1.20	0.84	-	0.45	1.02
Cottonseed meal, 38%	2	91.4 (1.77)	38.3 (0.21)	1.58 (0.01)	4.54 (0.14)	3.72 (0.05)	7.70 (0.13)	1.67 (0.06)	1.23 (0.13)	1.31 (0.09)	2.34 (0.02)	1.70 (0.16)	0.54 (0.03)	2.09 (0.04)	1.88 (0.18)	1.36 (0.07)	0.51 (0.01)	1.22 (0.01)	1.81 (0.02)

**TABLE 2 (cont)**

**Summary:** Dry matter (DM), total crude protein (TCP) and amino acid concentrations in feedstuffs (g/100 g as received). Values in parentheses refer to standard deviation of mean estimates

Feedstuff	N	DM	TCP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
Cottonseed meal, 40%	3	91.8 (1.27)	40.0 (0.40)	1.72 (0.05)	4.83 (0.22)	3.96 (0.11)	8.40 (0.28)	1.87 (0.08)	1.35 (0.07)	1.43 (0.07)	2.51 (0.07)	1.97 (0.14)	0.60 (0.07)	2.39 (0.02)	1.77 (0.35)	1.37 (0.08)	0.47 (0.01)	1.35 (0.05)	2.00 (0.10)
Cottonseed meal, 45%	2	87.8 (.14)	44.9 (0.18)	1.81	5.22 (0.05)	4.19 (0.02)	8.39 (0.37)	1.96	1.32 (0.02)	1.57 (0.01)	2.78 (0.01)	2.12 (0)	0.53 (0.03)	2.44 (0.03)	1.50 (0.02)	1.36	-	1.42 (0.01)	2.23 (0.02)
Palm kernel meal	1	94.4	13.6	0.62	1.92	1.25	3.00	0.65	0.32	0.55	1.04	0.40	0.17	0.64	0.78	0.53	-	0.24	0.77
Soyabean meal, full-fat	1	93.5	39.0	1.61	2.96	4.30	7.20	1.59	1.10	1.74	2.98	2.60	0.42	1.85	2.24	1.63	-	1.33	1.84
Soyabean meal, 45%	1	89.8	44.8	1.94	3.16	5.06	8.21	1.91	1.23	2.17	3.42	2.60	0.55	2.27	2.75	1.89	0.59	1.66	2.23
Soyabean meal, 46%	3	91.0 (0.98)	46.3 (0.15)	1.98 (0.08)	3.51 (0.09)	5.24 (0.14)	8.52 (0.18)	1.92 (0.05)	1.30 (0.04)	2.04 (0.07)	3.55 (0.09)	2.96 (0.17)	0.60 (0.03)	2.23 (0.09)	2.81 (0.18)	1.91 (0.02)	0.62 (0.01)	1.71 (0.15)	2.14 (0.04)
Soyabean meal, 47%	2	91.5 (1.91)	47.0 (0.46)	2.14 (0.18)	3.37 (0.31)	5.16 (0.01)	8.10 (0.45)	2.10 (0.24)	1.38 (0.03)	2.13 (0.44)	3.72 (0.26)	2.82 (0.25)	0.63 (0.03)	2.50 (0.14)	2.22 (0.42)	1.82 (0.06)	0.58	1.83 (0.01)	2.37 (0.40)
Soyabean meal, 48%	4	91.3 (3.23)	48.0 (0.25)	2.05 (0.02)	3.59 (0.11)	5.48 (0.12)	8.89 (0.23)	1.55 (0.98)	1.42 (0.07)	2.11 (0.18)	3.70 (0.08)	2.85 (0.07)	0.66 (0.06)	2.38 (0.12)	2.67 (0.19)	1.99 (0.07)	0.63 (0.02)	1.75 (0.16)	2.25 (0.14)
Soyabean meal, 49%	4	91.0 (2.05)	48.9 (0.22)	2.28 (0.13)	3.74 (0.17)	5.89 (0.32)	9.08 (0.35)	2.20 (0.15)	1.48 (0.07)	2.34 (0.16)	3.88 (0.15)	3.14 (0.21)	0.69 (0.02)	2.61 (0.22)	2.70 (0.14)	2.15 (0.09)	0.70 (0.01)	1.94 (0.21)	2.47 (0.14)
Soyabean meal, 50%	1	90.9	49.8	2.31	3.73	5.77	9.52	2.17	1.51	2.35	3.96	3.14	0.67	2.44	2.98	2.22	-	1.77	2.44
Sunflower meal, 31%	1	90.6	31.0	1.28	2.42	2.68	5.88	1.71	0.78	1.20	2.03	1.08	0.71	1.41	1.34	1.19	0.34	0.89	1.51
Sunflower meal, 35%	1	91.0	34.6	1.46	2.90	3.16	6.68	1.95	0.81	1.27	2.20	1.19	0.85	1.55	1.57	1.32	0.36	0.92	1.60

TABLE 2 (cont)

**Summary:** Dry matter (DM), total crude protein (TCP) and amino acid concentrations in feedstuffs (g/100 g as received). Values in parentheses refer to standard deviation of mean estimates

Feedstuff	N	DM	TCP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
Sunflower meal, 36%	1	94.6	36.3	1.45	2.87	3.06	7.17	1.85	0.97	1.44	2.22	1.09	0.44	1.54	1.65	1.32	-	0.86	1.72
Sunflower meal, 37%	1	93.5	36.6	1.53	2.97	3.20	6.59	2.07	0.88	1.38	2.22	1.27	0.83	1.63	1.54	1.31	0.39	0.91	1.70
<i>Grain Legumes</i>																			
Chickpea	1	93.0	21.3	0.92	2.32	2.43	3.42	0.85	0.61	1.01	1.61	1.35	0.19	1.22	1.22	0.77	0.18	0.58	1.05
Faba bean	1	92.3	23.8	1.04	2.33	2.58	3.79	1.05	0.62	1.08	1.80	1.50	0.15	1.02	1.29	0.89	0.19	0.76	1.22
Field pea	3	90.4 (0.82)	22.5 (0.75)	1.01 (0.01)	2.33 (0.22)	2.70 (0.20)	3.87 (0.24)	1.01 (0.05)	0.59 (0.03)	0.99 (0.13)	1.69 (0.13)	1.59 (0.11)	0.18 (0.03)	1.11 (0.12)	1.05 (0.17)	0.85 (0.02)	0.19 (0.01)	0.75 (0.16)	1.14 (0.10)
Lupin, <i>angustifolius</i>	5	92.3 (1.01)	30.7 (1.96)	1.13 (0.10)	3.55 (0.32)	3.21 (0.17)	6.61 (0.54)	1.35 (0.07)	0.90 (0.06)	1.35 (0.06)	2.20 (0.13)	1.71 (0.08)	0.22 (0.02)	1.28 (0.09)	1.53 (0.21)	1.09 (0.09)	0.27 (0.01)	1.21 (0.06)	1.32 (0.05)
Lupin, <i>albus</i>	1	93.5	34.70	1.22	3.85	3.56	6.73	1.41	0.81	1.64	2.51	1.61	0.21	1.36	1.99	1.33	0.28	1.59	1.55
<i>Animal Protein Meals</i>																			
Blood meal	2	92.3 (0.57)	90.5 (1.13)	7.12 (0.29)	3.83 (0.06)	9.91 (0.06)	8.21 (0.16)	3.91 (0.01)	6.04 (0.10)	0.89 (0.01)	11.8 (0)	9.09 (0.98)	1.35 (0.02)	6.56 (0.01)	5.68 (0.01)	5.23 (0.08)	1.32 (0.05)	2.89 (0.06)	8.40 (0.15)
Feather meal	1	92.9	87.1	4.19	5.79	6.07	9.53	6.52	1.03	4.71	7.26	2.33	0.70	4.23	10.6	4.39	0.45	2.73	6.87
Fish meal	3	91.9 (1.06)	61.4 (2.45)	3.87 (0.30)	3.85 (0.53)	5.41 (0.26)	7.59 (0.89)	4.99 (0.42)	1.49 (0.09)	2.58 (0.17)	4.42 (0.33)	4.51 (0.59)	1.71 (0.10)	2.43 (0.15)	3.19 (0.33)	2.79 (0.05)	0.55 (0.08)	1.98 (0.04)	3.00 (0.15)
Meat and bone meal, 48%	1	92.0	47.8	3.70	3.19	3.34	5.38	6.40	1.22	1.57	2.89	2.08	0.65	1.42	2.09	1.69	0.26	1.21	2.39

**TABLE 2 (cont)**

**Summary:** Dry matter (DM), total crude protein (TCP) and amino acid concentrations in feedstuffs (g/100 g as received). Values in parentheses refer to standard deviation of mean estimates

Feedstuff	N	DM	TCP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
Meat and bone meal, 49%	1	91.8	49.0	3.96	3.47	3.51	5.99	7.31	0.99	1.54	2.97	2.26	0.77	1.55	2.09	1.61	0.19	1.10	2.24
Meat and bone meal, 50%	1	92.9	49.9	3.73	3.61	3.87	6.31	6.72	1.11	1.45	3.15	2.28	0.81	1.72	2.02	1.71	0.26	1.21	2.12
Meat and bone meal, 54%	1	92.6	54.0	3.90	3.45	4.48	6.79	6.88	1.50	1.64	4.11	2.81	0.81	3.16	2.27	1.93	0.30	1.39	2.88
Meat and bone meal, 55%	3	92.2 (0.53)	54.8 (0.19)	4.15 (0.06)	3.82 (0.11)	4.07 (0.12)	6.73 (0.24)	7.28 (0.28)	1.21 (0.08)	1.72 (0.04)	3.32 (0.08)	2.66 (0.13)	0.82 (0.05)	2.46 (0.66)	1.84 (0.57)	1.68 (0.14)	0.24	1.27 (0.08)	2.44 (0.03)
Meat and bone meal, 56%	1	91.2	55.7	3.88	3.87	4.15	7.03	6.85	1.16	1.86	3.62	2.46	0.81	3.62	2.56	2.06	0.27	1.46	2.69
Meat and bone meal, 57%	1	94.6	56.5	4.30	3.67	4.25	6.97	6.83	1.39	1.76	3.55	2.74	0.91	2.22	1.55	1.66	-	1.34	2.58
Meat and bone meal , 59%	1	95.5	58.6	3.87	3.90	4.21	7.21	6.73	1.55	1.71	3.75	3.04	1.00	1.86	2.69	2.15	-	1.38	2.44
Poultry meal	1	93.5	63.0	3.81	4.19	4.92	7.89	5.74	1.72	2.27	4.29	3.86	1.35	2.23	2.82	2.55	-	1.75	2.75
<i>Miscellaneous</i>																			
Biscuit meal	1	92.9	10.4	0.55	0.52	0.70	2.54	0.46	0.30	0.41	0.88	0.27	0.16	0.51	0.61	0.37	-	0.30	0.53
Casein	3	92.7 (0.59)	87.5 (0.46)	3.31 (0.03)	3.60 (0.04)	7.91 (0.05)	20.4 (0.31)	18.0 (0.12)	2.75 (0.10)	5.39 (0.15)	9.03 (0.12)	8.85 (0.53)	2.82 (0.22)	4.94 (0.04)	5.81 (0.06)	4.43 (0.04)	1.09 (0.08)	5.50 (0.19)	6.50 (0.17)
Dogfood scrap meal	1	92.7	23.1	1.35	1.30	1.62	4.55	1.51	0.56	0.93	1.90	1.03	0.35	1.06	1.47	0.88	-	0.75	1.12
Gelatin	1	92.1	88.2	8.62	7.20	5.35	9.79	21.7	0.69	1.43	2.76	3.23	0.82	1.81	3.66	1.83	-	0.46	2.20
Maize gluten	1	91.9	64.3	5.83	2.12	4.16	14.3	1.75	1.36	2.74	11.3	1.08	1.37	4.17	3.04	2.10	-	3.53	3.21

**TABLE 3 Apparent ileal digestibility coefficients of protein and amino acids in feedstuffs**

Dry matter (DM) and total crude protein (TCP) concentrations (g/100 g as received) and apparent ileal digestibility coefficients of crude protein (CP) and amino acids in feedstuffs for broilers

Code	Feedstuff	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
<i>Cereals</i>																				
B01	Barley	89.6	8.50	-	0.67	0.73	0.59	0.83	0.60	0.66	0.72	0.76	0.69	0.79	0.76	0.62	0.62	0.72	0.65	0.72
M01	Maize	89.1	7.60	0.79	0.88	0.86	0.76	0.90	0.74	0.85	0.84	0.91	0.79	0.88	0.87	0.77	0.65	-	0.79	0.82
M02	Maize	88.1	7.80	0.80	0.90	0.88	0.81	0.92	0.77	0.86	0.85	0.91	0.79	0.91	0.88	0.79	0.67	-	0.79	0.83
M03	Maize	90.5	7.80	0.74	0.86	0.83	0.74	0.88	0.68	0.79	0.80	0.89	0.78	0.87	0.84	0.74	0.60	0.66	0.76	0.77
M04	Maize	90.2	7.90	0.86	0.92	0.88	0.83	0.93	0.78	0.88	0.87	0.93	0.85	0.92	0.90	0.82	0.73	0.71	0.73	0.86
M05	Maize	88.5	8.10	0.79	0.88	0.87	0.79	0.90	0.75	0.86	0.83	0.90	0.81	0.90	0.85	0.77	0.72	0.70	0.79	0.81
M06	Maize	91.9	8.10	0.80	0.91	0.90	0.84	0.93	0.79	0.88	0.86	0.92	0.84	0.93	0.88	0.82	0.73	0.75	0.80	0.85
M07	Maize	88.3	8.70	0.82	0.90	0.87	0.80	0.91	0.77	0.87	0.84	0.91	0.80	0.90	0.87	0.81	0.69	-	0.77	0.83
M08	Maize, high lysine	92.0	9.80	0.79	0.86	0.89	0.84	0.90	0.77	0.86	0.83	0.88	0.84	0.88	0.84	0.77	0.73	0.70	0.80	0.82
S01	Sorghum	90.6	7.10	0.74	0.79	0.75	0.72	0.80	0.64	0.66	0.74	0.79	0.70	0.78	0.75	0.70	0.58	0.71	0.67	0.71
S02	Sorghum	90.1	8.02	0.73	0.84	0.75	0.75	0.85	0.64	0.64	0.79	0.84	0.67	0.78	0.82	0.72	0.60	-	0.72	0.74
S03	Sorghum	91.1	8.10	0.79	0.89	0.86	0.82	0.90	0.75	0.80	0.84	0.89	0.75	0.87	0.85	0.80	0.72	0.76	0.80	0.83
S04	Sorghum	90.2	8.75	0.72	0.85	0.80	0.79	0.85	0.69	0.70	0.81	0.85	0.75	0.81	0.83	0.76	0.67	-	0.78	0.77
S05	Sorghum	89.3	9.29	0.69	0.82	0.71	0.76	0.82	0.67	0.62	0.77	0.82	0.70	0.75	0.80	0.74	0.63	-	0.71	0.73
S06	Sorghum	89.2	9.82	0.80	0.86	0.78	0.81	0.87	0.72	0.71	0.83	0.86	0.75	0.83	0.85	0.78	0.70	-	0.78	0.79

**TABLE 3 (cont)**

Dry matter (DM) and total crude protein (TCP) concentrations (g/100 g as received) and apparent ileal digestibility coefficients of crude protein (CP) and amino acids in feedstuffs for broilers

	Code	Feedstuff	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
30	S07	Sorghum	88.4	10.3	-	0.83	0.78	0.78	0.84	0.66	0.74	0.78	0.83	0.75	0.80	0.80	0.74	0.64	0.80	0.73	0.76
	S08	Sorghum	87.4	10.5	0.82	0.91	0.84	0.85	0.90	0.75	0.75	0.87	0.91	0.83	0.88	0.89	0.81	0.71	-	0.81	0.84
	S09	Sorghum	90.0	10.9	0.77	0.83	0.72	0.76	0.83	0.66	0.62	0.78	0.83	0.67	0.75	0.81	0.73	0.61	-	0.71	0.73
	S10	Sorghum	90.3	10.9	0.78	0.84	0.80	0.78	0.83	0.72	0.74	0.81	0.84	0.72	0.84	0.83	0.78	0.69	-	0.75	0.79
	S11	Sorghum	87.9	11.0	0.82	0.86	0.81	0.82	0.87	0.74	0.72	0.84	0.85	0.79	0.86	0.83	0.76	0.68	0.75	0.79	0.81
	S12	Sorghum	90.4	11.0	0.84	0.92	0.84	0.87	0.73	0.92	0.76	0.87	0.92	0.77	0.76	0.90	0.84	0.76	-	0.84	0.85
	S13	Sorghum	89.9	11.1	0.83	0.88	0.83	0.82	0.88	0.73	0.76	0.83	0.87	0.72	0.85	0.84	0.79	0.70	0.72	0.81	0.81
	S14	Sorghum	87.1	11.4	0.78	0.86	0.82	0.81	0.85	0.77	0.79	0.83	0.86	0.77	0.84	0.85	0.80	0.72	-	0.77	0.82
	S15	Sorghum	90.5	11.6	0.78	0.88	0.80	0.83	0.88	0.76	0.72	0.85	0.88	0.76	0.84	0.87	0.82	0.73	-	0.81	0.81
	S16	Sorghum	90.8	11.6	-	0.84	0.80	0.77	0.84	0.70	0.73	0.83	0.84	0.75	0.85	0.83	0.73	0.66	0.74	0.79	0.80
	S17	Sorghum	89.5	11.8	0.77	0.86	0.82	0.82	0.86	0.74	0.73	0.83	0.86	0.78	0.82	0.85	0.80	0.72	-	0.80	0.80
	T01	Triticale	90.5	10.2	0.76	0.75	0.79	0.74	0.91	0.72	0.74	0.80	0.82	0.78	0.88	0.85	0.76	0.69	0.76	0.79	0.78
	T02	Triticale	90.1	10.6	0.71	0.70	0.70	0.67	0.89	0.68	0.71	0.74	0.76	0.69	0.79	0.79	0.72	0.61	0.74	0.76	0.78
	T03	Triticale	91.2	10.7	0.77	0.76	0.78	0.75	0.91	0.76	0.80	0.81	0.82	0.75	0.86	0.85	0.79	0.71	0.76	0.75	0.78
	W01	Wheat, Triller	89.9	8.80	0.72	0.70	0.70	0.62	0.89	0.68	0.64	0.77	0.73	0.69	0.74	0.69	0.70	0.57	0.80	0.63	0.74
	W02	Wheat, Tailem Bent	93.6	9.00	0.77	0.73	0.74	0.69	0.92	0.73	0.75	0.80	0.82	0.70	0.78	0.83	0.78	0.67	-	0.68	0.77
	W03	Wheat	90.7	9.20	0.80	0.87	0.89	0.84	0.96	0.87	0.88	0.89	0.91	0.86	0.92	0.89	0.87	0.73	0.82	0.84	0.87

