Table ‘Standardized ileal digestibility of amino acids in feedstuffs for poultry’

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Preface

Since 1979 a Table based on the apparent fecal digestibility of amino acid in feedstuffs determined with adult roosters has been used for protein and amino acid evaluation of feedstuffs for poultry. Some years ago, when CVB was an activity of the Product Board Animal Feed (PDV), it was recognized that this Table required an update.

Ravindran and co-workers made their extensive database - containing ileal digestibility values of feedstuffs for broilers - available to CVB. On behalf of CVB we wish to express our great appreciation to Dr. Ravindran for making available this dataset. This enabled the start of a project to replace the existing Table, based on fecal digestibility data, by a new Table, based on ileal digestibility studies. Firstly, a literature study was undertaken to collect as much additional relevant data from the scientific literature to further extend the database of Ravindran.
The report lying before you describes the procedure that was performed to compose the new Table 'Standardized ileal amino acid digestibility of feedstuffs for poultry'. The considerations that led to the decision to declare this Table also applicable to other categories of chickens (rearing pullets, laying hens, broiler breeders and roosters) and other types of poultry (turkeys, ducks, et cetera) are given as well.

The first phase of the project was guided by the (former) CVB Project Group Ileal Digestible Amino Acids Poultry (DVAZP) and assisted by the (former) CVB Working Group Nutrition and Feed Evaluation Pigs and Poultry (VVVP) for final assessment. The second additional phase of the project was guided and assessed by the (new) Technical Committee of CVB.

Together with this Documentation report, another Documentation report is published named: CVB Documentation report nr. 60: 'Amount and amino acid composition of basal endogenous protein losses at the terminal ileum of broilers' (M.C. Blok and C.A. Makkink, 2017).

The Table 'Standardized ileal digestibility of amino acids in feedstuffs for poultry' as described in this report will also be incorporated in the CVB Feed Table 2018 and will be the Dutch reference system from that moment onward.

As a feed evaluation system has two pillars – the supply of nutrients by the diet on the one hand and the utilization by the animals on the other hand (both expressed in the same units) – it was necessary to also update and express the amino acid requirements on a standardized ileal digestibility (SID) basis. An update of the SID amino requirements for laying hens and broilers is expected to be published in the nearby future.

Wageningen, November 2017

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List of abbreviations

Abbreviation	Unit	Explanation
AA		Amino acid(s)
AFDC	%	Apparent fecal digestibility coefficient
AIA		Acid insoluble ash
AID		Apparent ileal digestibility
AIDC		Apparent ileal digestibility coefficient
ALA		Alanine
ARG		Arginine
ASP		Aspartic acid
BEF-AA	g/kg DM	Basal endogenous flow of amino acids at the terminal ileum
CASH	g/kg	Crude ash
CFAT	g/kg	Crude fat
CFIBRE	g/kg	Crude fibre
CP	g/kg	Crude protein
CYS		Cystine
DC-AA	%	Digestibility coefficient amino acid
DM	g/kg	Dry matter
DMI	G	Dry matter intake
GLY		Glycine
GLU		Glutamic acid
HIS		Histidine
ILE		Isoleucine
LEU		Leucine
LYS		Lysine
MET		Methionine
PFC		Precision Fed Chick Assay
PFR		Precision Fed (Caecectomized) Rooster Assay
PHE		Phenylalanine
PRO		Proline
SER		Serine
std		Standard deviation
SID		Standardized ileal digestibility
SIC		Standardized Ileal Chick Assay
SIDC	%	Standardized ileal digestibility coefficient
SIDC-AA	%	Standardized ileal digestibility coefficient of an Amino acid
STA	g/kg	Starch
SUG	g/kg	Sugars
THR		Threonine
TRP		Tryptophan
TYR		Tyrosine
VAL		Valine

1. Introduction

1.1 Origin of the table 'Fecal digestible amino acids poultry', as published in the CVB Feed Table up to 2016

For many years a Table based on (apparent) fecal amino acid digestibility of feedstuffs determined with adult roosters is used to evaluate protein and amino acids of feedstuffs for all categories and types of poultry. This Table is largely identical to the Table '(Fecal) digestible amino acids in feeds for poultry', which was incorporated in the CVB Feed Table for the first time in 1979 (Centraal Veevoederbureau in Nederland (1979). Further, this Table was mainly based on fecal digestibility studies of feedstuffs as published in Report 177.77 of the former Institute for Poultry Research "Het Spelderholt", Beekbergen, The Netherlands, entitled 'De verteerbaarheid van eiwit en aminozuren in grondstoffen voor pluimveevoeders' (The digestibility of protein and amino acids in poultry feed ingredients), K. Terpstra, F.F.E. Beeking and W.M.M.A. Janssen (1977). For a number of feedstuffs – for which no experimental data were available – the values were based either on literature data on protein and amino acid digestibility, or on an estimated protein digestibility. However, for some products, the origin of reported values is not clear. It should be noted, that feedstuffs with less robust data underlying the reported amino acid digestibility were less relevant for use in poultry diets.

1.2 Actualization of the existing table

Some years ago the former CVB Working Group 'Nutrition and Feed Evaluation Pigs and Poultry' (VVVP) decided that the existing table – containing experimental results dating back at least 30 years – should be updated.
When CVB contacted Ravindran – who constructed the database underlying the RIRDC-table (Bryden et al., 2009), containing research data on (apparent) ileal digestibility of feedstuffs for poultry – he was willing to make this database available to CVB. This database data contains about 130 observations in broilers, largely consisting of feedstuffs that are relevant for the Dutch poultry industry. So, it was decided to formulate a new system for the evaluation of protein and amino acids for poultry, based on the ileal digestibility of amino acids in broilers.
After studying the RIRDC-table (Bryden et al., 2009), a project was started to obtain as much data on ileal digestibility of amino acids in feedstuffs for broilers as possible and to construct a Table using these data. In this report a description is given of the procedure resulting in the table 'Standardized ileal digestibility of amino acid in feedstuffs for poultry'.