**TABLE 3 (cont)**

Total Dry matter (DM) and total crude protein (TCP) concentrations (g/100 g as received) and apparent ileal digestibility coefficients of crude protein (CP) and amino acids in feedstuffs for broilers

Code	Feedstuff	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
W04	Wheat	92.7	9.30	0.81	0.79	0.80	0.76	0.94	0.80	0.81	0.84	0.86	0.76	0.85	0.87	0.83	0.73	-	0.78	0.82
W05	Wheat	90.1	9.40	0.83	0.79	0.81	0.75	0.94	0.79	0.83	0.84	0.86	0.77	0.85	0.87	0.81	0.69	0.85	0.73	0.81
W06	Wheat, Meering	88.9	9.60	0.78	0.74	0.70	0.68	0.92	0.73	0.78	0.81	0.83	0.78	0.80	0.84	0.78	0.66	-	0.73	0.80
W07	Wheat	88.4	9.70	0.77	0.69	0.66	0.89	0.69	0.72	0.61	0.74	0.70	0.78	0.81	0.64	0.75	0.82	-	0.59	0.74
W08	Wheat, Currawong	91.5	10.1	0.76	0.71	0.74	0.65	0.91	0.73	0.75	0.78	0.81	0.67	0.80	0.81	0.77	0.63	-	0.73	0.75
W09	Wheat, Lowan	90.1	10.1	0.79	0.79	0.82	0.76	0.94	0.79	0.78	0.85	0.86	0.82	0.86	0.86	0.82	0.72	-	0.73	0.82
W10	Wheat	88.0	10.4	0.77	0.69	0.72	0.63	0.83	0.70	0.73	0.76	0.79	0.64	0.74	0.79	0.76	0.61	-	0.69	0.72
W11	Wheat, Harvey	91.0	10.4	0.81	0.76	0.79	0.74	0.92	0.78	0.79	0.83	0.85	0.74	0.83	0.86	0.81	0.72	-	0.82	0.80
W12	Wheat, Murray Bridge	93.2	10.5	0.81	0.78	0.79	0.74	0.93	0.78	0.79	0.83	0.86	0.75	0.89	0.87	0.82	0.72	-	0.83	0.83
W13	Wheat, Lawson	92.3	10.7	0.80	0.75	0.77	0.72	0.92	0.74	0.78	0.83	0.84	0.70	0.87	0.86	0.80	0.70	-	0.81	0.79
W14	Wheat	90.4	10.8	0.75	0.75	0.76	0.71	0.92	0.77	0.78	0.82	0.79	0.74	0.84	0.83	0.81	0.69	0.81	0.81	0.78
W15	Wheat	89.9	10.9	0.80	0.76	0.77	0.74	0.92	0.71	0.73	0.72	0.78	0.83	0.81	0.77	0.78	0.67	-	0.84	0.72
W16	Wheat	88.9	11.6	0.79	0.80	0.77	0.91	0.79	0.82	0.80	0.81	0.83	0.86	0.87	0.76	0.85	0.87	-	0.72	0.82
W17	Wheat	92.1	11.8	0.81	0.80	0.80	0.75	0.94	0.80	0.82	0.82	0.84	0.73	0.85	0.84	0.80	0.70	0.79	0.77	0.79
W18	Wheat, Broadbent	92.6	11.8	0.84	0.81	0.83	0.77	0.95	0.81	0.83	0.86	0.88	0.80	0.86	0.89	0.84	0.75	-	0.84	0.83
W19	Wheat	92.4	12.1	0.84	0.79	0.80	0.77	0.94	0.81	0.82	0.86	0.87	0.76	0.83	0.89	0.83	0.75	-	0.81	0.83
W20	Wheat, Bouchier	91.0	12.3	0.83	0.79	0.80	0.75	0.94	0.80	0.81	0.85	0.87	0.78	0.83	0.89	0.84	0.74	-	0.82	0.82



**TABLE 3 (cont)**

Dry matter (DM) and total crude protein (TCP) concentrations (g/100 g as received) and apparent ileal digestibility coefficients of crude protein (CP) and amino acids in feedstuffs for broilers

Code	Feedstuff	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
W21	Wheat, old season	92.0	12.5	0.84	0.83	0.84	0.80	0.96	0.84	0.86	0.89	0.90	0.80	0.91	0.91	0.86	0.78	0.85	0.84	0.86
W22	Wheat, new season	91.7	13.7	0.84	0.82	0.83	0.79	0.95	0.82	0.85	0.88	0.89	0.80	0.89	0.90	0.86	0.78	0.84	0.84	0.85
W23	Wheat	90.5	14.9	0.84	0.78	0.80	0.75	0.95	0.80	0.83	0.86	0.88	0.75	0.87	0.89	0.85	0.76	-	0.85	0.83
W24	Wheat	90.6	15.1	-	0.78	0.81	0.75	0.95	0.80	0.84	0.86	0.88	0.76	0.87	0.90	0.84	0.75	-	0.85	0.83
W25	Wheat	92.0	15.2	0.85	0.80	0.81	0.77	0.95	0.81	0.84	0.87	0.88	0.77	0.88	0.90	0.85	0.76	-	0.85	0.84
W26	Wheat	93.3	15.8	0.85	0.80	0.82	0.77	0.94	0.82	0.84	0.87	0.88	0.76	0.89	0.90	0.85	0.76	0.84	0.86	0.84
W27	Wheat, Warbler	93.4	16.2	0.83	0.78	0.79	0.76	0.95	0.82	0.84	0.83	0.85	0.76	0.81	0.84	0.83	0.73	-	0.71	0.80
<b><i>Cereal by-products</i></b>																				
MM01	Millmix	87.4	14.9	0.73	0.72	0.79	0.71	0.86	0.67	0.74	0.74	0.76	0.79	0.79	0.76	0.66	0.61	-	0.69	0.72
MM02	Millrun	92.1	15.1	0.69	0.72	0.74	0.71	0.87	0.68	0.72	0.75	0.76	0.73	0.81	0.77	0.72	0.65	0.76	0.70	0.72
RP01	Rice pollard	90.5	12.9	0.62	0.65	0.76	0.62	0.69	0.60	0.67	0.58	0.58	0.65	0.64	0.58	0.57	0.52	0.65	0.58	0.58
<b><i>Oilseed Meals</i></b>																				
CM01	Canola meal, full-fat	91.7	26.6	-	-	0.85	0.77	0.86	0.82	0.83	0.75	0.78	0.82	0.87	0.77	0.71	0.69	0.86	0.70	0.75
CM02	Canola meal	90.6	27.7	0.68	0.74	0.77	0.67	0.80	0.70	0.74	0.71	0.74	0.71	0.85	0.73	0.65	0.64	-	0.7	0.69

**TABLE 3 (cont)**

Dry matter (DM) and total crude protein (TCP) concentrations (g/100 g as received) and apparent ileal digestibility coefficients of crude protein (CP) and amino acids in feedstuffs for broilers

Code	Feedstuff	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
CM03	Canola meal	92.3	29.1	-	0.76	0.81	0.73	0.84	0.74	0.78	0.72	0.75	0.78	0.88	0.75	0.67	0.65	0.80	0.76	0.71
CM04	Canola meal	89.2	29.7	0.80	0.78	0.84	0.77	0.86	0.77	0.81	0.75	0.78	0.81	0.91	0.81	0.70	0.68	0.78	0.73	0.73
CM05	Canola meal	88.7	31.2	0.75	0.80	0.86	0.78	0.88	0.78	0.84	0.76	0.80	0.84	0.93	0.80	0.73	0.70	-	0.77	0.75
CM06	Canola meal	88.5	34.0	0.75	0.79	0.88	0.76	0.87	0.77	0.81	0.77	0.81	0.79	0.92	0.80	0.74	0.71	-	0.79	0.77
CM07	Canola meal	91.7	35.0	0.66	0.63	0.74	0.60	0.81	0.65	0.68	0.61	0.67	0.64	0.91	0.74	0.58	0.51	0.77	0.68	0.58
CM08	Canola meal	92.9	35.1	0.77	0.78	0.83	0.70	0.84	0.73	0.77	0.79	0.79	0.76	0.91	0.80	0.67	0.65	0.80	0.76	0.76
CM09	Canola meal	90.6	35.5	0.77	0.77	0.82	0.71	0.82	0.77	0.79	0.78	0.77	0.77	0.91	0.78	0.69	0.66	0.73	0.76	0.73
CM10	Canola meal	89.7	36.5	0.73	0.78	0.84	0.73	0.85	0.74	0.79	0.76	0.79	0.75	0.89	0.79	0.72	0.69	-	0.77	0.74
CM11	Canola meal	88.9	37.0	0.78	0.81	0.88	0.78	0.89	0.78	0.80	0.79	0.83	0.80	0.91	0.82	0.72	0.72	-	0.79	0.78
CM12	Canola meal	94.0	37.9	0.81	0.84	0.89	0.82	0.80	0.90	0.82	0.81	0.85	0.84	0.90	0.85	0.78	0.75	-	0.81	0.80
CM13	Canola meal	92.3	38.8	0.76	0.78	0.84	0.70	0.84	0.73	0.77	0.76	0.79	0.77	0.91	0.79	0.69	0.66	0.79	0.79	0.74
CM14	Canola meal	90.8	39.4	0.75	0.77	0.83	0.70	0.77	0.84	0.73	0.74	0.78	0.74	0.85	0.79	0.70	0.66	-	0.76	0.73
CNM01	Copra meal	90.3	21.7	0.63	0.75	0.86	0.71	0.78	0.70	0.61	0.74	0.76	0.51	0.71	0.79	0.71	0.63	-	0.65	0.76
CSM01	Cottonseed meal	90.1	38.1	0.72	0.66	0.85	0.71	0.82	0.67	0.73	0.66	0.67	0.56	0.74	0.76	0.68	0.58	-	0.74	0.67
CSM02	Cottonseed meal	92.6	38.4	0.73	0.70	0.86	0.73	0.84	0.69	0.71	0.70	0.70	0.58	0.77	0.79	0.70	0.62	0.76	0.74	0.71
CSM03	Cottonseed meal	91.6	39.6	0.75	0.68	0.87	0.74	0.84	0.68	0.75	0.67	0.71	0.54	0.77	0.78	0.71	0.63	0.75	0.72	0.70

**TABLE 3 (cont)**

Dry matter (DM) and total crude protein (TCP) concentrations (g/100 g as received) and apparent ileal digestibility coefficients of crude protein (CP) and amino acids in feedstuffs for broilers

Code	Feedstuff	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
CSM04	Cottonseed meal	93.2	40.0	0.76	0.69	0.85	0.75	0.84	0.68	0.71	0.67	0.67	0.52	0.78	0.80	0.66	0.59	0.76	0.76	0.72
CSM05	Cottonseed meal	90.7	40.4	0.74	0.68	0.86	0.73	0.84	0.69	0.76	0.67	0.70	0.60	0.80	0.79	0.70	0.63	-	0.79	0.70
CSM06	Cottonseed meal	87.9	44.7	0.72	0.65	0.84	0.69	0.81	0.67	0.74	0.62	0.66	0.60	0.74	0.76	0.69	0.59	-	0.75	0.66
CSM07	Cottonseed meal	87.7	45.0	0.72	0.65	0.85	0.71	0.82	0.64	0.74	0.62	0.66	0.55	0.74	0.76	0.68	0.60	-	0.77	0.66
PKM01	Palm kernel meal	94.4	13.6	0.54	0.72	0.82	0.62	0.75	0.67	0.61	0.73	0.74	0.57	0.71	0.76	0.70	0.63	-	0.58	0.78
SBM01	Soyabean meal, full-fat	93.5	39.0	0.88	0.88	0.94	0.89	0.85	0.92	0.85	0.89	0.90	0.90	0.88	0.91	0.87	0.83	-	0.90	0.88
SBM02	Soyabean meal	89.8	44.8	0.83	0.81	0.86	0.77	0.83	0.76	0.82	0.81	0.81	0.84	0.89	0.82	0.80	0.76	0.84	0.84	0.80
SBM03	Soyabean meal	90.7	46.1	0.84	0.85	0.92	0.78	0.88	0.89	0.8	0.86	0.87	0.87	0.83	0.90	0.83	0.79	-	0.89	0.83
SBM04	Soyabean meal	90.2	46.3	0.81	0.83	0.89	0.81	0.87	0.79	0.77	0.86	0.85	0.86	0.89	0.86	0.81	0.77	0.87	0.86	0.84
SBM05	Soyabean meal	92.1	46.4	0.81	0.80	0.89	0.79	0.88	0.78	0.81	0.84	0.83	0.84	0.89	0.84	0.80	0.75	0.85	0.86	0.82
SBM06	Soyabean meal	92.8	46.7	0.82	0.79	0.88	0.80	0.90	0.77	0.85	0.81	0.80	0.85	0.95	0.86	0.75	0.74	0.85	0.86	0.83
SBM07	Soyabean meal	90.1	47.3	0.86	0.85	0.90	0.83	0.87	0.83	0.87	0.86	0.86	0.89	0.92	0.86	0.84	0.8	-	0.88	0.85
SBM08	Soyabean meal	90.2	47.7	0.82	0.79	0.86	0.79	0.83	0.77	0.82	0.80	0.80	0.85	0.88	0.80	0.79	0.74	-	0.83	0.79
SBM09	Soyabean meal	87.9	48.0	0.85	0.87	0.91	0.86	0.90	0.85	0.87	0.87	0.87	0.91	0.92	0.87	0.85	0.82	-	0.89	0.86
SBM10	Soyabean meal	95.6	48.1	0.82	0.85	0.92	0.86	0.86	0.90	0.82	0.87	0.87	0.88	0.89	0.89	0.85	0.79	-	0.88	0.87
SBM11	Soyabean meal	91.5	48.3	0.82	0.82	0.89	0.82	0.88	0.79	0.83	0.80	0.82	0.86	0.91	0.85	0.80	0.75	0.83	0.85	0.80

**TABLE 3 (cont)**  
Dry matter (DM) and total crude protein (TCP) concentrations (g/100 g as received) and apparent ileal digestibility coefficients of crude protein (CP) and amino acids in feedstuffs for broilers

Code	Feedstuff	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
SBM12	Soyabean meal	88.1	48.7	0.85	0.86	0.91	0.86	0.89	0.84	0.88	0.87	0.86	0.90	0.93	0.87	0.85	0.81	-	0.88	0.86
SBM13	Soyabean meal	92.6	48.7	0.81	0.81	0.89	0.79	0.87	0.73	0.85	0.85	0.85	0.85	0.87	0.86	0.76	0.77	0.83	0.82	0.82
SBM14	Soyabean meal	90.9	49.0	0.82	0.83	0.86	0.81	0.84	0.80	0.82	0.83	0.84	0.86	0.90	0.83	0.84	0.78	0.84	0.80	0.82
SBM15	Soyabean meal	92.3	49.1	0.83	0.78	0.87	0.78	0.87	0.77	0.81	0.84	0.83	0.86	0.92	0.85	0.76	0.77	0.81	0.84	0.82
SBM16	Soyabean meal	90.9	49.8	0.83	0.85	0.89	0.81	0.82	0.87	0.81	0.85	0.85	0.85	0.86	0.86	0.83	0.79	-	0.87	0.85
SM01	Sunflower meal	90.6	31.0	0.80	0.81	0.89	0.77	0.82	0.80	0.78	0.81	0.82	0.81	0.92	0.84	0.74	0.72	0.80	0.82	0.80
SM02	Sunflower meal	91.0	34.6	0.83	0.87	0.94	0.85	0.93	0.73	0.77	0.89	0.88	0.82	0.95	0.90	0.76	0.76	-	0.87	0.87
SM03	Sunflower meal	94.6	36.3	0.84	0.85	0.93	0.82	0.74	0.92	0.70	0.87	0.86	0.79	0.91	0.90	0.78	0.78	-	0.86	0.86
SM04	Sunflower meal	93.5	36.6	0.79	0.80	0.90	0.80	0.89	0.78	0.81	0.83	0.82	0.79	0.88	0.85	0.76	0.73	0.82	0.87	0.83
<i>Grain Legumes</i>																				
CP01	Chickpea	93.0	21.3	0.72	0.71	0.84	0.73	0.77	0.68	0.76	0.68	0.69	0.75	0.76	0.74	0.69	0.66	0.71	0.70	0.70
FB01	Faba bean	92.3	23.8	0.66	0.68	0.78	0.69	0.73	0.64	0.70	0.65	0.66	0.73	0.67	0.67	0.65	0.64	0.63	0.66	0.65
FP01	Field pea	91.1	21.6	0.66	0.66	0.78	0.68	0.73	0.65	0.69	0.62	0.63	0.78	0.63	0.64	0.64	0.62	0.63	0.64	0.62
FP02	Field pea	90.6	22.9	0.79	0.80	0.89	0.81	0.85	0.77	0.79	0.77	0.76	0.86	0.78	0.78	0.77	0.74	0.75	0.77	0.76
FP03	Field pea	89.5	22.9	0.63	0.62	0.76	0.64	0.66	0.64	0.67	0.59	0.59	0.66	0.69	0.62	0.60	0.60	-	0.66	0.60

**TABLE 3 (cont)**

Dry matter (DM) and total crude protein (TCP) concentrations (g/100 g as received) and apparent ileal digestibility coefficients of crude protein (CP) and amino acids in feedstuffs for broilers

Code	Feedstuff	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
L01	Lupin, <i>angustifolius</i>	90.7	28.8	0.85	0.81	0.89	0.83	0.82	0.81	0.84	0.82	0.84	0.85	0.83	0.85	0.81	0.76	0.79	0.85	0.80
L02	Lupin, <i>angustifolius</i>	92.9	29.9	0.84	0.84	0.90	0.84	0.89	0.85	0.86	0.82	0.84	0.86	0.84	0.84	0.83	0.81	0.82	0.86	0.83
L03	Lupin, <i>angustifolius</i>	92.0	30.4	0.78	0.77	0.85	0.78	0.85	0.77	0.82	0.76	0.77	0.80	0.78	0.77	0.75	0.75	0.77	0.78	0.73
L04	Lupin, <i>angustifolius</i>	93.3	30.4	0.82	0.81	0.89	0.82	0.86	0.82	0.84	0.82	0.83	0.84	0.80	0.83	0.81	0.77	-	0.84	0.80
L05	Lupin, <i>angustifolius</i>	92.6	34.0	0.79	0.79	0.89	0.81	0.87	0.81	0.81	0.79	0.81	0.84	0.80	0.80	0.79	0.75	0.78	0.82	0.78
L06	Lupin, <i>albus</i>	93.5	34.7	0.79	0.78	0.88	0.80	0.85	0.79	0.81	0.77	0.79	0.81	0.83	0.79	0.78	0.75	0.83	0.81	0.76
<b><i>Animal Protein Meals</i></b>																				
BM01	Blood meal	91.9	89.7	-	0.85	0.81	0.82	0.81	0.80	0.85	0.62	0.85	0.86	0.84	0.85	0.82	0.79	0.84	0.79	0.84
BM02	Blood meal	92.7	91.3	-	0.87	0.84	0.88	0.81	0.83	0.90	0.48	0.89	0.89	0.86	0.90	0.85	0.85	-	0.85	0.88
FTM01	Feather meal	92.9	87.1	0.57	0.63	0.67	0.31	0.55	0.63	0.56	0.71	0.64	0.54	0.61	0.72	0.61	0.50	0.52	0.66	0.65
FM01	Fishmeal	90.8	58.9	0.77	0.76	0.78	0.74	0.78	0.66	0.74	0.81	0.82	0.82	0.82	0.80	0.73	0.75	-	0.75	0.79
FM02	Fishmeal	92.1	61.6	-	0.66	0.68	0.53	0.65	0.67	0.65	0.65	0.65	0.67	0.66	0.63	0.58	0.59	0.72	0.62	0.60
FM03	Fishmeal	92.9	63.8	0.74	0.79	0.81	0.67	0.78	0.70	0.71	0.82	0.82	0.83	0.86	0.80	0.67	0.70	0.81	0.78	0.79
MBM01	Meat and bone meal	92.0	47.8	0.58	0.67	0.68	0.45	0.65	0.69	0.60	0.66	0.65	0.62	0.65	0.70	0.52	0.53	0.60	0.54	0.61

**TABLE 3 (cont)**

Dry matter (DM) and total crude protein (TCP) concentrations (g/100 g as received) and apparent ileal digestibility coefficients of crude protein (CP) and amino acids in feedstuffs for broilers

Code	Feedstuff	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
MBM02	Meat and bone meal	91.8	49.0	0.53	0.62	0.64	0.34	0.56	0.59	0.54	0.58	0.60	0.53	0.63	0.69	0.47	0.46	0.56	0.59	0.60
MBM03	Meat and bone meal	92.9	49.9	0.73	0.76	0.76	0.60	0.73	0.73	0.73	0.75	0.76	0.76	0.79	0.75	0.67	0.68	0.70	0.73	0.73
MBM04	Meat and bone meal	92.6	54.0	0.69	0.73	0.76	0.52	0.71	0.73	0.65	0.71	0.68	0.71	0.81	0.69	0.63	0.63	0.68	0.69	0.67
MBM05	Meat and bone meal	92.6	54.6	0.59	0.63	0.66	0.43	0.62	0.55	0.66	0.67	0.68	0.67	0.72	0.74	0.52	0.54	-	0.67	0.65
MBM06	Meat and bone meal	92.4	54.8	0.74	0.77	0.77	0.67	0.77	0.71	0.8	0.81	0.81	0.79	0.83	0.81	0.73	0.75	-	0.81	0.79
MBM07	Meat and bone meal	91.6	55.0	0.75	0.79	0.82	0.66	0.79	0.75	0.78	0.81	0.82	0.81	0.84	0.81	0.73	0.76	-	0.81	0.80
MBM08	Meat and bone meal	91.2	55.7	0.61	0.72	0.72	0.47	0.66	0.69	0.68	0.68	0.71	0.72	0.74	0.71	0.54	0.59	0.57	0.61	0.70
MBM09	Meat and bone meal	94.6	56.5	0.69	0.70	0.73	0.62	0.72	0.75	0.76	0.77	0.78	0.75	0.81	0.77	0.67	0.71	-	0.78	0.76
MBM10	Meat and bone meal	95.5	58.6	0.60	0.67	0.54	0.40	0.34	0.55	0.64	0.56	0.57	0.48	0.72	0.59	0.39	0.44	-	0.48	0.54
PM01	Poultry meal	93.5	63.0	0.78	0.82	0.84	0.66	0.82	0.81	0.77	0.8	0.81	0.84	0.86	0.81	0.75	0.76	-	0.81	0.79

**TABLE 3 (cont)**

Dry matter (DM) and total crude protein (TCP) concentrations (g/100 g as received) and apparent ileal digestibility coefficients of crude protein (CP) and amino acids in feedstuffs for broilers

Code	Feedstuff	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
<i>Miscellaneous</i>																				
MIS01	Biscuit meal	92.9	10.4	-	0.60	0.63	0.45	0.76	0.53	0.56	0.59	0.65	0.40	0.58	0.67	0.57	0.45	-	0.42	0.56
MIS02	Casein	93.1	87.0	-	0.93	0.94	0.96	0.94	0.93	0.89	0.92	0.92	0.98	0.98	0.97	0.86	0.90	0.97	0.97	0.94
MIS03	Casein	92.9	87.6	-	0.93	0.97	0.95	0.97	0.93	0.93	0.96	0.95	0.98	0.97	0.96	0.91	0.92	-	0.97	0.95
MIS04	Casein	92.0	87.9	0.96	0.92	0.95	0.96	0.95	0.96	0.93	0.95	0.95	0.96	0.98	0.98	0.90	0.92	-	0.99	0.95
38 MIS05	Dogfood scrap meal	92.7	23.1	-	0.77	0.80	0.70	0.85	0.73	0.76	0.78	0.81	0.75	0.82	0.81	0.74	0.70	-	0.75	0.77
MIS06	Gelatin	92.1	88.2	0.92	0.95	0.97	0.83	0.91	0.93	0.82	0.91	0.91	0.95	0.89	0.92	0.88	0.85	-	0.89	0.91
MIS07	Maize gluten	91.9	64.3	0.85	0.89	0.85	0.80	0.89	0.75	0.82	0.83	0.90	0.75	0.89	0.88	0.85	0.76	-	0.89	0.89

**TABLE 4    Summary: Apparent ileal digestibility coefficients of protein and amino acids in feedstuffs**

Dry matter (DM), total crude protein (TCP), apparent ileal digestibility coefficients of crude protein (CP) and amino acids in feedstuffs for broilers. Values in parentheses refer to standard deviation of mean estimates

Feedstuff	N	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
<i>Cereals</i>																				
Barley	1	89.6	8.50	-	0.67	0.73	0.59	0.83	0.60	0.66	0.72	0.76	0.69	0.79	0.76	0.62	0.62	0.72	0.65	0.72
Maize	7	89.5	8.00	0.80 (0.04)	0.89 (0.02)	0.87 (0.02)	0.80 (0.04)	0.91 (0.02)	0.75 (0.04)	0.86 (0.03)	0.84 (0.02)	0.91 (0.01)	0.81 (0.03)	0.90 (0.02)	0.87 (0.02)	0.79 (0.03)	0.68 (0.05)	0.71 (0.04)	0.78 (0.02)	0.82 (0.03)
Maize, high lysine	1	92.0	9.80	0.79	0.86	0.89	0.84	0.90	0.77	0.86	0.83	0.88	0.84	0.88	0.84	0.77	0.73	0.70	0.80	0.82
Sorghum, 7%	1	90.6	7.10	0.74	0.79	0.75	0.72	0.80	0.64	0.66	0.74	0.79	0.70	0.78	0.75	0.70	0.58	0.71	0.67	0.71
Sorghum, 8%	2	90.6	8.06	0.76 (0.04)	0.86 (0.04)	0.80 (0.08)	0.78 (0.05)	0.87 (0.04)	0.69 (0.08)	0.72 (0.11)	0.81 (0.04)	0.86 (0.04)	0.71 (0.06)	0.83 (0.06)	0.83 (0.02)	0.76 (0.05)	0.66 (0.08)	0.76	0.76 (0.05)	0.78 (0.07)
Sorghum, 9%	2	89.8	9.02	0.71 (0.02)	0.83 (0.02)	0.75 (0.06)	0.77 (0.02)	0.84 (0.02)	0.68 (0.01)	0.66 (0.06)	0.79 (0.03)	0.83 (0.02)	0.73 (0.04)	0.78 (0.04)	0.82 (0.02)	0.75 (0.02)	0.65 (0.03)	-	0.74 (0.05)	0.75 (0.03)
Sorghum, 10%	3	88.3	10.2	0.81 (0.01)	0.87 (0.04)	0.80 (0.03)	0.81 (0.04)	0.87 (0.03)	0.71 (0.05)	0.73 (0.02)	0.83 (0.05)	0.87 (0.04)	0.78 (0.05)	0.84 (0.04)	0.85 (0.05)	0.78 (0.04)	0.68 (0.04)	0.80	0.77 (0.04)	0.80 (0.04)
Sorghum, 11%	6	89.3	11.1	0.80 (0.03)	0.87 (0.03)	0.80 (0.04)	0.81 (0.04)	0.83 (0.05)	0.76 (0.09)	0.73 (0.06)	0.83 (0.03)	0.86 (0.03)	0.74 (0.04)	0.82 (0.05)	0.84 (0.03)	0.78 (0.04)	0.69 (0.05)	0.74 (0.02)	0.78 (0.05)	0.80 (0.04)
Sorghum, 12%	3	90.3	11.7	0.78 (0.01)	0.86 (0.02)	0.81 (0.01)	0.81 (0.03)	0.86 (0.02)	0.73 (0.03)	0.73 (0.01)	0.84 (0.01)	0.86 (0.02)	0.76 (0.02)	0.84 (0.02)	0.85 (0.02)	0.78 (0.05)	0.70 (0.04)	0.74	0.80 (0.01)	0.80 (0.01)
Triticale	3	90.6	10.5	0.75 (0.03)	0.74 (0.03)	0.76 (0.05)	0.72 (0.04)	0.90 (0.01)	0.72 (0.04)	0.75 (0.05)	0.78 (0.04)	0.80 (0.03)	0.74 (0.05)	0.84 (0.05)	0.83 (0.03)	0.76 (0.04)	0.67 (0.05)	0.75 (0.01)	0.77 (0.02)	0.78



TABLE 4 (cont)

**Summary:** Dry matter (DM), total crude protein (TCP), apparent ileal digestibility coefficients of crude protein (CP) and amino acids in feedstuffs for broilers. Values in parentheses refer to standard deviation of mean estimates

Feedstuff	N	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
Wheat, 9%	5	91.4	9.10	0.79 (0.04)	0.78 (0.07)	0.79 (0.07)	0.73 (0.08)	0.93 (0.03)	0.77 (0.07)	0.78 (0.09)	0.83 (0.05)	0.84 (0.07)	0.76 (0.07)	0.83 (0.07)	0.83 (0.08)	0.80 (0.06)	0.68 (0.07)	0.82 (0.03)	0.73 (0.08)	0.80 (0.05)
Wheat, 10%	7	90.2	10.1	0.79 (0.02)	0.75 (0.04)	0.76 (0.05)	0.70 (0.05)	0.91 (0.04)	0.75 (0.04)	0.77 (0.02)	0.81 (0.03)	0.83 (0.03)	0.73 (0.07)	0.82 (0.05)	0.84 (0.03)	0.79 (0.03)	0.68 (0.05)	-	0.76 (0.06)	0.79 (0.04)
Wheat, 11%	3	90.9	10.8	0.78 (0.03)	0.75 (0.01)	0.77 (0.01)	0.72 (0.02)	0.92 (0.01)	0.74 (0.03)	0.76 (0.03)	0.79 (0.06)	0.80 (0.03)	0.76 (0.07)	0.84 (0.03)	0.82 (0.05)	0.80 (0.02)	0.69 (0.02)	0.81	0.82 (0.02)	0.76 (0.04)
Wheat, 12%	5	91.4	11.9	0.82 (0.02)	0.80 (0.01)	0.80 (0.02)	0.79 (0.07)	0.91 (0.07)	0.81 (0.01)	0.82 (0.01)	0.84 (0.02)	0.86 (0.02)	0.79 (0.05)	0.85 (0.02)	0.85 (0.06)	0.83 (0.02)	0.76 (0.06)	0.79	0.79 (0.05)	0.82 (0.02)
40 Wheat, 13%	1	92.0	12.5	0.84	0.83	0.84	0.80	0.96	0.84	0.86	0.89	0.90	0.80	0.91	0.91	0.86	0.78	0.85	0.84	0.86
Wheat, 14%	1	91.7	13.7	0.84	0.82	0.83	0.79	0.95	0.82	0.85	0.88	0.89	0.80	0.89	0.90	0.86	0.78	0.84	0.84	0.85
Wheat, 15%	3	91.0	15.1	0.85 (0.01)	0.79 (0.01)	0.81 (0.01)	0.76 (0.02)	0.95 (0.01)	0.80 (0.02)	0.84 (0.01)	0.86 (0.01)	0.88 (0.02)	0.76 (0.01)	0.87 (0.01)	0.90 (0.01)	0.85 (0.01)	0.76 (0.01)	-	0.85 (0.02)	0.83 (0.01)
Wheat, 16%	2	93.4	16.0	0.84 (0.01)	0.79 (0.01)	0.81 (0.02)	0.77 (0.01)	0.95 (0.01)	0.82 (0)	0.84 (0)	0.85 (0.03)	0.87 (0.02)	0.76 (0.01)	0.85 (0.06)	0.87 (0.04)	0.84 (0.01)	0.75 (0.02)	0.84	0.79 (0.11)	0.82 (0.03)
<i>Cereal by-products</i>																				
Millmix	1	87.4	14.9	0.73	0.72	0.79	0.71	0.86	0.67	0.74	0.74	0.76	0.79	0.79	0.76	0.66	0.61	-	0.69	0.72
Millrun	1	92.1	15.1	0.69	0.72	0.74	0.71	0.87	0.68	0.72	0.75	0.76	0.73	0.81	0.77	0.72	0.65	0.76	0.70	0.72
Rice pollard	1	90.5	12.9	0.62	0.65	0.76	0.62	0.69	0.60	0.67	0.58	0.58	0.65	0.64	0.58	0.57	0.52	0.65	0.58	0.58

TABLE 4 (cont)

Summary: Dry matter (DM), total crude protein (TCP), apparent ileal digestibility coefficients of crude protein CP) and amino acids in feedstuffs for broilers. Values in parentheses refer to standard deviation of mean estimates

Feedstuff	N	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
<i>Oilseed Meals</i>																				
Canola meal, full-fat	1	91.7	26.6	-	-	0.85	0.77	0.86	0.82	0.83	0.75	0.78	0.82	0.87	0.77	0.71	0.69	0.86	0.70	0.75
Canola meal, 28%	1	90.6	27.7	0.68	0.74	0.77	0.67	0.80	0.70	0.74	0.71	0.74	0.71	0.85	0.73	0.65	0.64	-	0.70	0.69
Canola meal, 29%	1	92.3	29.1	-	0.76	0.81	0.73	0.84	0.74	0.78	0.72	0.75	0.78	0.88	0.75	0.67	0.65	0.80	0.76	0.71
Canola meal, 30%	1	89.2	29.7	0.80	0.78	0.84	0.77	0.86	0.77	0.81	0.75	0.78	0.81	0.91	0.81	0.70	0.68	0.78	0.73	0.73
Canola meal, 31%	1	88.7	31.2	0.75	0.80	0.86	0.78	0.88	0.78	0.84	0.76	0.80	0.84	0.93	0.80	0.73	0.70	-	0.77	0.75
Canola meal, 34%	1	88.5	34.0	0.75	0.79	0.88	0.76	0.87	0.77	0.81	0.77	0.81	0.79	0.92	0.80	0.74	0.71	-	0.79	0.77
Canola meal, 35%	3	91.7	35.2	0.73 (0.06)	0.73 (0.08)	0.80 (0.05)	0.67 (0.06)	0.82 (0.02)	0.72 (0.06)	0.75 (0.06)	0.73 (0.10)	0.74 (0.06)	0.72 (0.07)	0.91 (0.01)	0.77 (0.03)	0.65 (0.06)	0.61 (0.08)	0.77 (0.04)	0.73 (0.05)	0.69 (0.10)
Canola meal, 37%	2	89.3	36.8	0.76 (0.04)	0.80 (0.02)	0.86 (0.03)	0.76 (0.04)	0.87 (0.03)	0.76 (0.03)	0.80 (0.01)	0.78 (0.02)	0.81 (0.03)	0.78 (0.04)	0.90 (0.01)	0.81 (0.02)	0.72	0.71 (0.02)	-	0.78 (0.01)	0.76 (0.03)
Canola meal, 38%	1	94.0	37.9	0.81	0.84	0.89	0.82	0.80	0.90	0.82	0.81	0.85	0.84	0.90	0.85	0.78	0.75	-	0.81	0.80
Canola meal, 39%	2	91.6	39.1	0.76 (0.01)	0.78 (0.01)	0.84 (0.01)	0.70 (0)	0.81 (0.05)	0.79 (0.08)	0.75 (0.03)	0.75 (0.01)	0.79 (0.01)	0.76 (0.02)	0.88 (0.04)	0.79	0.70 (0.01)	0.66 (0)	0.79	0.78 (0.02)	0.74 (0.01)
Copra meal	1	90.3	21.7	0.63	0.75	0.86	0.71	0.78	0.70	0.61	0.74	0.76	0.51	0.71	0.79	0.71	0.63	-	0.65	0.76