It was stated that a Table based on the *standardized* ileal amino acid digestibility instead of *apparent* ileal digestibility is preferred. This implies that a literature study on basal ileal endogenous excretion of amino acids had to be performed as well (Blok and Makkink, 2017), and – subsequently - that this basal ileal endogenous excretion should be used to recalculate the available literature data on apparent ileal digestibility into standardized ileal digestibility.

To be incorporated in the database a publication should meeta set of criteria. In defining these criteria we made use of a publication of Kluth and Rodehutscord (2009), describing criteria for the sampling of digesta when determining the standardized amino acid digestibility of feedstuffs.

1.3 Actualization of the amino acid recommendations for laying hens and broilers

The current recommendations of CVB with respect to amino acid supply of laying hens and broilers have been formulated by B.J. Schutte and are published in a CVB documentation report in 1996 (Schutte, 1995). These recommendations are based on the system ‘Apparent fecal digestible amino acids‘.
The switch from a system ‘Apparent fecal digestible amino acids‘ to a system ‘Standardized ileal digestible amino acids’ requires that amino acids recommendations are based also on standardized ileal amino acid digestibility. Therefore, in the near future a Documentation report will be published on SID-LYS requirements for performance in broilers and laying hens.

2. Literature survey and data collection

2.1 Procedure

The first step in the development of a Table 'Standardized ileal digestibility of amino acid in feedstuffs for poultry' was a literature survey. Papers published between 1994 and 2017 and concerning ileal amino acid digestibility of feedstuffs for broilers were collected. From all publications, the following basic data – as far as available - were gathered in a spreadsheet:

- Record number
- Data file
- Author(s), scientific journal and year of publication
- Chemical composition of the test ingredient(s):
    - Dry matter (DM)
    - Crude protein (CP)
    - Crude fibre (CFIBRE)
    - Crude ash (CASH)
    - Starch
    - Separate run for S-containing amino acids: yes/no
    - Separate run for the amino acid Tryptophan: yes/no
- Animal data:
    - Type
    - Genotype
    - Sex
    - Housing system
    - Number of birds per replicate
    - Number of replicates
- Diets: direct or indirect method
    - Direct:
        - Percentage of ingredient incorporated in diet
        - Protein-rich ingredients; CP-level
        - Digestibility as published: in the diet or in test ingredient?
    - Indirect: Percentage of test ingredient in test diet
- Experimental aspects:
    - Feeding method: ad lib / crop intubation / restricted
    - Experiments or treatments where enzymes were added to the feed have been excluded from the database
    - Diet: mash / pellets
    - Duration of feeding the experimental diet
    - Marker: Cr_2O_3 / Acid insoluble ash As (AIA) / TiO_2
- Digesta collection:
    - Age of birds (days)
    - NB: in cases where digesta was collected at more than one point of time after the age of 21 days, the mean digestibility for these points of time has been used in the database
    - Collection method: section (slaughter) / caecectomised birds
    - Killing method: intracardial injection / CO_2 / cervical dislocation
    - Which section of the ileum (in case of slaughter method)
    - Collection method: flushing / gentle squeezing
    - Sampling: pooled per cage / individually
    - Drying of digesta: freeze-drying, air-drying

In the original publications different ways were used to express the data. Therefore data were at first gathered five separate databases:

Database 1.
Contains publications where the *direct method* (with the test product as sole protein source) is applied and where the *apparent ileal amino acid digestibility* (AID-AA) *of the experimental diet* is given, as can be concluded from the way the digestibility is calculated.[1]

Database 2.
Contains publications where the *apparent ileal amino acid digestibility of the test product* is given as determined with the *indirect method* (i.e., the digestibility is determined of a basal diet and of an experimental diet containing X% of the basal diet and (100-X)% of the test product; the digestibility of the test product is calculated from the difference).[2]

Database 3.
Contains publications where the *direct method* is applied and where the *standardized ileal amino acid digestibility of the diet* is given, with the test product as sole protein source in the diet.[3]

Database 4.
Contains publications where the *direct method* is applied and where the *standardized ileal amino acid digestibility of the test product* is given, with the test product as sole protein source in the diet. [4]

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[1] In the Materials and Methods section of the papers the calculation of the apparent ileal digestibility coefficient of the amino acid (in the test ingredient), AIDC-AA (%) is specified. Mostly one of the following formula are mentioned:

- $\text{AIDC-AA (\%)} = [1 - (AA_{chyme} * marker_{diet})/(AA_{diet} * marker_{chyme})] * 100$
- $\text{AIDC-AA (\%)} = \frac{(AA/Marker)_{diet} - (AA/Marker)_{chyme}}{(AA/Marker)_{diet}} * 100$

In fact both formula yield the same result.

[2] In formula:

- Calculation of digestibility of basal diet and test diet:
  $\text{AIDC-AA (\%)} = [1 - (AA_{chyme} * marker_{diet})/(AA_{diet} * marker_{chyme})] * 100$
- Calculation of digestibility of test ingredient:
  $\text{AIDC-AA}_{\text{test product}}\text{ (\%)} = \frac{(\text{AIDC-AA}_{\text{test diet}} * AA_{\text{test diet}} - \text{AIDC-AA}_{\text{basal diet}} * AA_{\text{basal diet}} * X)}{(AA_{\text{test diet}} - AA_{\text{basal diet}} * X)} * 100$

In which: X = fraction of basal diet in test diet

[3] In the Materials and Methods section of the publications the way of calculating SIDC is mentioned as follows:

- First the AIDC-AA (%) is calculated. When the following (or an – essentially – identical) formula is used, in fact the SIDC-AA of *the diet* is calculated:
  $\text{AIDC-AA}_{diet}\text{ (\%)} = \frac{(AA/Marker)_{diet} - (AA/Marker)_{chyme}}{(AA/Marker)_{diet}} * 100$
- Then the SIDC-AA (%) is calculated using one of the following formula:
  a. SIDC-AAdiet (%) = AIDC-AA_{diet} (%) + [(BEL-AA; g/kg of DMI)/($AA_{\boldsymbol{diet}}$; g/kg of DM) * 100]

[4] First the AIDC (%) of the diet is calculated in the same way as mentioned in footnote 3.