TABLE 4 (cont)

Summary: Dry matter (DM), total crude protein (TCP), apparent ileal digestibility coefficients of crude protein (CP) and amino acids in feedstuffs for broilers. Values in parentheses refer to standard deviation of mean estimates

Feedstuff	N	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
Cottonseed meal, 38%	2	91.4	38.3	0.73 (0.01)	0.68 (0.03)	0.86 (0.01)	0.72 (0.01)	0.83 (0.01)	0.68 (0.01)	0.72 (0.01)	0.68 (0.03)	0.69 (0.02)	0.57 (0.01)	0.76 (0.02)	0.78 (0.02)	0.69 (0.01)	0.60 (0.03)	0.76	0.74 (0)	0.69 (0.03)
Cottonseed meal, 40%	3	91.8	40.0	0.75 (0.01)	0.68 (0.01)	0.86 (0.01)	0.74 (0.01)	0.84 (0)	0.68 (0.01)	0.74 (0.03)	0.67 (0)	0.69 (0.02)	0.55 (0.04)	0.78 (0.02)	0.79 (0.01)	0.69 (0.03)	0.62 (0.02)	0.76 (0.01)	0.76 (0.04)	0.71 (0.01)
Cottonseed meal, 45%	2	87.8	44.9	0.72	0.65	0.85 (0.01)	0.70 (0.01)	0.82 (0.01)	0.66 (0.02)	0.74 (0)	0.62 (0)	0.66 (0)	0.58 (0.04)	0.74 (0)	0.76 (0)	0.69 (0.01)	0.60 (0.01)	-	0.76 (0.01)	0.66
Palm kernel meal	1	94.4	13.6	0.54	0.72	0.82	0.62	0.75	0.67	0.61	0.73	0.74	0.57	0.71	0.76	0.70	0.63	-	0.58	0.78
Soyabean meal, full-fat	1	93.5	39.0	0.88	0.88	0.94	0.89	0.85	0.92	0.85	0.89	0.90	0.90	0.88	0.91	0.87	0.83	-	0.90	0.88
Soyabean meal, 45%	1	89.8	44.8	0.83	0.81	0.86	0.77	0.83	0.76	0.82	0.81	0.81	0.84	0.89	0.82	0.80	0.76	0.84	0.84	0.80
Soyabean meal, 46%	3	91.0	46.3	0.82 (0.02)	0.83 (0.03)	0.90 (0.02)	0.79 (0.02)	0.88 (0.01)	0.82 (0.06)	0.79 (0.02)	0.85 (0.01)	0.85 (0.02)	0.86 (0.02)	0.87 (0.03)	0.87 (0.03)	0.81 (0.02)	0.77 (0.02)	0.86 (0.01)	0.87 (0.02)	0.83 (0.01)
Soyabean meal, 47%	2	91.5	47.0	0.84 (0.03)	0.82 (0.04)	0.89 (0.01)	0.82 (0.02)	0.89 (0.02)	0.80 (0.04)	0.86 (0.01)	0.84 (0.04)	0.83 (0.04)	0.87 (0.03)	0.94 (0.02)	0.86 (0)	0.80 (0.06)	0.77 (0.04)	0.85	0.87 (0.01)	0.84 (0.01)
Soyabean meal, 48%	4	91.3	48.0	0.83 (0.02)	0.83 (0.03)	0.90 (0.03)	0.83 (0.03)	0.87 (0.03)	0.83 (0.06)	0.84 (0.02)	0.84 (0.04)	0.84 (0.04)	0.88 (0.03)	0.90 (0.02)	0.85 (0.04)	0.82 (0.03)	0.78 (0.04)	0.83	0.86 (0.03)	0.83 (0.04)
Soyabean meal, 49%	4	91.0	48.9	0.83 (0.02)	0.82 (0.03)	0.88 (0.02)	0.81 (0.04)	0.87 (0.02)	0.79 (0.05)	0.84 (0.03)	0.85 (0.02)	0.85 (0.01)	0.87 (0.02)	0.91 (0.03)	0.85 (0.02)	0.80 (0.05)	0.78 (0.02)	0.83 (0.02)	0.84 (0.03)	0.83 (0.02)

TABLE 4 (cont)

Summary: Dry matter (DM), total crude protein (TCP), apparent ileal digestibility coefficients of crude protein (CP) and amino acids in feedstuffs for broilers. Values in parentheses refer to standard deviation of mean estimates

Feedstuff	N	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
Soyabean meal, 50%	1	90.9	49.9	0.83	0.85	0.89	0.81	0.82	0.87	0.81	0.85	0.85	0.85	0.86	0.86	0.83	0.79	-	0.87	0.85
Sunflower meal, 31%	1	90.6	31.0	0.80	0.81	0.89	0.77	0.82	0.80	0.78	0.81	0.82	0.81	0.92	0.84	0.74	0.72	0.80	0.82	0.80
Sunflower meal, 35%	1	91.0	34.6	0.83	0.87	0.94	0.85	0.93	0.73	0.77	0.89	0.88	0.82	0.95	0.90	0.76	0.76	-	0.87	0.87
Sunflower meal, 36%	1	94.6	36.3	0.84	0.85	0.93	0.82	0.74	0.92	0.70	0.87	0.86	0.79	0.91	0.90	0.78	0.78	-	0.86	0.86
Sunflower meal, 37%	1	93.5	36.6	0.79	0.80	0.90	0.80	0.89	0.78	0.81	0.83	0.82	0.79	0.88	0.85	0.76	0.73	0.82	0.87	0.83
<i>Grain Legumes</i>																				
Chickpea	1	93.0	21.3	0.72	0.71	0.84	0.73	0.77	0.68	0.76	0.68	0.69	0.75	0.76	0.74	0.69	0.66	0.71	0.70	0.70
Faba bean	1	92.3	23.8	0.66	0.68	0.78	0.69	0.73	0.64	0.70	0.65	0.66	0.73	0.67	0.67	0.65	0.64	0.63	0.66	0.65
Field pea	3	90.4	22.5	0.69 (0.09)	0.69 (0.09)	0.81 (0.070)	0.71 (0.09)	0.75 (0.10)	0.69 (0.07)	0.72 (0.06)	0.66 (0.10)	0.66 (0.09)	0.77 (0.10)	0.70 (0.08)	0.68 (0.09)	0.67 (0.09)	0.65 (0.08)	0.69 (0.08)	0.69 (0.07)	0.66 (0.09)
Lupin, <i>angustifolius</i>	5	92.3	30.7	0.82 (0.03)	0.80 (0.03)	0.88 (0.02)	0.82 (0.02)	0.86 (0.03)	0.81 (0.03)	0.83 (0.02)	0.80 (0.03)	0.82 (0.03)	0.84 (0.02)	0.81 (0.02)	0.82 (0.03)	0.80 (0.03)	0.77 (0.02)	0.79 (0.02)	0.83 (0.03)	0.79 (0.04)
Lupin, <i>albus</i>	1	93.5	34.7	0.79	0.78	0.88	0.80	0.85	0.79	0.81	0.77	0.79	0.81	0.83	0.79	0.78	0.75	0.83	0.81	0.76

TABLE 4 (cont)

Summary: Dry matter (DM), total crude protein (TCP), apparent ileal digestibility coefficients of crude protein (CP) and amino acids in feedstuffs for broilers. Values in parentheses refer to standard deviation of mean estimates

Feedstuff	N	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
<i>Animal Protein Meals</i>																				
Blood meal	2	92.3	90.5	-	0.86 (0.01)	0.83 (0.02)	0.85 (0.04)	0.81	0.82 (0.02)	0.88 (0.04)	0.55 (0.10)	0.87 (0.03)	0.88 (0.02)	0.85 (0.01)	0.88 (0.04)	0.84 (0.02)	0.82 (0.04)	0.84	0.82 (0.04)	0.86 (0.03)
Feather meal	1	92.9	87.1	0.57	0.63	0.67	0.31	0.55	0.63	0.56	0.71	0.64	0.54	0.61	0.72	0.61	0.50	0.52	0.66	0.65
Fishmeal	3	91.9	61.4	0.76 (0.02)	0.74 (0.07)	0.76 (0.07)	0.65 (0.11)	0.74 (0.08)	0.68 (0.02)	0.70 (0.05)	0.76 (0.10)	0.76 (0.10)	0.77 (0.09)	0.78 (0.11)	0.74 (0.10)	0.66 (0.08)	0.68 (0.08)	0.77 (0.06)	0.72 (0.09)	0.73 (0.11)
Meat and bone meal, 48%	1	92.0	47.8	0.58	0.67	0.68	0.45	0.65	0.69	0.60	0.66	0.65	0.62	0.65	0.70	0.52	0.53	0.60	0.54	0.61
Meat and bone meal, 49%	1	91.8	49.0	0.53	0.62	0.64	0.34	0.56	0.59	0.54	0.58	0.60	0.53	0.63	0.69	0.47	0.46	0.56	0.59	0.60
Meat and bone meal, 50%	1	92.9	49.9	0.73	0.76	0.76	0.60	0.73	0.73	0.73	0.75	0.76	0.76	0.79	0.75	0.67	0.68	0.70	0.73	0.73
Meat and bone meal, 54%	1	92.6	54.0	0.69	0.73	0.76	0.52	0.71	0.73	0.65	0.71	0.68	0.71	0.81	0.69	0.63	0.63	0.68	0.69	0.67
Meat and bone meal, 55%	3	92.2	54.8	0.69 (0.09)	0.73 (0.09)	0.75 (0.08)	0.59 (0.14)	0.73 (0.09)	0.67 (0.11)	0.75 (0.08)	0.76 (0.08)	0.77 (0.08)	0.76 (0.08)	0.80 (0.07)	0.79 (0.04)	0.66 (0.12)	0.68 (0.12)	-	0.76 (0.08)	0.75 (0.08)
Meat and bone meal, 56%	1	91.2	55.7	0.61	0.72	0.72	0.47	0.66	0.69	0.68	0.68	0.71	0.72	0.74	0.71	0.54	0.59	0.57	0.61	0.70
Meat and bone meal, 57%	1	94.6	56.5	0.69	0.70	0.73	0.62	0.72	0.75	0.76	0.77	0.78	0.75	0.81	0.77	0.67	0.71	-	0.78	0.76

TABLE 4 (cont)

Summary: Dry matter (DM), total crude protein (TCP), apparent ileal digestibility coefficients of crude protein (CP) and amino acids in feedstuffs for broilers. Values in parentheses refer to standard deviation of mean estimates

Feedstuff	N	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
Meat and bone meal, 59%	1	95.5	58.6	0.60	0.67	0.54	0.40	0.34	0.55	0.64	0.56	0.57	0.48	0.72	0.59	0.39	0.44	-	0.48	0.54
Poultry meal	1	93.5	63.0	0.78	0.82	0.84	0.66	0.82	0.81	0.77	0.80	0.81	0.84	0.86	0.81	0.75	0.76	-	0.81	0.79
<i>Miscellaneous</i>																				
Biscuit meal	1	92.9	10.4	-	0.60	0.63	0.45	0.76	0.53	0.56	0.59	0.65	0.40	0.58	0.67	0.57	0.45	-	0.42	0.56
Casein	3	92.7	87.5	0.96	0.93 (0.01)	0.95 (0.02)	0.96 (0.01)	0.95 (0.02)	0.94 (0.02)	0.92 (0.02)	0.94 (0.02)	0.94 (0.02)	0.97 (0.01)	0.98 (0.01)	0.97 (0.01)	0.89 (0.03)	0.91 (0.01)	0.97	0.98 (0.01)	0.95 (0.01)
Dogfood scrap meal	1	92.7	23.1	-	0.77	0.80	0.70	0.85	0.73	0.76	0.78	0.81	0.75	0.82	0.81	0.74	0.70	-	0.75	0.77
Gelatin	1	92.1	88.2	0.92	0.95	0.97	0.83	0.91	0.93	0.82	0.91	0.91	0.95	0.89	0.92	0.88	0.85	-	0.89	0.91
Maize gluten	1	91.9	64.3	0.85	0.89	0.85	0.80	0.89	0.75	0.82	0.83	0.90	0.75	0.89	0.88	0.85	0.76	-	0.89	0.89

**TABLE 5 Digestible amino acid concentrations in feedstuffs**

Dry matter (DM), total (TCP) and digestible crude protein (CP) and amino acid concentrations in feedstuffs (g/100 g as received) for broilers.

Code	Feedstuff	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
<i>Cereals</i>																				
B01	Barley	89.6	8.50	-	0.27	0.36	0.34	1.88	0.23	0.15	0.24	0.52	0.25	0.10	0.36	0.27	0.19	0.08	0.18	0.35
M01	Maize	89.1	7.60	6.00	0.51	0.33	0.38	1.31	0.21	0.18	0.22	0.91	0.21	0.12	0.34	0.31	0.32	-	0.20	0.30
M02	Maize	88.1	7.80	6.24	0.55	0.35	0.45	1.46	0.25	0.20	0.26	0.93	0.20	0.15	0.36	0.24	0.18	-	0.18	0.34
M03	Maize	90.5	7.80	5.77	0.57	0.31	0.44	1.33	0.24	0.18	0.26	0.88	0.16	0.10	0.34	0.35	0.19	0.04	0.22	0.33
M04	Maize	90.2	7.90	6.79	0.60	0.34	0.46	1.65	0.25	0.22	0.28	1.09	0.22	0.12	0.41	0.33	0.26	0.04	0.18	0.40
M05	Maize	88.5	8.10	6.40	0.64	0.37	0.46	1.52	0.29	0.24	0.30	1.03	0.23	0.13	0.38	0.39	0.24	0.04	0.25	0.38
M06	Maize	91.9	8.10	6.48	0.67	0.37	0.53	1.55	0.31	0.22	0.31	1.04	0.22	0.15	0.39	0.42	0.25	0.05	0.26	0.39
M07	Maize	88.3	8.70	7.13	0.59	0.36	0.46	1.54	0.25	0.22	0.27	1.01	0.21	0.14	0.38	0.26	0.19	-	0.17	0.37
M08	Maize, high-lysine	92.0	9.80	7.74	0.61	0.59	0.79	1.56	0.42	0.32	0.32	0.84	0.35	0.12	0.37	0.44	0.30	0.06	0.26	0.48
S01	Sorghum	90.6	7.10	5.25	0.54	0.27	0.39	1.33	0.17	0.13	0.24	0.86	0.14	0.11	0.32	0.25	0.15	0.05	0.21	0.29
S02	Sorghum	90.1	8.02	5.84	0.52	0.19	0.32	1.24	0.14	0.11	0.21	0.77	0.10	0.08	0.28	0.25	0.14	-	0.14	0.25
S03	Sorghum	91.1	8.10	6.40	0.73	0.36	0.47	1.60	0.23	0.18	0.33	1.06	0.18	0.16	0.42	0.30	0.20	0.07	0.30	0.40
S04	Sorghum	90.2	8.75	6.31	0.59	0.22	0.38	1.37	0.16	0.13	0.24	0.88	0.11	0.09	0.32	0.29	0.17	-	0.18	0.28
S05	Sorghum	89.3	9.29	6.41	0.56	0.20	0.37	1.33	0.16	0.12	0.23	0.85	0.12	0.09	0.31	0.29	0.17	-	0.15	0.27
S06	Sorghum	89.2	9.82	7.90	0.59	0.22	0.41	1.39	0.17	0.13	0.25	0.89	0.12	0.10	0.33	0.31	0.18	-	0.17	0.30
S07	Sorghum	88.4	10.3	-	0.93	0.36	0.58	2.04	0.22	0.19	0.39	1.34	0.19	0.15	0.51	0.36	0.22	0.08	0.34	0.44

TABLE 5 (cont)

Dry matter (DM), total (TCP) and digestible crude protein (CP) and amino acid concentrations in feedstuffs (g/100 g as received) for broilers.

	Code	Feedstuff	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
47	S08	Sorghum	87.4	10.5	8.61	0.92	0.34	0.65	2.03	0.26	0.18	0.41	1.39	0.21	0.15	0.53	0.31	0.23	-	0.25	0.50
	S09	Sorghum	90.0	10.9	8.36	0.69	0.23	0.44	1.62	0.19	0.14	0.28	1.04	0.12	0.10	0.37	0.34	0.19	-	0.18	0.32
	S10	Sorghum	90.3	10.9	8.53	0.95	0.29	0.62	1.90	0.30	0.21	0.41	1.31	0.18	0.16	0.54	0.32	0.24	-	0.26	0.51
	S11	Sorghum	87.9	11.0	9.02	1.00	0.39	0.66	2.24	0.27	0.20	0.45	1.44	0.19	0.17	0.55	0.45	0.27	0.08	0.38	0.50
	S12	Sorghum	90.4	11.0	9.24	0.81	0.33	0.64	1.89	0.29	0.15	0.38	1.43	0.15	0.09	0.51	0.47	0.28	-	0.26	0.45
	S13	Sorghum	89.9	11.1	9.21	1.05	0.42	0.65	2.31	0.27	0.19	0.45	1.48	0.19	0.18	0.56	0.40	0.25	0.09	0.44	0.50
	S14	Sorghum	87.1	11.4	8.92	0.92	0.35	0.64	1.91	0.27	0.20	0.41	1.35	0.19	0.17	0.53	0.31	0.24	-	0.26	0.51
	S15	Sorghum	90.5	11.6	9.04	0.79	0.26	0.50	1.83	0.21	0.16	0.33	1.19	0.13	0.12	0.43	0.40	0.23	-	0.22	0.37
	S16	Sorghum	90.8	11.6	-	0.97	0.36	0.65	2.21	0.27	0.23	0.45	1.40	0.19	0.18	0.53	0.49	0.28	0.08	0.32	0.51
	S17	Sorghum	89.5	11.8	9.05	0.75	0.26	0.49	1.74	0.20	0.16	0.31	1.11	0.13	0.10	0.40	0.38	0.22	-	0.22	0.36
	T01	Triticale	90.5	10.2	7.75	0.32	0.45	0.48	2.54	0.30	0.20	0.28	0.60	0.29	0.13	0.43	0.38	0.24	0.08	0.24	0.36
	T02	Triticale	90.1	10.6	7.53	0.30	0.39	0.44	2.41	0.31	0.19	0.29	0.54	0.26	0.12	0.39	0.40	0.22	0.07	0.21	0.39
	T03	Triticale	91.2	10.7	8.24	0.33	0.40	0.45	2.39	0.34	0.20	0.33	0.55	0.28	0.14	0.39	0.38	0.23	0.08	0.18	0.41
	W01	Wheat, Triller	89.9	8.80	6.34	0.27	0.32	0.33	2.35	0.28	0.16	0.28	0.47	0.23	0.07	0.29	0.36	0.18	0.10	0.13	0.33
	W02	Wheat, Tailem Bent	93.6	9.00	6.93	0.27	0.32	0.35	2.71	0.30	0.19	0.28	0.55	0.21	0.09	0.37	0.44	0.21	-	0.16	0.32
	W03	Wheat	90.7	9.20	7.36	0.31	0.45	0.46	2.63	0.41	0.21	0.33	0.61	0.25	0.14	0.42	0.44	0.23	0.10	0.25	0.40
	W04	Wheat	92.7	9.30	7.53	0.31	0.37	0.41	2.85	0.34	0.22	0.32	0.60	0.25	0.09	0.41	0.47	0.24	-	0.18	0.38



TABLE 5 (cont)

Dry matter (DM), total (TCP) and digestible crude protein (CP) and amino acid concentrations in feedstuffs (g/100 g as received) for broilers.

	Code	Feedstuff	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
48	W05	Wheat	90.1	9.40	7.80	0.30	0.38	0.40	2.68	0.33	0.22	0.32	0.59	0.22	0.13	0.39	0.47	0.22	0.09	0.15	0.36
	W06	Wheat, Meering	88.9	9.60	7.49	0.30	0.33	0.38	2.88	0.33	0.22	0.32	0.65	0.24	0.10	0.40	0.48	0.21	-	0.18	0.36
	W07	Wheat	88.4	9.72	7.48	0.27	0.32	0.48	1.60	0.32	0.15	0.30	0.53	0.25	0.13	0.31	0.28	0.24	-	0.11	0.37
	W08	Wheat, Currawong	91.5	10.1	7.68	0.30	0.39	0.38	2.83	0.34	0.22	0.31	0.59	0.25	0.10	0.40	0.46	0.21	-	0.20	0.37
	W09	Wheat, Lowan	90.1	10.1	7.98	0.29	0.39	0.40	2.77	0.32	0.20	0.30	0.58	0.27	0.12	0.40	0.47	0.23	-	0.21	0.35
	W10	Wheat	88.0	10.4	8.00	0.30	0.39	0.37	1.80	0.37	0.21	0.33	0.64	0.23	0.11	0.43	0.32	0.19	-	0.19	0.39
	W11	Wheat, Harvey	91.0	10.4	8.42	0.31	0.40	0.43	3.09	0.36	0.21	0.32	0.64	0.25	0.12	0.44	0.52	0.25	-	0.27	0.38
	W12	Wheat, Murray Bridge	93.2	10.5	8.51	0.32	0.42	0.41	3.16	0.36	0.21	0.32	0.65	0.24	0.13	0.44	0.52	0.25	-	0.28	0.39
	W13	Wheat, Lawson	92.3	10.7	8.56	0.32	0.44	0.43	3.15	0.33	0.23	0.33	0.66	0.25	0.13	0.46	0.52	0.25	-	0.28	0.39
	W14	Wheat	90.4	10.8	8.10	0.32	0.43	0.42	3.16	0.39	0.23	0.35	0.66	0.24	0.13	0.46	0.45	0.24	0.09	0.27	0.41
	W15	Wheat	89.9	10.9	8.72	0.33	0.43	0.44	3.22	0.31	0.23	0.33	0.66	0.26	0.12	0.45	0.49	0.25	-	0.28	0.39
	W16	Wheat	88.9	11.6	9.16	0.38	0.50	0.63	2.16	0.46	0.25	0.42	0.78	0.33	0.17	0.47	0.39	0.31	-	0.21	0.51
	W17	Wheat	92.1	11.8	9.56	0.40	0.50	0.44	3.57	0.40	0.27	0.34	0.68	0.27	0.14	0.49	0.42	0.25	0.10	0.25	0.43
	W18	Wheat, Broadbent	92.6	11.8	9.91	0.37	0.47	0.49	3.76	0.43	0.26	0.38	0.75	0.30	0.12	0.52	0.62	0.29	-	0.28	0.45
	W19	Wheat	92.4	12.1	10.2	0.36	0.46	0.49	3.68	0.41	0.26	0.40	0.74	0.30	0.11	0.54	0.59	0.29	-	0.23	0.46
	W20	Wheat, Bouchier	91.0	12.3	10.2	0.36	0.46	0.47	4.13	0.43	0.27	0.41	0.79	0.27	0.12	0.56	0.66	0.30	-	0.28	0.47
	W21	Wheat, old season	92.0	12.5	10.5	0.36	0.45	0.46	3.81	0.44	0.25	0.43	0.76	0.26	0.17	0.54	0.54	0.29	0.13	0.29	0.48
	W22	Wheat, new season	91.7	13.7	11.5	0.40	0.51	0.52	4.12	0.48	0.27	0.48	0.83	0.29	0.20	0.59	0.59	0.32	0.14	0.33	0.54
	W23	Wheat	90.5	14.9	12.5	0.41	0.54	0.56	4.99	0.50	0.33	0.52	0.94	0.33	0.15	0.69	0.75	0.35	-	0.39	0.56

TABLE 5 (cont)

Dry matter (DM), total (TCP) and digestible crude protein (CP) and amino acid concentrations in feedstuffs (g/100 g as received) for broilers.

Code	Feedstuff	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
W24	Wheat	90.6	15.1	-	0.42	0.57	0.56	5.22	0.50	0.34	0.54	0.97	0.31	0.17	0.76	0.74	0.35	-	0.38	0.58
W25	Wheat	92.0	15.2	12.9	0.44	0.56	0.59	5.20	0.52	0.34	0.54	0.98	0.34	0.16	0.71	0.77	0.36	-	0.38	0.59
W26	Wheat	93.3	15.8	13.4	0.45	0.60	0.61	5.25	0.54	0.35	0.55	0.99	0.36	0.18	0.73	0.80	0.37	0.13	0.43	0.60
W27	Wheat, Warbler	93.4	16.2	13.4	0.44	0.60	0.69	5.04	0.62	0.35	0.54	0.96	0.35	0.16	0.66	0.84	0.40	-	0.32	0.58
<i>Cereal by-products</i>																				
MM01	Millmix	87.4	14.9	10.9	0.50	0.78	0.72	2.38	0.52	0.33	0.34	0.68	0.53	0.08	0.41	0.47	0.32	-	0.21	0.48
MM02	Millrun	92.1	15.1	10.4	0.49	0.68	0.69	2.67	0.52	0.29	0.38	0.68	0.42	0.17	0.45	0.50	0.32	0.16	0.28	0.50
RP01	Rice pollard	90.5	12.9	8.0	0.49	0.78	0.78	1.18	0.43	0.31	0.28	0.54	0.44	0.15	0.33	0.44	0.30	0.10	0.24	0.41
<i>Oilseed Meals</i>																				
CM01	Canola meal, full-fat	91.7	26.6	-	-	1.50	1.62	4.29	1.14	0.89	0.89	1.56	1.58	0.27	0.89	1.05	0.89	0.31	0.61	1.11
CM02	Canola meal	90.6	27.7	18.8	0.96	1.28	1.34	3.90	1.07	0.65	0.90	1.55	1.21	0.32	0.90	0.63	0.77	-	0.70	1.15
CM03	Canola meal	92.3	29.1	-	1.03	1.49	1.67	4.47	1.12	0.83	0.94	1.61	1.55	0.33	0.92	1.07	0.92	0.40	0.75	1.15
CM04	Canola Meal	89.2	29.7	23.8	0.98	1.58	1.70	4.38	1.19	0.84	0.95	1.67	1.55	0.40	0.97	1.20	1.05	0.34	0.72	1.11
CM05	Canola meal	88.7	31.2	23.4	1.06	1.65	1.70	4.86	1.18	0.72	1.00	1.75	1.74	0.38	1.00	0.74	0.86	-	0.78	1.26
CM06	Canola meal	88.5	34.0	25.5	1.24	1.88	1.89	5.49	1.40	0.82	1.15	2.06	1.77	0.37	1.13	0.87	1.00	-	0.88	1.51

**TABLE 5 (cont)**

Dry matter (DM), total (TCP) and digestible crude protein (CP) and amino acid concentrations in feedstuffs (g/100 g as received) for broilers.

Code	Feedstuff	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
CM07	Canola meal	91.7	35.0	23.1	0.93	1.42	1.37	4.71	1.11	0.71	0.73	1.57	1.24	0.51	1.05	1.05	0.77	0.35	0.76	0.93
CM08	Canola meal	92.9	35.1	27.0	1.21	1.80	1.78	5.13	1.35	1.01	1.22	1.95	1.48	0.53	1.13	1.20	1.12	0.31	0.84	1.44
CM09	Canola meal	90.6	35.5	27.3	1.21	1.68	1.78	5.18	1.36	0.79	1.18	1.94	1.51	0.50	1.11	1.29	1.12	0.27	0.82	1.38
CM10	Canola meal	89.7	36.5	26.6	1.30	1.92	1.95	5.82	1.43	0.94	1.22	2.16	1.67	0.42	1.24	0.89	1.03	-	0.89	1.54
CM11	Canola meal	88.9	37.0	28.9	1.38	2.12	2.16	6.26	1.55	0.89	1.30	2.31	1.87	0.44	1.27	0.91	1.10	-	0.95	1.68
CM12	Canola meal	94.0	37.9	30.7	1.38	2.16	2.16	5.66	1.58	0.93	1.22	2.28	1.99	0.51	1.22	1.42	1.31	-	0.87	1.50
CM13	Canola meal	92.3	38.8	29.5	1.39	2.09	1.98	6.01	1.46	0.91	1.14	2.24	1.58	0.55	1.26	1.23	1.16	0.41	0.95	1.47
CM14	Canola meal	90.8	39.4	29.6	1.26	1.88	1.81	5.42	1.55	0.82	1.12	2.09	1.55	0.48	1.12	1.30	1.17	-	0.80	1.38
CNM01	Copra meal	90.3	21.7	13.7	0.78	2.62	1.41	3.64	0.65	0.35	0.60	1.21	0.28	0.23	0.81	0.85	0.53	-	0.29	0.78
CSM01	Cottonseed meal	90.1	38.1	27.4	1.04	3.94	2.61	6.39	1.09	0.82	0.82	1.57	0.89	0.38	1.61	1.19	0.76	-	0.90	1.20
CSM02	Cottonseed meal	92.6	38.4	28.0	1.11	3.82	2.74	6.38	1.18	0.94	0.96	1.62	1.05	0.43	1.63	1.40	0.87	0.38	0.90	1.29
CSM03	Cottonseed meal	91.6	39.6	29.7	1.16	4.41	2.97	7.24	1.21	1.07	0.92	1.75	1.13	0.47	1.87	1.29	0.88	0.35	0.94	1.34
CSM04	Cottonseed meal	93.2	40.0	30.4	1.23	4.05	2.87	6.79	1.32	0.91	0.94	1.66	0.95	0.51	1.93	1.37	0.84	0.36	1.05	1.43
CSM05	Cottonseed meal	90.7	40.4	29.9	1.15	4.00	2.94	7.13	1.31	1.04	1.01	1.81	1.20	0.42	1.87	0.98	0.80	-	1.09	1.47
CSM06	Cottonseed meal	87.9	44.7	32.2	1.18	4.42	2.90	6.58	1.32	0.99	0.97	1.84	1.27	0.38	1.87	1.04	0.80	-	1.06	1.48
CSM07	Cottonseed meal	87.7	45.0	32.4	1.18	4.41	2.96	7.09	1.26	0.97	0.97	1.83	1.17	0.41	1.84	1.01	0.82	-	1.10	1.46
PKM01	Palm kernel meal	94.4	13.6	7.34	0.45	1.57	0.78	2.25	0.44	0.20	0.40	0.77	0.23	0.12	0.49	0.55	0.33	-	0.14	0.60

TABLE (5 (cont))

Dry matter (DM), total (TCP) and digestible crude protein (CP) and amino acid concentrations in feedstuffs (g/100 g as received) for broilers.

Code	Feedstuff	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
SBM01	Soyabean meal, full-fat	93.5	39.0	34.3	1.42	2.78	3.83	6.12	1.46	0.94	1.55	2.68	2.34	0.37	1.68	1.95	1.35	-	1.20	1.62
SBM02	Soyabean meal	89.8	44.8	37.2	1.57	2.72	3.90	6.81	1.45	1.01	1.76	2.77	2.18	0.49	1.86	2.20	1.44	0.5	1.39	1.78
SBM03	Soyabean meal	90.7	46.1	38.7	1.61	3.16	3.98	7.65	1.66	1.02	1.75	3.00	2.39	0.51	1.94	2.19	1.51	-	1.39	1.78
SBM04	Soyabean meal	90.2	46.3	37.5	1.67	3.21	4.35	7.25	1.52	1.04	1.69	3.07	2.63	0.55	2.00	2.43	1.46	0.53	1.47	1.76
SBM05	Soyabean meal	92.1	46.4	37.6	1.63	3.11	4.16	7.52	1.53	1.04	1.77	2.97	2.55	0.51	1.86	2.23	1.44	0.53	1.60	1.79
SBM06	Soyabean meal	92.8	46.7	38.3	1.59	3.16	4.14	7.58	1.49	1.16	1.47	2.83	2.54	0.58	2.06	1.88	1.38	0.49	1.57	1.73
SBM07	Soyabean meal	90.1	47.3	40.7	1.92	2.83	4.28	6.77	1.88	1.22	2.10	3.36	2.35	0.60	2.23	1.61	1.42	-	1.61	2.26
SBM08	Soyabean meal	90.2	47.7	39.1	1.64	3.16	4.46	7.24	1.53	1.10	1.78	3.04	2.47	0.53	1.99	1.97	1.44	-	1.57	1.88
SBM09	Soyabean meal	87.9	48.0	40.8	1.78	3.13	4.61	8.00	1.65	1.25	1.92	3.26	2.64	0.60	2.02	2.33	1.68	-	1.49	1.96
SBM10	Soyabean meal	95.6	48.1	39.4	1.73	3.37	4.72	7.93	1.95	1.23	1.89	3.16	2.46	0.66	1.98	2.47	1.63	-	1.38	1.99
SBM11	Soyabean meal	91.5	48.3	39.6	1.66	3.19	4.45	7.68	0.07	1.15	1.48	2.98	2.39	0.59	2.09	2.05	1.43	0.53	1.61	1.64
SBM12	Soyabean meal	88.1	48.7	41.4	1.80	3.22	4.70	7.98	1.70	1.28	1.95	3.26	2.72	0.62	2.04	2.37	1.68	-	1.47	2.00
SBM13	Soyabean meal	92.6	48.7	39.4	1.87	3.28	4.65	7.74	1.58	1.28	1.85	3.16	2.50	0.60	2.16	2.00	1.66	0.57	1.56	1.96
SBM14	Soyabean meal	90.9	49.0	40.2	1.93	3.37	5.06	8.06	1.79	1.28	2.03	3.29	2.93	0.65	2.32	2.13	1.65	0.60	1.62	2.13
SBM15	Soyabean meal	92.3	49.1	40.8	1.88	3.33	4.64	7.69	1.83	1.13	2.11	3.38	2.75	0.64	2.37	2.15	1.76	0.58	1.81	2.12
SBM16	Soyabean meal	90.9	49.8	41.3	1.96	3.32	4.67	7.81	1.89	1.22	2.00	3.37	2.67	0.58	2.10	2.47	1.75	-	1.54	2.07
SM01	Sunflower meal	90.6	31.0	24.8	1.04	2.15	2.06	4.82	1.37	0.61	0.97	1.66	0.87	0.65	1.18	0.99	0.86	0.27	0.73	1.21
SM02	Sunflower meal	91.0	34.6	28.7	1.27	2.73	2.69	6.21	1.42	0.62	1.13	1.94	0.98	0.81	1.40	1.19	1.00	-	0.80	1.39

TABLE 5 (cont)

Dry matter (DM), total (TCP) and digestible crude protein (CP) and amino acid concentrations in feedstuffs (g/100 g as received) for broilers.