- Then the $\text{AIDC-AA}_{\text{test product}}$ (%) is calculated by correcting the AIDC AA_{diet} for the basal endogenous loss caused by the non-test product part of the diet:
  $\text{AIDC}_{\text{test product}}\text{ (\%)} =$
  $[(AA_{\text{test product}}; \text{g/kg DM}) * \text{AIDC-AA}_{diet}/100)) + (1-X) * (\text{BEL-AA; g/kg DMI})]/(AA_{\text{test product}}; \text{g/kg DM}) * 100$
  In which: X = fraction of test product in diet
- Finally the SIDC-AA (%) is calculated using one of the following formula:
  SIDC-AAdiet (%) = AIDC-AA_{diet} (%) + [(BEL-AA; g/kg of DMI)/($AA_{\boldsymbol{diet}}$; g/kg of DM) * 100]

Database 5.
Contains publications where the ***regression method*** is used to calculate the *ileal amino acid digestibility of the test product.* The slope of the regression line represents the ***standardized*** *ileal digestibility*.

In cases where both the apparent and the standardized ileal amino acid digestibility was published, the data on the apparent digestibility were inserted in the relevant database.

The analyzed content of amino acids and other nutrients of the test products were also expressed in various ways in the published papers: g/kg DM, g/kg product, g/16 g N (or g per 100 g protein). The analyzed composition of the test product was recalculated to amino acid contents in g/kg product, and by using the information in the paper the amino acid pattern was calculated in g amino acid/16 g N, before entering the data in the database.

In database 1, the apparent ileal amino acid digestibility was corrected for a standard basal endogenous loss according to Blok and Makkink (2017) and represented in Table 1. At first, a correction was made for the proportion of basal endogenous loss (BEL) of the non-test product part of the test diet, by adding the *basal endogenous loss of the non-test ingredient* to the apparent ileal digested amount of the amino acid (g/kg DM). Subsequently, to the calculated apparent ileal digestible AA of the test product the endogenous AA loss was added to calculate the standardized ileal digested amount of the amino acid, and then the standardized ileal amino acid digestibility (in % units) was calculated.
In formula:

- $AIDC\text{-}AA_{test\ product}$ (%) = {($AIDC\text{-}AA_{diet}$ * AA_{diet}) + (X * BEL_{AA})} / AA_{diet} *100
- $SIDC\text{-}AA_{test\ product}$ (%) = {($AIDC\text{-}AA_{test\ product}$ * AA_{diet}) + BEL_{AA})} / $AA_{test\ product}$ *100

In which
X = fraction of non-test product in the diet.

In database 2, a similar procedure was followed to calculate to standardized ileal amino acid digestibility, however, no correction for the fraction of the basal endogenous loss of the non-test product fraction was required, because in experiments using the indirect method this correction for the basal diet is made automatically.

In database 3 and 4, the standardized values were *only* included in the dataset used for determination of SIDC-AA values of feed stuffs if the publication stated *how* the standardized ileal digestibility was calculated from the experimentally determined apparent digestibility, or – in other words – which data were used for the basal endogenous loss. In these cases, the standardized ileal digestibility mentioned in the paper was first recalculated into the apparent ileal digestibility, using the endogenous losses as mentioned in the scientific paper. Subsequently the calculated apparent ileal digestibility was converted into the 'CVB' standardized ileal digestibility by correcting the apparent digestibility for the basal endogenous loss according to Blok and Makkink (2017).

In Database 5, where the regression method was applied, the slope of the regression line directly gives the standardized ileal digestibility. In most studies the information on the basal endogenous loss (being the intercept of the Y-axis) was not accurate enough to recalculate the digestibility to an apparent ileal digestibility and to subsequently convert these data into a standardized ileal digestibility using the basal endogenous loss according to Blok and Makkink (2017). This means that these data are used without any further modification.

In the databases, described above data from the following publications were collected:

Adedokun et al. (2007a, 2007b, 2008, 2009, 2014), Aghakhanian et al. (2009), *Ahmed et al. (2014), Ali et al. (1995), Al-Marzooqi et al. (2009, 2010, 2011), Bandegan et al. (2009, 2010, 2011), Batal et al. (2006), Bryden et al. (2009), Clark and Wiseman (2005), Coca-Sinova et al.*

(2008), De Marco et al. (2015), Donkoh et al. (2009), Dozier et al. (2015), Fastinger et al. (2006), Foltyn et al. (2015), Frikha et al. (2012), Garcia et al. (2007), Grasshorn and Ritteser (2016), Hejdysz et al. (2016a, 2016b), Hew et al. (1998, 1999), Huang et al. (2005, 2006, 2007), Iyayi et al. (2006), Jahanian and Rasouli (2016), Kaczmarek et al. (2016), Kadim et al. (2002), Kim et al. (2010, 2012), Kim (2010), Kim and Corzo (2012), Kluth et al. (2005b, 2009), Kluth and Rodehutscord (2006), Kong and Andeola (2010, 2011, 2013), Kozlowski et al. (2011), Masey O'Neill et al. (2012), Nalle (2009), Nalle et al. (2010a, 2010b, 2011, 2012), Nandha (2011), Nandha et al. (2013), Newkirk et al. (2003a), Opapeju et al. (2006), Palander et al. (2006), Perez et al. (1993), Perez-Malonado ((2002), Perryman and Dozier (2012), Perttila et al. (2002), Ravindran et al. (1999a, 1999b, 2002, 2014a, 2014b), Rodehutscord et al. (2004), Scheele et al. (1992), Short et al. (1999), Sundu et al. (2008), Szczurek (2009, 2010), Thong et al. (2015), Toghyani et al. (2015), Ullah et al. (2016), Valencia et al. (2009a, 2009b), Wang et al. (2008), Woyengo et al. (2010), Woyengo et al. (2016)

2.2 Basal endogenous ileal amino acid loss

Blok and Makkink (2017) provided recommendations concerning the level of basal ileal amino acid losses, based on a literature study. These recommended losses were established by CVB. For the present report, the values recommended by Blok and Makkink (2017) were rounded off to a total amino acids loss of 5.90 g/kg DM (while maintaining the ratios between amino acids). The basal endogenous loss per amino acid – as applied in this report – is given in Table 1.