Code	Feedstuff	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
SM03	Sunflower meal	94.6	36.3	30.5	1.23	2.67	2.51	5.31	1.70	0.68	1.25	1.91	0.86	0.40	1.39	1.29	1.03	-	0.74	1.48
SM04	Sunflower meal	93.5	36.6	28.9	1.22	2.67	2.56	5.87	1.61	0.71	1.15	1.82	1.00	0.73	1.39	1.17	0.96	0.32	0.79	1.41
<i>Grain Legumes</i>																				
CP01	Chickpea	93.0	21.3	15.3	0.65	1.95	1.77	2.63	0.58	0.46	0.69	1.11	1.01	0.14	0.90	0.84	0.51	0.13	0.41	0.74
FB01	Faba bean	92.3	23.8	15.7	0.71	1.82	1.78	2.77	0.67	0.43	0.70	1.19	1.10	0.10	0.68	0.84	0.57	0.12	0.50	0.79
FP01	Field Pea	91.1	21.6	14.3	0.66	1.61	1.70	2.66	0.64	0.38	0.61	1.00	1.15	0.10	0.67	0.76	0.53	0.13	0.39	0.71
FP02	Field Pea	90.6	22.9	18.1	0.81	2.22	2.18	3.28	0.76	0.48	0.66	1.25	1.35	0.13	0.81	0.86	0.64	0.14	0.55	0.78
FP03	Field pea	89.5	22.9	14.4	0.64	1.84	1.86	2.72	0.69	0.41	0.66	1.08	1.13	0.15	0.77	0.52	0.49	-	0.61	0.74
L01	Lupin, <i>angustifolius</i>	90.7	28.8	24.5	0.83	3.06	2.56	5.23	1.03	0.73	1.07	1.81	1.45	0.18	0.99	1.23	0.75	0.22	0.99	1.02
L02	Lupin, <i>angustifolius</i>	92.9	29.9	25.1	0.92	2.89	2.52	5.60	1.10	0.71	1.12	1.76	1.38	0.16	1.02	1.39	0.89	0.21	0.96	1.10
L03	Lupin, <i>angustifolius</i>	92.0	30.4	23.7	0.84	3.09	2.54	5.89	1.03	0.72	0.99	1.62	1.34	0.20	1.05	1.15	0.86	0.20	0.98	0.96
L04	Lupin, <i>angustifolius</i>	93.3	30.4	24.9	0.92	3.02	2.67	5.22	1.19	0.79	1.19	1.89	1.50	0.18	1.11	0.97	0.78	-	1.04	1.13
L05	Lupin, <i>angustifolius</i>	92.6	34.0	26.9	1.03	3.60	2.79	6.43	1.13	0.80	1.06	1.94	1.50	0.18	1.06	1.36	0.89	0.21	1.03	1.01
L06	Lupin, <i>albus</i>	93.5	34.7	27.4	0.95	3.39	2.85	5.72	1.11	0.66	1.26	1.98	1.30	0.17	1.07	1.55	1.00	0.23	1.29	1.18

TABLE 5 (cont)

Dry matter (DM), total (TCP) and digestible crude protein (CP) and amino acid concentrations in feedstuffs (g/100 g as received) for broilers.

Code	Feedstuff	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
<i>Animal Protein Meals</i>																				
BM01	Blood meal	91.9	89.7	-	6.22	3.06	8.09	6.74	3.13	5.19	0.55	10.0	8.41	1.12	5.58	4.65	4.08	1.08	2.31	7.14
BM02	Blood meal	92.7	91.3	-	6.01	3.25	8.76	6.55	3.24	5.37	0.43	10.5	7.48	1.17	5.90	4.83	4.49	-	2.41	7.30
FTM01	Feather meal	92.9	87.1	49.6	2.64	3.88	1.88	5.24	4.11	0.58	3.34	4.65	1.26	0.43	3.05	6.47	2.20	0.23	1.80	4.47
FM01	Fish meal	90.8	58.9	45.4	2.68	2.82	3.89	5.44	3.10	1.15	2.04	3.34	3.46	1.38	1.81	2.30	2.12	-	1.46	2.24
FM02	Fish meal	92.1	61.6	-	2.67	2.36	2.79	4.67	2.85	1.00	1.80	2.90	3.47	1.08	1.55	1.67	1.62	0.46	1.25	1.88
FM03	Fish meal	92.9	63.8	47.2	3.20	3.61	3.83	6.72	3.70	0.99	2.00	3.88	3.42	1.57	2.05	2.37	1.97	0.41	1.55	2.40
MBM01	Meat and bone meal	92.0	47.8	27.7	2.48	2.17	1.50	3.50	4.42	0.73	1.04	1.88	1.29	0.42	0.99	1.09	0.90	0.16	0.65	1.46
MBM02	Meat and bone meal	91.8	49.0	26.0	2.46	2.22	1.19	3.35	4.31	0.53	0.89	1.78	1.20	0.49	1.07	0.98	0.74	0.11	0.65	1.34
MBM03	Meat and bone meal	92.9	49.9	36.4	2.83	2.74	2.32	4.61	4.91	0.81	1.09	2.39	1.73	0.64	1.29	1.35	1.16	0.18	0.88	1.55
MBM04	Meat and bone meal	92.6	54.0	37.3	2.85	2.62	2.33	4.82	5.02	0.98	1.16	2.79	2.00	0.66	2.18	1.43	1.22	0.20	0.96	1.93
MBM05	Meat and bone meal	92.6	54.6	32.2	2.58	2.44	1.69	4.01	4.15	0.73	1.18	2.20	1.85	0.63	2.39	1.30	0.99	-	0.79	1.61
MBM06	Meat and bone meal	92.4	54.8	40.5	3.21	2.99	2.78	5.31	4.96	1.01	1.38	2.74	2.15	0.67	1.69	1.11	1.21	-	1.08	1.91
MBM07	Meat and bone meal	91.6	55.0	41.2	3.31	3.18	2.73	5.40	5.49	0.97	1.37	2.76	2.03	0.65	1.68	1.10	1.21	-	1.05	1.94
MBM08	Meat and bone meal	91.2	55.7	34.0	2.79	2.79	1.95	4.64	4.73	0.79	1.26	2.57	1.77	0.60	2.57	1.38	1.22	0.15	0.89	1.88

TABLE 5 (cont)

Dry matter (DM), total (TCP) and digestible crude protein (CP) and amino acid concentrations in feedstuffs (g/100 g as received) for broilers.

Code	Feedstuff	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
MBM09	Meat and bone meal	94.6	56.5	39.0	3.01	2.68	2.64	5.02	5.12	1.06	1.35	2.77	2.06	0.74	1.71	1.04	1.18	-	1.05	1.96
MBM10	Meat and bone meal	95.5	58.6	35.2	2.59	2.11	1.68	2.45	3.70	0.99	0.96	2.14	1.46	0.72	1.10	1.05	0.95	-	0.66	1.32
PM01	Poultry meal	93.5	63.0	49.1	3.12	3.52	3.25	6.47	4.65	1.32	1.82	3.47	3.24	1.16	1.81	2.12	1.94	-	1.42	2.17
<i>Miscellaneous</i>																				
MIS01	Biscuit meal	92.9	10.4	-	0.33	0.33	0.32	1.93	0.24	0.17	0.24	0.57	0.11	0.09	0.34	0.35	0.17	-	0.13	0.30
MIS02	Casein	93.1	87.0	-	3.05	3.36	7.55	18.9	16.6	2.34	5.10	8.19	9.27	3.02	4.83	4.94	4.02	1.14	5.55	6.20
MIS03	Casein	92.9	87.6	-	3.11	3.54	7.51	20.1	16.8	2.60	5.03	8.63	8.31	2.63	4.75	5.33	4.08	-	5.22	6.27
MIS04	Casein	92.0	87.9	84.4	3.05	3.40	7.64	19.5	17.2	2.61	5.12	8.66	8.27	2.63	4.80	5.24	4.04	-	5.36	5.99
MIS05	Dogfood scrap meal	92.7	23.1	-	1.04	1.04	1.13	3.87	1.10	0.43	0.73	1.54	0.77	0.29	0.86	1.09	0.62	-	0.56	0.86
MIS06	Gelatin	92.1	88.2	81.1	8.19	6.98	4.44	8.91	20.2	0.57	1.30	2.51	3.07	0.73	1.67	3.22	1.56	0	0.41	2.00
MIS07	Maize gluten	91.9	64.3	54.7	5.19	1.80	3.33	12.7	1.31	1.12	2.27	10.2	0.81	1.22	3.67	2.58	1.60	-	3.14	2.86

TABLE 6 Summary: Digestible amino acid concentrations in feedstuffs

Dry matter (DM), total (TCP) and digestible crude protein (CP) and amino acid concentrations in feedstuffs (g/100 g as received) for broilers.  
Values in parentheses refer to standard deviation of mean estimates

Feedstuff	N	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
<i>Cereals</i>																				
Barley	1	89.6	8.50	-	0.27	0.36	0.34	1.88	0.23	0.15	0.24	0.52	0.25	0.10	0.36	0.27	0.19	0.08	0.18	0.35
Maize	7	89.5	8.00	6.40 (0.46)	0.59 (0.06)	0.35 (0.02)	0.45 (0.04)	1.48 (0.12)	0.26 (0.03)	0.21 (0.02)	0.27 (0.03)	0.98 (0.08)	0.20 (0.02)	0.13 (0.02)	0.37 (0.03)	0.33 (0.07)	0.23 (0.05)	0.04 (0.01)	0.21 (0.04)	0.36 (0.04)
Maize, high lysine	1	92.0	9.80	7.74	0.61	0.59	0.79	1.56	0.42	0.32	0.32	0.84	0.35	0.01	0.37	0.44	0.30	0.06	0.26	0.48
Sorghum, 7%	1	90.6	7.10	5.25	0.54	0.27	0.39	1.33	0.17	0.13	0.24	0.86	0.14	0.11	0.32	0.25	0.15	0.05	0.21	0.29
Sorghum 8%	2	90.6	8.06	6.12 (0.39)	0.62 (0.15)	0.28 (0.12)	0.39 (0.11)	1.42 (0.26)	0.18 (0.07)	0.14 (0.05)	0.27 (0.08)	0.92 (0.20)	0.14 (0.14)	0.12 (0.05)	0.35 (0.10)	0.28 (0.04)	0.17 (0.04)	0.07	0.22 (0.12)	0.32 (0.11)
Sorghum 9%	2	89.8	9.02	6.36 (0.07)	0.57 (0.03)	0.21 (0.01)	0.37 (0.01)	1.35 (0.03)	0.16 (0.01)	0.12 (0.01)	0.24 (0.01)	0.86 (0.02)	0.12 (0)	0.09 (0)	0.31 (0)	0.29 (0)	0.17 (0)	-	0.16 (0.02)	0.28 (0.01)
Sorghum 10%	3	88.3	10.2	8.25 (0.50)	0.81 (0.19)	0.31 (0.07)	0.54 (0.12)	1.82 (0.37)	0.22 (0.04)	0.17 (0.03)	0.35 (0.08)	1.21 (0.28)	0.17 (0.05)	0.13 (0.03)	0.45 (0.11)	0.32 (0.03)	0.21 (0.02)	0.08	0.25 (0.09)	0.41 (0.11)
Sorghum, 11%	6	89.3	11.1	8.88 (0.36)	0.90 (0.13)	0.34 (0.07)	0.61 (0.08)	1.98 (0.26)	0.26 (0.04)	0.18 (0.03)	0.40 (0.06)	1.34 (0.16)	0.17 (0.03)	0.14 (0.04)	0.51 (0.07)	0.38 (0.07)	0.24 (0.03)	0.08	0.30 (0.09)	0.47 (0.08)
Sorghum, 12%	3	90.3	11.6	9.04 (0.01)	0.84 (0.11)	0.29 (0.06)	0.55 (0.09)	1.83 (0.10)	0.23 (0.04)	0.18 (0.04)	0.36 (0.08)	1.23 (0.15)	0.15 (0.03)	0.13 (0.04)	0.45 (0.07)	0.42 (0.06)	0.24 (0.03)	0.08	0.25 (0.06)	0.41 (0.09)
Triticale	3	90.6	10.5	7.91 (0.28)	0.32 (0.01)	0.41 (0.03)	0.47 (0.02)	2.45 (0.08)	0.33 (0.02)	0.20 (0)	0.30 (0.03)	0.57 (0.03)	0.28 (0.02)	0.13 (0.01)	0.41 (0.03)	0.41 (0.01)	0.24 (0.01)	0.08 (0.01)	0.21 (0.03)	0.39 (0.02)



TABLE 6 (cont)

Summary: Dry matter (DM), total (TCP) and digestible crude protein (CP) and amino acid concentrations in feedstuffs (g/100 g as received) for broilers. Values in parentheses refer to standard deviation of mean estimates

Feedstuff	N	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
Wheat, 9%	5	91.4	9.1	7.19 (0.57)	0.29 (0.02)	0.37 (0.06)	0.39 (0.05)	2.64 (0.18)	0.33 (0.05)	0.20 (0.03)	0.30 (0.02)	0.57 (0.06)	0.23 (0.02)	0.11 (0.03)	0.38 (0.05)	0.44 (0.05)	0.22 (0.03)	0.10 (0.01)	0.17 (0.05)	0.36 (0.03)
Wheat, 10%	7	90.2	10.1	7.94 (0.42)	0.30 (0.02)	0.38 (0.040)	0.41 (0.04)	2.59 (0.63)	0.34 (0.02)	0.20 (0.02)	0.31 (0.01)	0.61 (0.05)	0.25 (0.01)	0.12 (0.01)	0.40 (0.05)	0.44 (0.09)	0.23 (0.02)	-	0.21 (0.06)	0.37 (0.02)
Wheat, 11%	3	90.9	10.8	8.46 (0.32)	0.33 (0.01)	0.43 (0)	0.43 (0.01)	3.17 (0.04)	0.34 (0.04)	0.23 (0)	0.34 (0.01)	0.66 (0)	0.25 (0.01)	0.13 (0.01)	0.46 (0.01)	0.49 (0.03)	0.25 (0.01)	0.09	0.27 (0.01)	0.39 (0.01)
Wheat, 12%	5	91.4	11.9	9.80 (0.44)	0.38 (0.02)	0.48 (0.02)	0.50 (0.07)	3.46 (0.75)	0.43 (0.02)	0.26 (0.01)	0.39 (0.03)	0.75 (0.04)	0.29 (0.02)	0.13 (0.02)	0.52 (0.04)	0.54 (0.12)	0.29 (0.03)	0.10	0.25 (0.03)	0.46 (0.03)
Wheat, 13%	1	92.0	12.5	10.5	0.36	0.45	0.46	3.81	0.44	0.25	0.43	0.76	0.26	0.17	0.54	0.54	0.29	0.13	0.29	0.48
Wheat, 14%	1	91.7	13.7	11.5	0.40	0.51	0.52	4.12	0.48	0.27	0.48	0.83	0.29	0.20	0.59	0.59	0.32	0.14	0.33	0.54
Wheat, 15%	3	91.0	15.1	12.7 (0.29)	0.42 (0.01)	0.55 (0.02)	0.57 (0.02)	5.13 (0.13)	0.50 (0.01)	0.34 (0.01)	0.53 (0.01)	0.96 (0.02)	0.33 (0.01)	0.16 (0.01)	0.72 (0.04)	0.75 (0.01)	0.35 (0)	-	0.39 (0)	0.58 (0.01)
Wheat, 16%	2	93.4	16.0	13.4 (0.01)	0.44 (0.01)	0.60 (0)	0.65 (0.06)	5.14 (0.16)	0.58 (0.05)	0.35 (0)	0.54 (0.01)	0.98 (0.02)	0.35 (0.01)	0.17 (0.01)	0.70 (0.05)	0.70 (0.15)	0.39 (0.02)	0.13	0.37 (0.08)	0.59 (0.02)
<i>Cereal by-products</i>																				
Millmix	1	87.4	14.9	10.9	0.50	0.78	0.72	2.38	0.52	0.33	0.34	0.68	0.53	0.08	0.41	0.47	0.32	-	0.21	0.48
Millrun	1	92.1	15.1	10.4	0.49	0.68	0.69	2.67	0.52	0.29	0.38	0.68	0.42	0.17	0.45	0.50	0.32	0.16	0.28	0.50

TABLE 6 (cont)

Summary: Dry matter (DM), total (TCP) and digestible crude protein (CP) and amino acid concentrations in feedstuffs (g/100 g as received) for broilers. Values in parentheses refer to standard deviation of mean estimates

Feedstuff	N	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
Rice pollard	1	90.5	12.9	8.00	0.49	0.78	0.78	1.18	0.43	0.31	0.28	0.54	0.44	0.15	0.33	0.44	0.30	0.10	0.24	0.41
<i>Oilseed Meals</i>																				
Canola meal, full-fat	1	91.7	26.6	-	-	1.50	1.62	4.29	1.14	0.89	0.89	1.56	1.58	0.27	0.89	1.05	0.89	0.31	0.61	1.11
Canola meal, 28%	1	90.6	27.7	18.8	0.96	1.28	1.34	3.90	1.07	0.65	0.90	1.55	1.21	0.32	0.90	0.63	0.77	-	0.70	1.15
Canola meal, 29%	1	92.3	29.1	-	1.03	1.49	1.67	4.47	1.12	0.83	0.94	1.61	1.55	0.33	0.92	1.07	0.92	0.40	0.75	1.15
Canola Meal, 30%	1	89.2	29.7	23.8	0.98	1.58	1.70	4.38	1.19	0.84	0.95	1.67	1.55	0.40	0.97	1.20	1.05	0.34	0.72	1.11
Canola meal, 31%	1	88.7	31.2	23.4	1.06	1.65	1.70	4.86	1.18	0.72	1.00	1.75	1.74	0.38	1.00	0.74	0.86	-	0.78	1.26
Canola meal, 34%	1	88.5	34.0	25.5	1.24	1.88	1.89	5.49	1.40	0.82	1.15	2.06	1.77	0.37	1.13	0.87	1.00	-	0.88	1.51
Canola meal, 35%	3	91.7	35.2	25.8 (2.36)	1.11 (0.16)	1.63 (0.19)	1.64 (0.23)	5.01 (0.26)	1.27 (0.14)	0.88 (0.16)	1.04 (0.27)	1.82 (0.22)	1.51 (0.15)	0.51 (0.01)	1.10 (0.04)	1.18 (0.12)	1.08 (0.20)	0.31 (0.04)	0.81 (0.04)	1.25 (0.28)
Canola meal, 37%	2	89.3	36.8	27.8 (1.57)	1.34 (0.05)	2.02 (0.14)	2.06 (0.14)	6.04 (0.31)	1.49 (0.08)	0.91 (0.04)	1.26 (0.06)	2.24 (0.11)	1.77 (0.14)	0.43 (0.01)	1.26 (0.02)	0.90 (0.02)	1.06 (0.05)	-	0.92 (0.04)	1.61 (0.10)
Canola meal, 38%	1	94.0	37.9	30.7	1.38	2.16	2.16	5.66	1.58	0.93	1.22	2.28	1.99	0.51	1.22	1.42	1.31	-	0.87	1.50
Canola meal, 39%	2	91.6	39.1	29.5 (0.04)	1.33 (0.09)	1.98 (0.15)	1.90 (0.12)	5.72 (0.42)	1.51 (0.07)	0.87 (0.06)	1.13 (0.02)	2.17 (0.11)	1.56 (0.02)	0.52 (0.04)	1.19 (0.09)	1.26 (0.05)	1.16 (0)	0.41	0.87 (0.11)	1.42 (0.06)