Table 1: Basal ileal endogenous amino acid loss (g per kg DM intake) in broilers aged 15 to 45 days.

Amino acid	**Basal endogenous loss (g/kg DM intake)**
ALA	0.28
ARG	0.25
ASP	0.57
CYS	0.17
GLU	0.86
GLY	0.34
HIS	0.14
ILE	0.31
LEU	0.38
LYS	0.25
MET	0.09
PHE	0.29
PRO	0.40
SER	0.49
THR	0.47
TRP	0.08
TYR	0.21
VAL	0.37
CP	-
Total AA	5.92

3. Evaluation and further refinement of the database

3.1 Method to determine ileal amino acid digestibility

The ileal amino acid digestibility, as laid down in the database, may have been obtained according to two different procedures:

- Standardized Ileal Chick Assay (SIC-method), in which the birds are fed ad libitum and digesta is collected from the ileum, after killing of the animal. In this method, a marker is applied.
- Precision-fed Ileal Chick Assay (PFC-method), in which the birds are fasted for a couple of hours up to two days, and then receive a certain amount of feed (often one single feedstuff) through the crop. After killing the animal, the digesta from the ileum is collected. Also in this method, a marker is applied.

The majority of the data in the final database – as used to compose the table 'Standardized ileal digestibility of amino acids in feedstuffs for poultry' – were from trials in which digesta was collected according to the SIC-method. Further, few data obtained with the PFC method, using short fasting times, were incorporated.

3.2 Effect of ileum segment on amino acid digestibility

Kluth et al. (2005a) investigated the differences in amino acid digestibility between different parts of the ileum. After seven days on three different dietary treatments (diet 1, 2 and 3, with soybean meal, peas and maize as main ingredient, respectively), broilers were euthanized at an age of 28 days. The ileum was divided into three equal parts: proximal, medial and terminal. The apparent amino acid digestibility of the diets was determined for each segment; the results are given in Figures 1, 2 and 3.

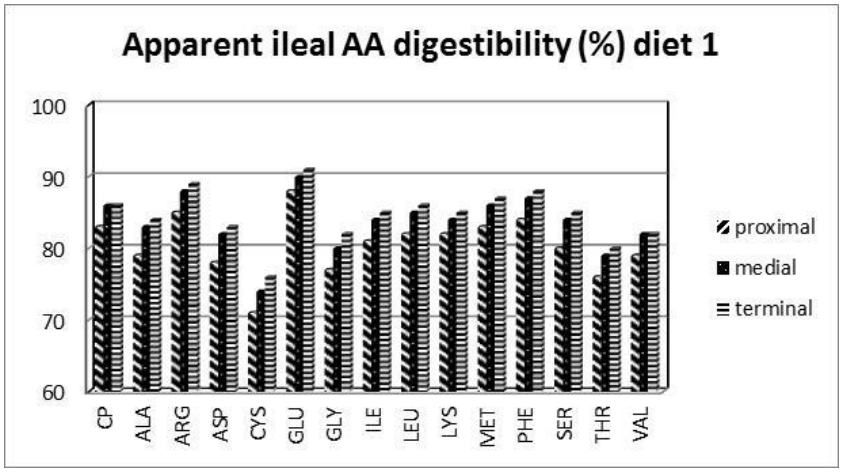

Figure 1. Apparent ileal amino acid digestibility of diet 1 (40% soybean meal) per ileal segment (according to Kluth et al., 2005a).

The amino acid digestibility is significantly lower in the first segment, as compared to the other two ileal segments. From this study, it was concluded that the digesta from the proximal ileum should be discarded when determining the ileal amino acid digestibility. Kluth and Rodehutscord (2009) reached the same conclusion in their literature review.
Therefore, only ileal amino acid digestibility values obtained from digesta collection from the distal half (or a terminal part) were recorded in the final database of the present report.

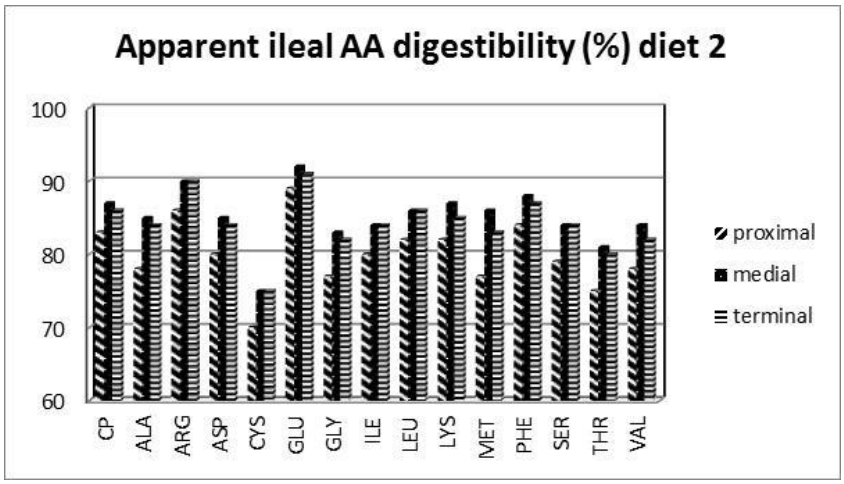

Figure 2. Apparent ileal amino acid digestibility of diet 2 (40% peas) per ileal segment (according to Kluth et al., 2005a).

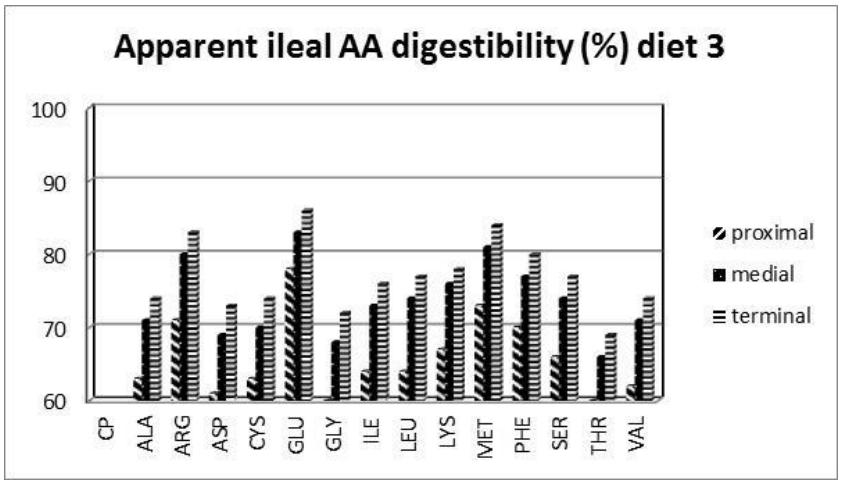

Figure 3. Apparent ileal amino acid digestibility of diet 3 (45% maize) per ileal segment (according to Kluth et al., 2005a).

3.3 Effect of age on amino acid digestibility in broilers

Batal and Parsons (2002) studied the *fecal* amino acid digestibility of three different diets (maize/rapeseed meal, maize/soybean meal, and a diet containing only crystalline amino acids) in broilers aged 2, 4, 7, 14 and 21 days (Figure 4, 5 and 6). For the maize/rapeseed meal diet and the maize/soybean meal diet, the amino acid digestibility was significantly lower on days 2, 4 and 7 (and for most amino acids also on day 14), as compared to day 21. The amino acid digestibility of the diet containing crystalline amino acids was hardly affected by the age of the birds. This suggests that the effects of age on amino acid digestibility were primarily caused by a lower enzymatic capacity to hydrolyze proteins of the (small) intestine at a young age.

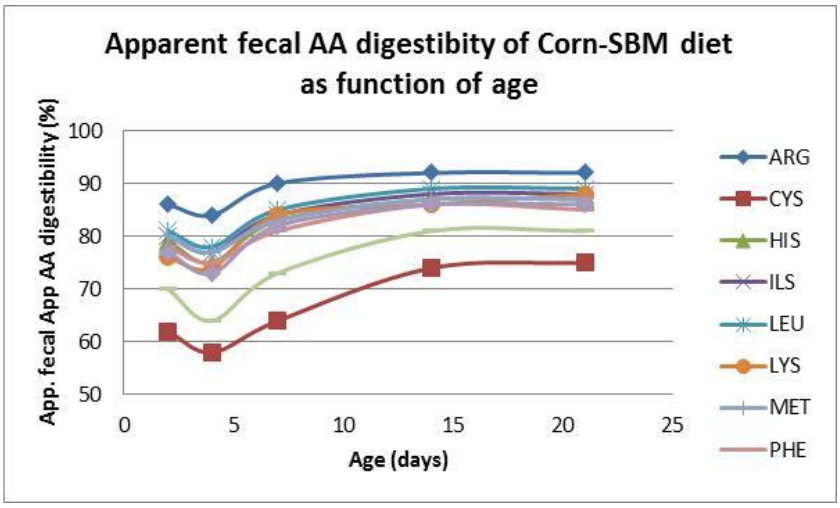

Figure 4. Apparent fecal amino acid digestibility of a maize-soybean meal diet in broilers at different ages according to Batal and Parsons (2002).

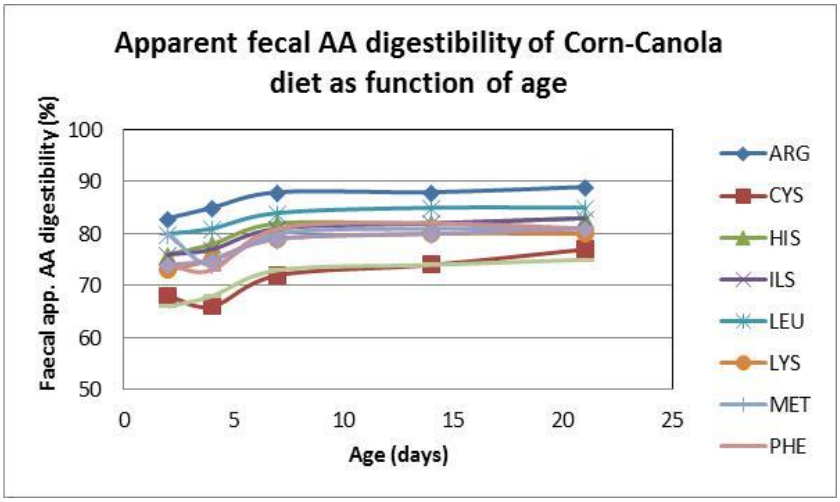

Figure 5. Apparent fecal amino acid digestibility of a maize-rapeseed meal diet at different ages according to Batal and Parsons (2002).