**TABLE 6 (cont)**

**Summary:** Dry matter (DM), total (TCP) and digestible crude protein (CP) and amino acid concentrations in feedstuffs (g/100 g as received) for broilers. Values in parentheses refer to standard deviation of mean estimates

Feedstuff	N	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
Copra meal	1	90.3	21.7	13.7	0.78	2.62	1.41	3.64	0.65	0.35	0.60	1.21	0.28	0.23	0.81	0.85	0.53	-	0.29	0.78
Cottonseed meal, 38%	2	91.4	38.3	27.7 (0.42)	1.07 (0.05)	3.88 (0.09)	2.68 (0.09)	6.39 (0)	1.13 (0.07)	0.88 (0.08)	0.89 (0.10)	1.60 (0.04)	0.97 (0.11)	0.41 (0.03)	1.62 (0.01)	1.30 (0.15)	0.82 (0.08)	0.31	0.90 (0.01)	1.25 (0.07)
Cottonseed meal, 40%	3	91.8	40.0	30.0 (0.36)	1.18 (0.04)	4.15 (0.23)	2.93 (0.05)	7.05 (0.24)	1.28 (0.06)	1.00 (0.08)	0.96 (0.05)	1.74 (0.08)	1.09 (0.13)	0.47 (0.05)	1.89 (0.03)	1.21 (0.21)	0.84 (0.04)	0.36 (0.01)	1.02 (0.08)	1.41 (0.07)
Cottonseed meal, 45%	2	87.8	44.8	32.3 (0.13)	1.18 (0)	4.41 (0)	2.93 (0.04)	6.84 (0.36)	1.29 (0.04)	0.98 (0.01)	0.97 (0)	1.83 (0.01)	1.22 (0.07)	0.40 (0.02)	1.85 (0.02)	1.03 (0.02)	0.81 (0.01)	-	1.08 (0.03)	1.47 (0.01)
Palm kernel meal	1	94.4	13.6	7.34	0.45	1.57	0.78	2.25	0.44	0.20	0.40	0.77	0.23	0.12	0.49	0.55	0.33	-	0.14	0.60
Soyabean meal, full-fat	1	93.5	39.0	34.3	1.42	2.78	3.83	6.12	1.46	0.94	1.55	2.68	2.34	0.37	1.68	1.95	1.35	-	1.20	1.62
Soyabean meal, 45%	1	89.8	44.8	37.2	1.57	2.72	3.90	6.81	1.45	1.01	1.76	2.77	2.18	0.49	1.86	2.20	1.44	0.50	1.39	1.78
Soyabean meal, 46%	3	91.0	46.3	37.9 (0.68)	1.64 (0.03)	3.16 (0.05)	4.16 (0.19)	7.47 (0.20)	1.57 (0.08)	1.03 (0.02)	1.74 (0.04)	3.01 (0.05)	2.52 (0.12)	0.52 (0.03)	1.93 (0.07)	2.28 (0.13)	1.47 (0.04)	0.53	1.49 (0.11)	1.78 (0.01)
Soyabean meal, 47%	2	91.5	47.0	39.5 (1.71)	1.75 (0.24)	3.00 (0.23)	4.21 (0.10)	7.17 (0.57)	1.68 (0.28)	1.19 (0.04)	1.79 (0.45)	3.10 (0.37)	2.45 (0.14)	0.59 (0.01)	2.15 (0.12)	1.75 (0.19)	1.40 (0.03)	0.49	1.59 (0.03)	2.00 (0.37)
Soyabean meal, 48%	4	91.3	48.0	39.7 (0.72)	1.70 (0.07)	3.21 (0.11)	4.56 (0.13)	7.71 (0.34)	1.30 (0.84)	1.18 (0.07)	1.77 (0.20)	3.11 (0.12)	2.49 (0.11)	0.59 (0.05)	2.02 (0.05)	2.20 (0.24)	1.55 (0.13)	0.53	1.51 (0.10)	1.87 (0.16)
Soyabean meal, 49%	4	91.0	48.9	40.4 (0.82)	1.87 (0.05)	3.30 (0.06)	4.77 (0.20)	7.87 (0.18)	1.73 (0.11)	1.24 (0.07)	1.98 (0.11)	3.27 (0.09)	2.72 (0.18)	0.63 (0.02)	2.22 (0.15)	2.16 (0.16)	1.68 (0.05)	0.58 (0.15)	1.61 (0.15)	2.05 (0.09)

TABLE 6 (cont)

Summary: Dry matter (DM), total (TCP) and digestible crude protein (CP) and amino acid concentrations in feedstuffs (g/100 g as received) for broilers. Values in parentheses refer to standard deviation of mean estimates

Feedstuff	N	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
Soyabean meal, 50%	1	90.9	49.8	41.3	1.96	3.32	4.67	7.81	1.89	1.22	2.00	3.37	2.67	0.58	2.10	2.47	1.75	-	1.54	2.07
Sunflower meal, 31%	1	90.6	31.0	24.8	1.04	2.15	2.06	4.82	1.37	0.61	0.97	1.66	0.87	0.65	1.18	0.99	0.86	0.27	0.73	1.21
Sunflower meal, 35%	1	91.0	34.6	28.7	-	2.73	2.69	6.21	1.42	0.62	1.13	1.94	0.98	0.81	1.40	1.19	1.00	-	0.80	1.39
Sunflower meal, 36%	1	94.6	36.3	30.5	1.23	2.67	2.51	5.31	1.70	0.68	1.25	1.91	0.86	0.40	1.39	1.29	1.03	-	0.74	1.48
Sunflower meal, 37%	1	93.5	36.6	28.9	1.22	2.67	2.56	5.87	1.61	5.57	1.15	1.82	1.00	0.73	1.39	1.17	0.96	0.32	0.79	1.41
<i>Grain Legumes</i>																				
Chickpea	1	93.0	21.3	15.3	0.65	1.95	1.77	2.63	0.58	0.46	0.69	1.11	1.01	0.14	0.90	0.84	0.51	0.13	0.41	0.74
Faba bean	1	92.3	23.8	15.7	0.71	1.82	1.78	2.77	0.67	0.43	0.70	1.19	1.10	0.10	0.68	0.84	0.57	0.12	0.50	0.79
Field pea	3	90.4	22.5	15.6 (2.17)	0.70 (0.09)	1.89 (0.30)	1.91 (0.24)	2.89 (0.34)	0.70 (0.06)	0.42 (0.05)	0.64 (0.03)	1.11 (0.13)	1.21 (0.12)	0.13 (0.03)	0.75 (0.07)	0.71 (0.18)	0.55 (0.07)	0.14 (0.01)	0.52 (0.11)	0.74 (0.04)
Lupin, <i>angustifolius</i>	5	92.3	30.7	25.0 (1.16)	0.91 (0.08)	3.13 (0.27)	2.61 (0.12)	5.67 (0.51)	1.09 (0.07)	0.75 (0.04)	1.08 (0.07)	1.80 (0.12)	1.43 (0.07)	0.18 (0.01)	1.05 (0.05)	1.22 (0.17)	0.83 (0.06)	0.21 (0.01)	1.00 (0.03)	1.04 (0.07)
Lupin, <i>albus</i>	1	93.5	34.7	27.4	0.95	3.39	2.85	5.72	1.11	0.66	1.26	1.98	1.30	0.17	1.07	1.55	1.00	0.23	1.29	1.18

**TABLE 6 (cont)**

**Summary:** Dry matter (DM), total (TCP) and digestible crude protein (CP) and amino acid concentrations in feedstuffs (g/100 g as received) for broilers. Values in parentheses refer to standard deviation of mean estimates

Feedstuff	N	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
<i>Animal Protein Meals</i>																				
Blood meal	2	92.3	90.5	-	6.12 (0.15)	3.16 (0.13)	8.42 (0.47)	6.65 (0.13)	3.18 (0.08)	5.28 (0.13)	0.49 (0.08)	10.27 (0.33)	7.94 (0.66)	1.14 (0.04)	5.74 (0.22)	4.74 (0.13)	4.29 (0.29)	0.18	2.36 (0.07)	7.22 (0.11)
Feather meal	1	92.9	87.1	49.6	2.64	3.88	1.88	5.24	4.11	0.58	3.34	4.65	1.26	0.43	3.05	6.47	2.20	0.23	1.80	4.47
Fish meal	3	91.9	61.4	46.3 (1.31)	2.85 (0.31)	2.93 (0.63)	3.50 (0.62)	5.61 (1.03)	3.22 (0.44)	1.04 (0.09)	1.95 (0.13)	3.37 (0.49)	3.45 (0.03)	1.34 (0.25)	1.80 (0.25)	2.11 (0.38)	1.90 (0.26)	0.44 (0.04)	1.42 (0.16)	2.17 (0.27)
Meat and bone meal, 48%	1	92.0	47.8	27.7	2.48	2.17	1.50	3.50	4.42	0.73	1.04	1.88	1.29	0.42	0.99	1.09	0.90	0.16	0.65	1.46
Meat and bone meal, 49%	1	91.8	49.0	26.0	2.46	2.22	1.19	3.35	4.31	0.53	0.89	1.78	1.20	0.49	1.07	0.98	0.74	0.11	0.65	1.34
Meat and bone meal, 50%	1	92.9	49.9	36.4	2.83	2.74	2.32	4.61	4.91	0.81	1.09	2.39	1.73	0.64	1.29	1.35	1.16	0.18	0.88	1.55
Meat and bone meal, 54%	1	92.6	54.0	37.3	2.85	2.62	2.33	4.82	5.02	0.98	1.16	2.79	2.00	0.66	2.18	1.43	1.22	0.20	0.96	1.93
Meat and bone meal, 55%	3	92.2	54.8	38.0 (5.01)	3.03 (0.40)	2.87 (0.39)	2.40 (0.62)	4.91 (0.78)	4.87 (0.68)	0.90 (0.15)	1.31 (0.11)	2.56 (0.32)	2.01 (0.15)	0.65 (0.02)	1.92 (0.41)	1.17 (0.11)	1.14 (0.12)	-	0.97 (0.16)	1.82 (0.18)
Meat and bone meal, 56%	1	91.2	55.7	34.0	2.79	2.79	1.95	4.64	4.73	0.79	1.26	2.57	1.77	0.60	2.57	1.38	1.22	0.15	0.89	1.88
Meat and bone meal, 57%	1	94.6	56.5	39.0	3.01	2.68	2.64	5.02	5.12	1.06	1.35	2.77	2.06	0.74	1.17	1.04	1.18	-	1.05	1.96
Meat and bone meal, 59%	1	95.5	58.6	35.2	2.59	2.11	1.68	2.45	3.70	0.99	0.96	2.14	1.46	0.72	1.10	1.05	0.95	-	0.66	1.32
Poultry meal	1	93.5	63.0	49.1	3.12	3.52	3.25	6.47	4.65	1.32	1.82	3.47	3.24	1.16	1.81	2.12	1.94	-	1.42	2.17

TABLE 6 (cont)

Summary: Dry matter (DM), total (TCP) and digestible crude protein (CP) and amino acid concentrations in feedstuffs (g/100 g as received) for broilers. Values in parentheses refer to standard deviation of mean estimates

Feedstuff	N	DM	TCP	CP	ALA	ARG	ASP	GLU	GLY	HIS	ILE	LEU	LYS	MET	PHE	SER	THR	TRY	TYR	VAL
<i>Miscellaneous</i>																				
Biscuit meal	1	92.9	10.4	-	0.33	0.33	0.32	1.93	0.24	0.17	0.24	0.57	0.11	0.09	0.34	0.35	0.17	-	0.13	0.30
Casein	3	92.7	87.5	84.4 (0)	3.07 (0.03)	3.43 (0.10)	7.57 (0.07)	19.5 (0.59)	16.9 (0.27)	2.52 (0.15)	5.08 (0.05)	8.49 (0.26)	8.62 (0.57)	2.76 (0.23)	4.79 (0.04)	5.17 (0.21)	4.05 (0.03)	1.14	5.37 (0.17)	6.16 (0.14)
Dogfood scrap meal	1	92.7	23.1	-	1.04	1.04	1.13	3.87	1.10	0.43	0.73	1.54	0.77	0.29	0.86	1.09	0.62	-	0.56	0.86
Gelatin	1	92.1	88.2	81.1	8.19	6.98	4.44	8.91	20.2	0.57	1.30	2.51	3.07	0.73	1.67	3.22	1.56	-	0.41	2.00
Maize gluten	1	91.9	64.3	54.7	5.19	1.80	3.33	12.7	1.31	1.12	2.27	10.2	0.81	1.22	3.67	2.58	1.60	-	3.14	2.86

**TABLE 7 Linear regression analyses for maize**

Linear regression equations describing total and apparent ileal digestible amino acid content as function of total (TCP) and apparent ileal digestible crude protein (DCP) content (g/kg air dry basis) of maize samples (n = 8)

Amino acid	Regression equations describing total AA content as a function of TCP content		Regression equations describing apparent ileal digestible AA content as a function of TCP content		Regression equations describing apparent ileal digestible AA content as a function of apparent ileal DCP content	
	Regression equations	R	Regression equations	R	Regression equations	R
Alanine	= TCP x 0.037 + 0.360	0.47	= TCP x 0.024 + 0.392	0.35	= DCP x 0.030 + 0.040	0.38
Arginine	= TCP x 0.122 - 0.574	0.93**	= TCP x 0.114 - 0.562	0.93**	= DCP x 0.114 - 0.368	0.82*
Aspartic acid	= TCP x 0.171 - 0.793	0.90**	= TCP x 0.160 - 0.816	0.91**	= DCP x 0.157 - 0.532	0.80*
Glutamic acid	= TCP x 0.084 + 0.947	0.55	= TCP x 0.073 + 0.886	0.45	= DCP x 0.132 + 0.623	0.72*
Glycine	= TCP x 0.097 - 0.428	0.87**	= TCP x 0.079 - 0.373	0.87**	= DCP x 0.077 - 0.226	0.75*
Histidine	= TCP x 0.063 - 0.261	0.92**	= TCP x 0.057 - 0.248	0.92**	= DCP x 0.062 - 0.182	0.88*
Isoleucine	= TCP x 0.039 + 0.005	0.70	= TCP x 0.027 - 0.034	0.66	= DCP x 0.032 + 0.065	0.64
Leucine	= TCP x (-0.029 + 1.303	0.26	= TCP x (-0.041 + 1.305	0.34	= DCP x (-0.0002) + 0.967	0.0
Lysine	= TCP x 0.078 - 0.365	0.88**	= TCP x 0.066 - 0.322	0.87**	= DCP x 0.072 - 0.249	0.84*
Methionine	= TCP x 0.002 + 0.131	0.07	= TCP x (-0.048) + 0.511	0.76*	= DCP x (-0.041) + 0.383	0.57
Phenylalanine	= TCP x 0.015 + 0.307	0.42	= TCP x 0.007 + 0.317	0.20	= DCP x 0.019 + 0.243	0.51
Serine	= TCP x 0.060 - 0.057	0.45	= TCP x 0.045 - 0.032	0.45	= DCP x 0.034 + 0.120	0.30
Threonine	= TCP x 0.005 + 0.306	0.06	= TCP x 0.017 + 0.105	0.23	= DCP x 0.021 + 0.103	0.26
Tyrosine	= TCP x 0.024 + 0.080	0.39	= TCP x 0.020 + 0.048	0.39	= DCP x 0.009 + 0.155	0.15
Valine	= TCP x 0.081 - 0.212	0.88**	= TCP x 0.065 - 0.160	0.85**	= DCP x 0.075 + 0.120	0.88**
Average amino acid	= TCP x 0.057 + 0.050	0.84**	= TCP x 0.045 + 0.072	0.76*	= DCP x 0.053 + 0.092	0.80*

\* P<0.05; \*\* P<0.01

DCP = TCP x 0.808 - 0.08 R = 0.91

**TABLE 8 Linear regression analyses for sorghum**

Linear regression equations describing total and apparent ileal digestible amino acid content as function of total (TCP) and apparent ileal digestible crude protein (DCP) content (g/kg air dry basis) of sorghum samples (n = 7)

Amino acid	Regression equations describing total AA content as a function of TCP content		Regression equations describing apparent ileal digestible AA content as a function of TCP content		Regression equations describing apparent ileal digestible AA content as a function of apparent ileal DCP content	
	Regression equations	R	Regression equations	R	Regression equations	R
Alanine	= TCP x 0.074 + 0.134	0.96**	= TCP x 0.068 – 0.436	0.96**	= DCP x 0.070 + 1.092	0.93**
Arginine	= TCP x 0.020 + 0.953	0.98**	= TCP x 0.019 + 0.359	0.94**	= DCP x 0.020 + 0.736	0.94**
Aspartic acid	= TCP x 0.046 + 0.601	0.98**	= TCP x 0.045 – 0.335	0.98**	= DCP x 0.047 + 0.593	0.97**
Glutamic acid	= TCP x 0.165 + 1.126	0.96**	= TCP x 0.152 – 0.129	0.96**	= DCP x 0.155 + 3.313	0.93**
Glycine	= TCP x 0.017 + 0.79	0.91**	= TCP x 0.018 – 0.025	0.97**	= DCP x 0.018 + 0.366	0.95**
Histidine	= TCP x 0.015 + 0.553	0.97**	= TCP x 0.013 + 0.047	0.94**	= DCP x 0.014 + 0.321	0.93**
Isoleucine	= TCP x 0.029 + 0.361	0.97**	= TCP x 0.027 – 0.084	0.95**	= DCP x 0.029 + 0.483	0.94**
Leucine	= TCP x 0.109 + 0.358	0.96**	= TCP x 0.100 – 0.473	0.96**	= DCP x 0.103 + 1.818	0.93**
Lysine	= TCP x 0.007 + 0.968	0.74	= TCP x 0.007 + 0.467	0.92**	= DCP x 0.007 + 0.650	0.86*
Methionine	= TCP x 0.007 + 0.485	0.90**	= TCP x 0.007 + 0.273	0.83*	= DCP x 0.008 + 0.394	0.86*
Phenylalanine	= TCP x 0.037 + 0.453	0.96**	= TCP x 0.035 – 0.003	0.96**	= DCP x 0.036 + 0.771	0.93**
Serine	= TCP x 0.036 + 0.613	0.97**	= TCP x 0.035 – 0.293	0.97**	= DCP x 0.036 + 0.507	0.94**
Threonine	= TCP x 0.021 + 0.654	0.97**	= TCP x 0.021 – 0.235	0.96**	= DCP x 0.022 + 0.221	0.94**
Tyrosine	= TCP x 0.021 + 0.231	0.92**	= TCP x 0.020 – 0.180	0.87**	= DCP x 0.020 + 0.241	0.86*
Valine	= TCP x 0.032 + 0.769	0.98**	= TCP x 0.031 – 0.012	0.96**	= DCP x 0.032 + 0.636	0.94**
Average amino acid	= TCP x 0.042 + 0.603	0.97**	= TCP x 0.040 – 0.072	0.96**	= DCP x 0.041 + 0.806	0.94**