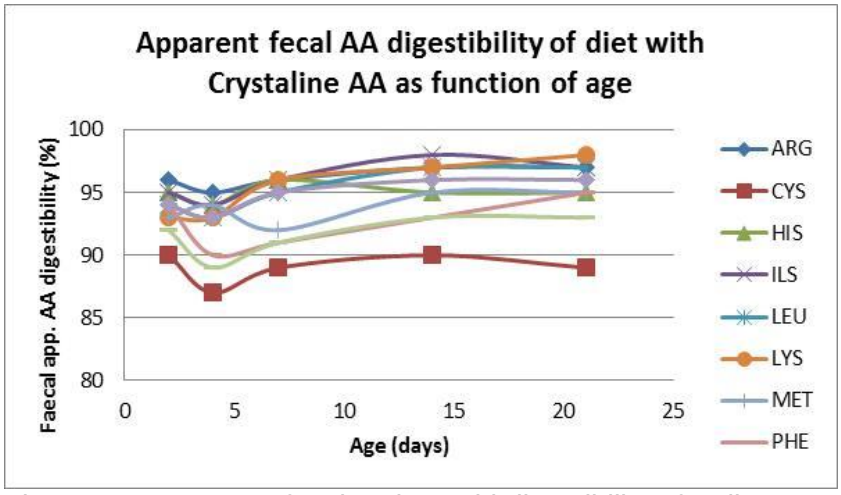

Figure 6. Apparent fecal amino acid digestibility of a diet containing crystalline amino acids at different ages according to Batal and Parsons (2002). Note that the Y-axis in this Figure differs from that in Figure 4 and 5.

Adedokun et al. (2007b) and Garcia et al. (2007) compared the ileal amino acid digestibility of various feed materials in broilers at different ages (5 vs. 21 days; and 7 vs. 21 days). In Figures 7, 8 and 9, the ratio of the ileal amino acid digestibility at day 5 or 7 to that at day 21 is presented, expressed as a percentage, for each feed material and for each amino acid. For fish meal the digestibility of amino acids at day 7 was on average 97.1 $\pm$ 2.96% of the level at day 21. For feather meal, poultry by-product meal and meat-and-bone meal these values were 90.1 $\pm$ 10.29; 96.5 $\pm$ 7.03 and 85.9 $\pm$ 5.07%, respectively. As can be seen from Figure 7, the differences in amino acid digestibility between day 7 and 21 are relatively small for fish meal, but much larger for all other animal protein sources studied. Further, it has to be mentioned that for meat-and-bone meal the average ratio for 4 batches is presented. For the individual batches the variation in amino acid digestibility at day 7 and day 21 was much larger. In the dataset of 4 meat-and-bone meal batches it is remarkable that for one batch the digestibility of all amino acids was larger at day 7 than at day 21, whereas for the other three batches the opposite was the case. In Figure 8 it is obvious that the difference in amino acid digestibility of maize at day 7 is less than for wheat. The mean digestibility ratio between the digestibility at day 7 to day 25 (expressed as percentage) for all amino acids was 94.7 $\pm$ 4.08 and 84.7 $\pm$ 8.58% for maize and wheat, respectively.

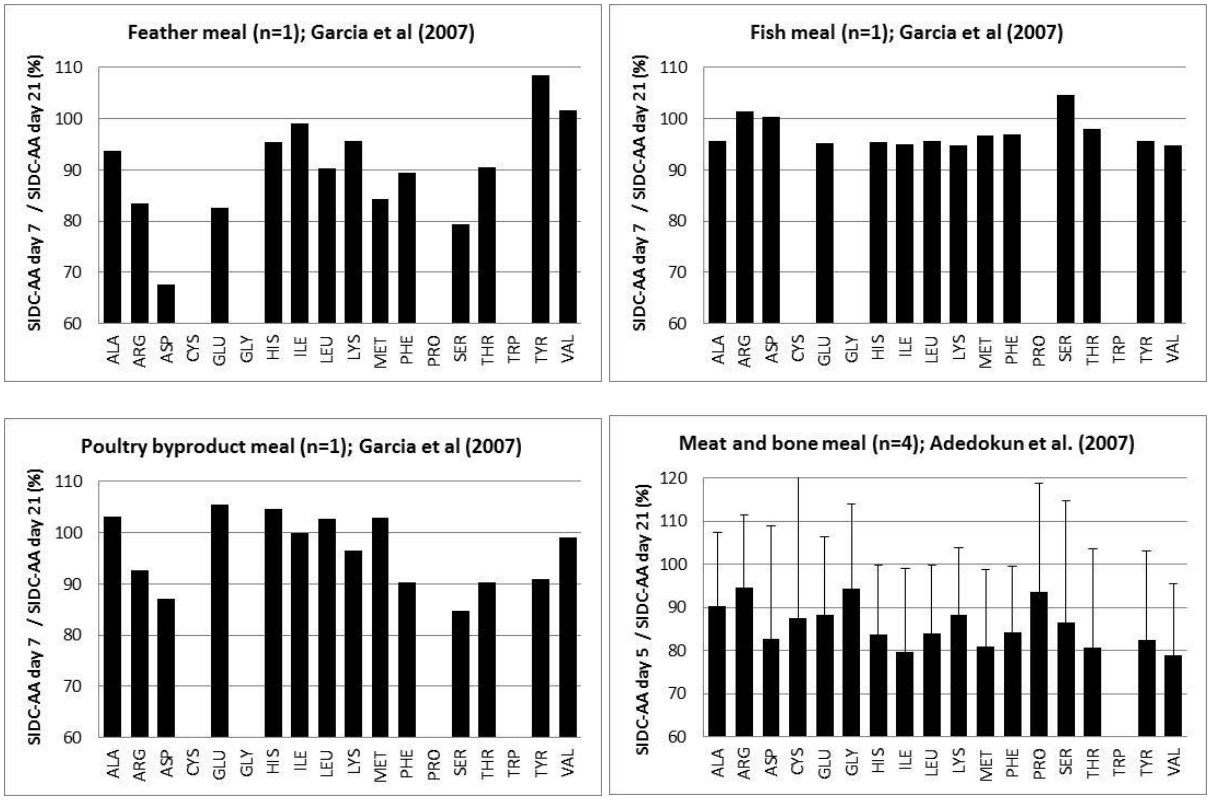

Figure 7. Effect of age (5 versus 21 days for Adedokun et al. (2007b) and 7 versus 21 days for Garcia et al. (2007)) on standardized ileal amino acid digestibility of various animal protein ingredients (feather meal and fish meal; upper figures; left and right, respectively; poultry by-product meal and meat-and-bone meal, lower figures; left and right, respectively). The Y-axis represents the digestibility on day 5 or 7 as a percentage of the digestibility on day 21 (vertical bars). In the figure for meat-and-bone meal the standard deviation of the relative difference between the four batches in both studies is shown as vertical lines.

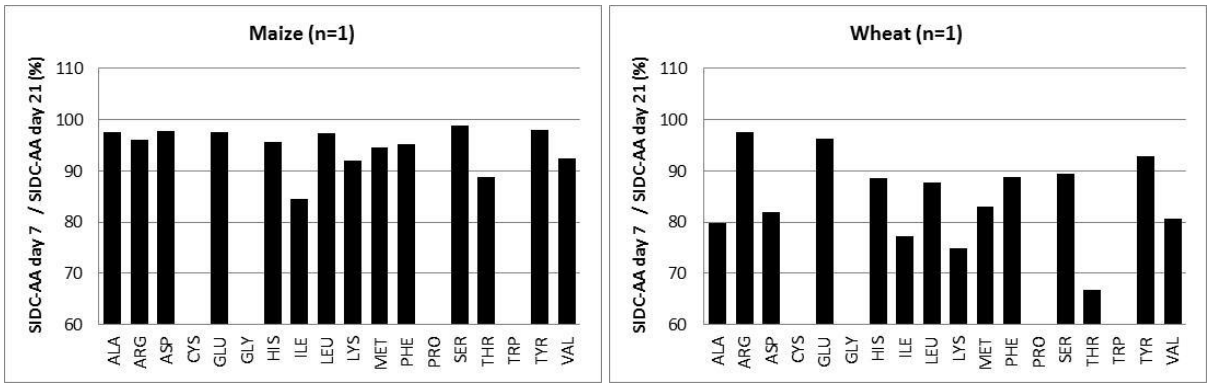

Figure 8. Effect of age (7 versus 21 days) on standardized ileal amino acid digestibility of maize and wheat (left and right figure, respectively), according to Garcia et al (2007). The Y-axis represents the digestibility on day 7 as a percentage of the digestibility on day 21 (vertical bars).

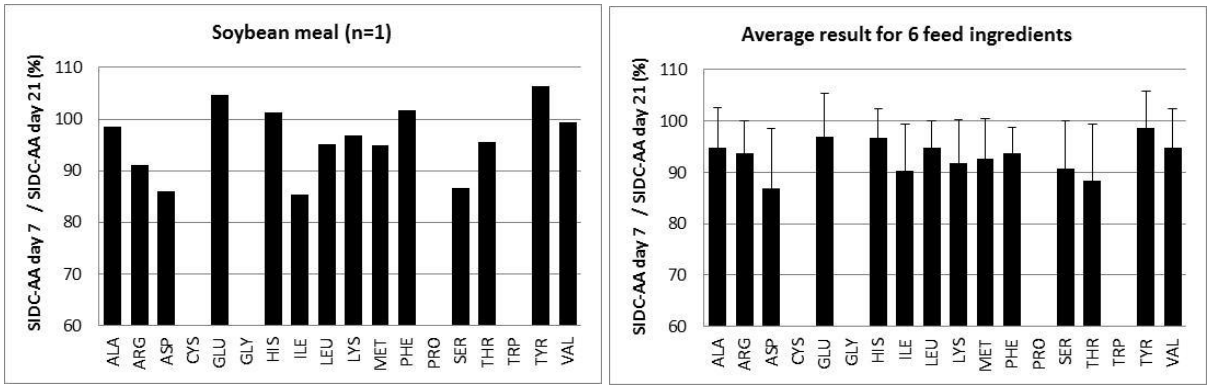

Figure 9. Effect of age (7 versus 21 days) on standardized ileal amino acid digestibility of soybean meal (left figure) and for the mean of all six feed ingredients studies by Garcia et al., (2007) (right figure). The Y-axis represents the digestibility on day 7 as a percentage of the digestibility on day 21 (vertical bars). In the right figure the standard deviation of the relative difference between the six ingredients is shown as vertical lines.

For soybean meal (Figure 9) the mean digestibility ratio between the digestibility at day 7 to day 25 was 96.0 $\pm$ 6.72%. So the difference in digestibility at day 7 to day 21 is at the same level as that for maize and fish meal, but the difference between amino acids is larger.

Noy and Sklan (1995) – using a diet consisting mainly of maize (51%) and soybean meal (38%) - found no significant difference in N digestibility between day 14 and day 21. However, the amino acid digestibility was numerically lower at day 14, which suggests that the development of the CP and amino acid digestibility has not reached an optimal level at this age. Even on day 28, the capacity to digest amino acids had not reached its maximum for products containing high levels of fibre (Noy and Sklan, 1995).

Based on the findings described above, for most raw materials a minimum age of 14 days should be respected for chyme collection in ileal digestibility studies. Because the database contains hardly any data on ileal amino acid digestibility for the age range 14-20 days, it was decided to set a lower age limit of 21 days for the final database as a safe boundary. This is in line with the recommendation of Kluth and Rodehutscord (2009) in their literature review on methodological aspects of determining the ileal amino acid digestibility in broilers.
With respect to the probability of a suboptimal amino acid digestion of high fibre products, it was considered that practical broiler feeds do not contain high levels of fibrous material; the

age effect will, therefore, be much smaller in practice than in, e.g., the study of Noy and Sklan (1995).