\* P<0.05; \*\* P<0.01

DCP = TCP x 0.92 -16.7 R = 0.98



**Table 9 Linear regression analyses for wheat**

Linear regression equations describing total and apparent ileal digestible amino acid content as function of total (TCP) and apparent ileal digestible crude protein (DCP) content (g/kg air dry basis) of wheat samples (n=21) (CP = N x5.89)

Amino acid	Regression equations describing total AA content as a function of TCP content		Regression equations describing apparent ileal digestible AA content as a function of TCP content		Regression equations describing apparent ileal digestible AA content as a function of apparent ileal DCP content	
	Regression equations	R	Regression equations	R	Regression equations	R
Alanine	= TCP x 0.026 + 1.403	0.99**	= TCP x 0.025 + 0.586	0.98**	= DCP x 0.026 + 0.960	0.99**
Arginine	= TCP x 0.040 + 1.022	0.97**	= TCP x 0.036 + 0.326	0.95**	= DCP x 0.038 + 0.894	0.96**
Aspartic acid	= TCP x 0.042 + 1.401	0.96**	= TCP x 0.038 + 0.213	0.95**	= DCP x 0.040 + 0.839	0.95**
Glutamic acid	= TCP x 0.393 – 7.325	0.99**	= TCP x 0.383 – 8.655	0.98**	= DCP x 0.408 – 2.582	0.99**
Glycine	= TCP x 0.038 + 0.651	0.97**	= TCP x 0.035 – 0.161	0.96**	= DCP x 0.038 + 0.415	0.97**
Histidine	= TCP x 0.025 + 0.221	0.97**	= TCP x 0.024 - 0.239	0.97**	= DCP x 0.025 + 0.129	0.98**
Isoleucine	= TCP x 0.040 – 0.198	0.98**	= TCP x 0.038 – 0.700	0.98**	= DCP x 0.041 - 0.081	0.98**
Leucine	= TCP x 0.068 + 0.523	>0.99**	= TCP x 0.066 – 0.422	>0.99**	= DCP x 0.070 + 0.630	>0.99**
Lysine	= TCP x 0.017 + 1.729	0.90**	= TCP x 0.016 + 0.919	0.91**	= DCP x 0.017 + 1.165	0.92**
Methionine	= TCP x 0.013 – 0.005	0.90**	= TCP x 0.011 - 0.091	0.92**	= DCP x 0.012 + 0.093	0.92**
Phenylalanine	= TCP x 0.052 - 0.371	0.97**	= TCP x 0.052 – 1.041	0.97**	= DCP x 0.055 - 0.237	0.97**
Serine	= TCP x 0.060 + 0.109	0.98**	= TCP x 0.058 – 0.889	0.97**	= DCP x 0.062 + 0.046	0.97**
Threonine	= TCP x 0.029 + 0.552	0.96**	= TCP x 0.027 – 0.278	0.94**	= DCP x 0.029 + 0.153	0.94**
Tyrosine	= TCP x 0.033 – 0.568	0.93**	= TCP x 0.031 – 1.037	0.91**	= DCP x 0.033 - 0.570	0.93**
Valine	= TCP x 0.041 + 0.633	0.98**	= TCP x 0.039 – 0.153	0.98**	= DCP x 0.041 + 0.461	0.98**
Average amino acid	= TCP x 0.061 - 0.015	>0.99**	= TCP x 0.059 – 0.775	>0.99**	= DCP x 0.062 + 0.154	>0.99**

\* P<0.05; \*\* P<0.01

DCP = TCP x 0.94 -15.94 R = 0.99

**TABLE 10 Linear regression analyses for canola meal**

Linea regression equations describing total and apparent ileal digestible amino acid content as function of total (TCP) and apparent ileal digestible crude protein (DCP) content (g/kg air dry basis) of canola meal samples (n=14)

Amino acid	Regression equations describing total AA content as a function of TCP content		Regression equations describing apparent ileal digestible AA content as a function of TCP content		Regression equations describing apparent ileal digestible AA content as a function of apparent ileal DCP content	
	Regression equations	R	Regression equations	R	Regression equations	R
Alanine	= TCP x 0.039 + 2.01	0.93**	= TCP x 0.037 - 0.552	0.94**	= DCP x 0.044 + 0.50	0.89**
Arginine	= TCP x 0.057 + 1.57	0.91**	= TCP x 0.060 - 2.57	0.89**	= DCP x 0.073 - 1.27	0.91**
Aspartic acid	= TCP x 0.055 + 5.67	0.90**	= TCP x 0.045 + 2.92	0.79**	= DCP x 0.064 + 1.19	0.86**
Glutamic acid	= TCP x 0.192 - 0.387	0.96**	= TCP x 0.158 - 2.17	0.89**	= DCP x 0.172 - 7.32	0.86**
Glycine	= TCP x 0.042 + 2.92	0.90**	= TCP x 0.042 - 1.02	0.96**	= DCP x 0.049 + 0.81	0.94**
Histidine	= TCP x 0.016 + 5.40	0.56*	= TCP x 0.015 + 3.167	0.62*	= DCP x 0.023 + 2.26	0.75**
Isoleucine	= TCP x 0.028 + 4.59	0.78**	= TCP x 0.027 + 1.75	0.84**	= DCP x 0.036 + 1.47	0.75**
Leucine	= TCP x 0.064 + 2.79	0.95**	= TCP x 0.062 - 1.68	0.93**	= DCP x 0.071 + 0.99	0.90**
Lysine	= TCP x 0.027 + 11.27	0.63*	= TCP x 0.025 + 7.76	0.48	= DCP x 0.044 + 4.53	0.65*
Methionine	= TCP x 0.019 - 1.80	0.87**	= TCP x 0.016 - 1.20	0.83**	= DCP x 0.015 + 0.62	0.71**
Phenylalanine	= TCP x 0.030 + 3.50	0.90*	= TCP x 0.030 + 0.93	0.88**	= DCP x 0.030 + 3.36	0.86**
Serine	= TCP x 0.033 + 3.97	0.43	= TCP x 0.034 - 1.12	0.55	= DCP x 0.052 - 2.91	0.71**
Threonine	= TCP x 0.038 + 2.39	0.81**	= TCP x 0.031 - 0.124	0.83**	= DCP x 0.044 - 1.11	0.91**
Tyrosine	= TCP x 0.018 + 4.64	0.82**	= TCP x 0.017 + 2.56	0.80**	= DCP x 0.018 + 3.45	0.77**
Valine	= TCP x 0.040 + 4.69	0.80**	= TCP x 0.036 + 1.33	0.81**	= DCP x 0.044 + 1.99	0.72**
Average amino acid	= TCP x 0.047 + 3.34	0.96**	= TCP x 0.042 - 0.67	0.92**	DCP x 0.052 + 1.55	0.94**

\*P<0.05; \*\* P<0.01

DCP = TCP x 0.86 - 37.8 R=0.91

**TABLE 11 Linear regression analyses for Cottonseed meal**

Linear regression equations describing total and apparent ileal digestible amino acid content as function of total (TCP) and apparent ileal digestible crude protein (DCP) content (g/kg air dry basis) of cottonseed meal samples (n=7)

Amino acid	Regression equations describing total AA content as a function of TCP content		Regression equations describing apparent ileal digestible AA content as a function of TCP content		Regression equations describing apparent ileal digestible AA content as a function of apparent ileal DCP content	
	Regression equations	R	Regression equations	R	Regression equations	R
Alanine	= TCP x 0.030 + 0.495	0.85*	= TCP x 0.012 + 0.674	0.54	= DCP x 0.025 + 0.410	0.77*
Arginine	= TCP x 0.093 + 1.066	0.84*	= TCP x 0.069 + 1.317	0.77*	= DCP x 0.107 + 0.929	0.80*
Aspartic acid	= TCP x 0.064 + 1.325	0.90**	= TCP x 0.028 + 1.691	0.60	= DCP x 0.055 + 1.217	0.78*
Glutamic acid	= TCP x 0.075 + 5.128	0.52	= TCP x 0.038 + 5.250	0.30	= DCP x 0.090 + 4.096	0.48
Glycine	= TCP x 0.038 + 0.268	0.80*	= TCP x 0.018 + 0.486	0.60	= DCP x 0.036 + 0.176	0.78*
Histidine	= TCP x 0.009 + 0.924	0.30	= TCP x 0.010 + 0.572	0.32	= DCP x 0.020 + 0.362	0.46
Isoleucine	= TCP x 0.037 – 0.100	0.88**	= TCP x 0.011 + 0.504	0.50	= DCP x 0.019 + 0.374	0.60
Leucine	= TCP x 0.065 – 0.105	0.97**	= TCP x 0.032 + 0.410	0.84*	= DCP x 0.050 + 0.233	0.87*
Lysine	= TCP x 0.054 – 0.271	0.75	= TCP x 0.035 – 0.344	0.72	= DCP x 0.051 – 0.445	0.71
Methionine	= TCP x (-0.004) + 0.744	0.23	= TCP x (-0.005) + 0.642	0.31	= DCP x (-0.0003) + 0.438	0.013
Phenylalanine	= TCP x 0.040 + 0.663	0.72	= TCP x 0.024 + 0.83	0.53	= DCP x 0.051 + 0.265	0.76*
Serine	= TCP x (-0.059) + 4.118	0.63	= TCP x (-0.042) + 2.901	0.68	= DCP x (-0.052) + 2.736	0.56
Threonine	= TCP x (-0.001) + 1.415	0.07	= TCP x (-0.002) + 0.925	0.17	= DCP x 0.0002 + 0.819	0.008
Tyrosine	= TCP x 0.028 + 0.204	0.85*	= TCP x 0.024 + 0.022	0.77*	= DCP x 0.040 – 0.189	0.85*
Valine	= TCP x 0.061 – 0.480	0.94**	= TCP x 0.029 + 0.192	0.77*	= DCP x 0.050 – 0.121	0.89**
Average amino acid	= TCP x 0.035 + 1.023	0.84*	= TCP x 0.019 + 1.067	0.61	DCP x 0.036 + 0.741	0.80*

\* P<0.05; \*\* P<0.01

DCP = TCP x 0.635 + 4.017; R= 0.95 \*\*

**TABLE 12 Linear regression analyses for soybean meal**

Linear regression equations describing total and apparent ileal digestible amino acid content as function of total (TCP) and apparent ileal digestible crude protein (DCP) content (g/kg air dry basis) of soybean meal samples (n=14)

Amino acid	Regression equations describing total AA content as a function of TCP content		Regression equations describing apparent ileal digestible AA content as a function of TCP content		Regression equations describing apparent ileal digestible AA content as a function of apparent ileal DCP content	
	Regression equations	R	Regression equations	R	Regression equations	R
Alanine	= TCP x 0.061 – 8.18	0.860**	= TCP x 0.049 – 5.90	0.802**	= DCP x 0.069 – 9.90	0.830**
Arginine	= TCP x 0.080 – 2.52	0.796**	= TCP x 0.060 + 3.06	0.754**	= DCP x 0.066 + 5.47	0.610*
Aspartic acid	= TCP x 0.155 – 18.79	0.876**	= TCP x 0.109 – 7.30	0.806**	= DCP x 0.138 – 10.15	0.748**
Glutamic acid	= TCP x 0.199 – 7.36	0.839**	= TCP x 0.147 + 6.63	0.710**	= DCP x 0.188 + 2.15	0.664**
Glycine	= TCP x 0.062 – 8.94	0.823**	= TCP x 0.045 – 4.82	0.726**	= DCP x 0.067 – 10.12	0.798**
Histidine	= TCP x 0.041 – 5.71	0.886**	= TCP x 0.034 – 4.52	0.780**	= DCP x 0.050 – 8.16	0.840**
Isoleucine	= TCP x 0.057 – 5.27	0.636**	= TCP x 0.042 – 1.68	0.534*	= DCP x 0.066 – 7.83	0.614*
Leucine	= TCP x 0.092 – 6.56	0.902**	= TCP x 0.068 – 0.92	0.801**	= DCP x 0.099 – 7.99	0.860**
Lysine	= TCP x 0.054 – 3.99	0.604*	= TCP x 0.042 + 5.74	0.559**	= DCP x 0.053 + 4.40	0.525*
Methionine	= TCP x 0.027 – 6.64	0.911**	= TCP x 0.026 – 6.39	0.897**	= DCP x 0.034 - 7.57	0.864**
Phenylalanine	= TCP x 0.071 – 9.45	0.766**	= TCP x 0.053 – 4.57	0.772**	= DCP x 0.072 – 7.64	0.762**
Serine	= TCP x 0.041 – 7.04	0.377	= TCP x 0.024 + 10.13	0.260	= DCP x 0.021 + 13.43	0.163
Threonine	= TCP x 0.054 – 5.43	0.813**	= TCP x 0.038 – 2.34	0.684**	= DCP x 0.054 – 5.74	0.716**
Tyrosine	= TCP x 0.054 – 7.77	0.694**	= TCP x 0.040 – 3.47	0.733**	= DCP x 0.047 – 3.18	0.635**
Valine	= TCP x 0.060 – 5.59	0.695**	= TCP x 0.046 – 2.51	0.624**	= DCP x 0.070 – 8.60	0.704**
Average amino acid	= TCP x 0.073 – 0.532	0.882**	= TCP x 0.056 – 0.138	0.845**	= DCP x 0.074 – 0.460	0.841**

\* P<0.05; \*\* P<0.01

DCP = TCP x 0.67 + 7.75 R = 0.91

**TABLE 13 Linear regression analyses for meat and bone meal**

Linear regression equations describing total and apparent ileal digestible amino acid content as function of total (TCP) and apparent ileal digestible crude protein (DCP) content (g/kg air dry basis) of meat and bone meal samples (n=10)

Amino acid	Regression equations describing total AA content as a function of TCP content		Regression equations describing apparent ileal digestible AA content as a function of TCP content		Regression equations describing apparent ileal digestible AA content as a function of apparent ileal DCP content	
	Regression equations	R	Regression equations	R	Regression equations	R
Alanine	= TCP x 0.031 + 2.325	0.54	= TCP x 0.035 + 0.948	0.41	= DCP x 0.053 + 0.968	0.91**
Arginine	= TCP x 0.054 + 0.78	0.80**	= TCP x 0.027 + 1.128	0.27	= DCP x 0.055 + 0.658	0.79**
Aspartic acid	= TCP x 0.083 – 0.420	0.83**	= TCP x 0.067 – 1.487	0.42	= DCP x 0.104 – 1.549	0.95**
Glutamic acid	= TCP x 0.150 – 1.442	0.94**	= TCP x 0.037 + 2.336	0.14	= DCP x 0.133 – 0.355	0.71*
Glycine	= TCP x 0.017 + 6.060	0.17	= TCP x (-0.001) + 4.722	0.005	= DCP x 0.068 + 2.318	0.65*
Histidine	= TCP x 0.032 – 0.469	0.63	= TCP x 0.034 – 0.973	0.71	= DCP x 0.029 – 0.165	0.89**
Isoleucine	= TCP x 0.027 + 0.215	0.79**	= TCP x 0.023 - 0.058	0.46	= DCP x 0.027 + 0.233	0.79**
Leucine	= TCP x 0.077 – 0.728	0.73*	= TCP x 0.062 – 0.935	0.57	= DCP x 0.069 – 0.003	0.92**
Lysine	= TCP x 0.075 – 1.463	0.88**	= TCP x 0.053 – 1.067	0.55	= DCP x 0.058 – 0.279	0.89**
Methionine	= TCP x 0.021 – 0.328	0.81**	= TCP x 0.024 - 0.644	0.84**	= DCP x 0.016 + 0.071	0.82**
Phenylalanine	= TCP x 0.106 – 3.380	0.48	= TCP x 0.074 – 2.310	0.46	= DCP x 0.035 + 0.432	0.32
Serine	= TCP x 0.015 + 1.275	0.12	= TCP x 0.002+ 1.086	0.039	= DCP x 0.005 + 0.994	0.17
Threonine	= TCP x 0.030 + 0.188	0.52	= TCP x 0.023 – 0.154	0.47	= DCP x 0.029 + 0.065	0.87**
Tyrosine	= TCP x 0.023 + 0.044	0.73*	= TCP x 0.020 – 0.209	0.41	= DCP x 0.030 – 0.168	0.88**
Valine	= TCP x 0.031 + 0.778	0.51	= TCP x 0.031 + 0.035	0.41	= DCP x 0.038 + 0.354	0.75*
Average amino acid	= TCP x 0.051 + 0.229	0.89**	= TCP x 0.034 + 0.160	0.40	DCP x 0.050 + 0.237	0.86**

\* P<0.05; \*\* P<0.01

DCP = TCP x 0.924 -14.573; R= 0.635

# Appendix: Publications and presentations associated with this research

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# Ileal Digestible Amino Acid Values in Feedstuffs for Poultry

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The availability of amino acids in feedstuffs is an important feature of dietary protein quality. Reliable values of this feed ingredient allow more efficient formulation of poultry diets.

Many approaches have been made to determine amino acid availability which is defined as that proportion of dietary amino acids that is in a form suitable for digestion, absorption and utilisation. The digestibility assay has become the most favoured technique for estimating availability, largely because the values apply directly to the bird and all amino acids can be measured in the one assay.

This publication will be a useful resource for the poultry industry, especially nutritionists and those engaged in poultry protein and amino acid research as differences in amino acid digestibility can be effectively used to improve the precision of feed formulation.

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