3.4 Effect of killing method on amino acid digestibility in broilers

In the literature studied for the present report, three methods were described to kill the broilers:

- CO_2-asphyxiation, often followed by exsanguination by cervical dislocation and cutting the blood vessels in the neck;
- Intracardial injection: the animals are killed by an injection with barbiturates or another euthanaticum directly into the heart;
- Intravenous injection: the animals are killed by an injection of an euthanaticum in one of the venes;
- Cervical dislocation with subsequent exsanguination by cutting the blood vessels in the neck.

No published papers were found describing a systematic comparison of two or more of these methods. In most studies, the animals were killed by intracardial injection. In trials with soybean meal sufficient data were available from studies applying CO_2-asphyxiation and intracardial injection to make a comparison between both killing methods (Appendix 1). The comparison did not yield arguments for the exclusion of one of the applied killing methods from the final database. Kluth and Rodehutscord (2009) also concluded that the method of killing is not relevant for the measured standardized amino acid digestibility.

3.5 Effect of marker on amino acid digestibility in broilers

Three different marker substances were used in trials applying the SIC-method:

- Acid insoluble ash (AIA)
- Chromium Oxide (Cr_2O_3)
- Titanium Oxide (TiO_2)

No study has been found where these markers where compared in one broiler trial. In most publications, AIA was used as a marker. For the three feed ingredients feed ingredients with the largest number of observations (soybean meal, wheat and rape seed meal), a comparison of markers could be made between different studies (Appendix 2). The comparison did not yield arguments for the exclusion of studies using one of the markers from the final database. Kluth and Rodehutscord (2009) did not discuss the effect of type of marker on digestibility.

3.6 Outliers

3.6.1 Outliers with respect to amino acid pattern

From the available observations of the (calculated) amino acid profile (expressed in g/16 g N), the mean and standard deviation (stdev) was calculated for each feedstuff. Per amino acid, all values deviating more than 2 x stdev from the mean value were removed from the database, and the standardized digestibility of the deleted amino acids was highlighted. In cases where five or more outliers were detected in the amino acid profile, all data concerning this feedstuff were deleted from the database. *An exception to this procedure was the maize variety with high lysine content; this product is, therefore, reported separately*.

3.6.2 Outliers with respect to standardized amino acid digestibility

Subsequently, for each feedstuff the mean and stdev of the standardized amino acid digestibility was calculated for each individual amino acid, using all available observations. For feed

ingredients where 20 or more observations were collected, all values deviating more than 2.0 x stdev from the mean value were removed from the database. When the number of observations was less than 20 values deviating more than 1.5 x stdev from the mean value were removed. [5] In cases where the standardized digestibility (including the values highlighted based on deviating amino acid contents from the amino acid profile) of five or more amino acids were regarded as outliers, all data concerning this feedstuff were deleted from the database.

3.7 Adjustments on published values

The GLY and GLU contents in the publication of Donkoh and Attoh-Kotoku (2009) have probably been switched in the original paper. This was adjusted before further data processing.
In Table 2 in Nalle et al. (2010a), the contents of several amino acids have been given on an incorrect line. An email was sent to co-author Ravindran to obtain clarification. His reply yielded the correct order of data. An adjustment was made accordingly before further data processing.
Ravindran also provided a further specification of the Canola meal, Rapeseed meal (all "double zero" varieties), 'Millmix' (comparable to wheat bran) and 'Millrun' (comparable to wheat middling's) used in the study of Nalle et al. (2010a). The 'field peas' used in this study were of the species "Pisum Sativum" (peas). Ravindran was not able to provide additional information concerning the poultry breeds used in the trials for the RIRDC-table (Bryden et al., 2009), other than that InghamTM70 and Cobb500 were used in the different experiments, depending on the availability of breeds at the time of the trial.
In a number of publications certain information was lacking to incorporate the data in our databases. Therefore we contacted one of the authors for sending us additional information.
We greatly acknowledge the following persons for sending us additional information:

- Adedokun sent additional information regarding the endogenous flow used in a study on the standardized amino acid digestibility of some batches of meat-and-bone meal (Adedokun et al., 2007b) as well as in a study where the ileal digestibility of several feed ingredients in broilers, laying hens and caecectomized roosters was compared (Adedokun et al., 2009).
- Bandegan provided us with the data of the individual batches of wheat, barley, peas and flax seed that were studied by Bandegan et al. (2011).
- Heidysz sent us the DM content of the faba beans varieties that were studied in Hejdysz et al. (2016b).
- Kaczmazek provided us with data on the amino acid composition of the lupin varieties that were studied by Kaczmarek et al. (2014).
- Kasprzak sent additional information of the rape seed expeller and rape seed meal samples that were examined in Kasprzak et al (2016).
- Mateos sent detailed information on the individual observations of the soybean meal samples studied by Frikha et al. (2012).
- Ravindran sent detailed information on the individual observations of the soybean meal samples studied by Ravindran et al. (2014).
- Szczurek (Szczurek, 2009, 2010) further specified 'Faba beans' (multi-coloured), Field peas (Pisum sativum) and 'Rapeseed' (double zero).
- Zijlstra sent us the basal endogenous loss that was used in the study of Woyengo et al. (2016) in which the digestibility of camelina cake was studied.

[5] When the number of observations is limited, the criterion '≥ 2 x std' yields hardly any outlier, while visual inspection of the data reveals good reasons for the elimination of certain data. With a limited number of observations, an outlier has a major influence on the mean value and on the level of the stdev. By applying the more strict criterion ('≥ 1.5 x stdev'), subjective removal of data as outlier is prevented. When executing this procedure it was recognized that the less the number of observations is, the less values are detected as outlier.

4. Determination of the standardized ileal amino acid digestibility for feedstuffs that have been experimentally studied

In Appendix 3, the mean standardized ileal amino acid digestibility of the feedstuffs – as obtained by the procedure described in Chapter 3 – is given. For each feedstuff, the following additional information has been included:

- the mean amino acid pattern of the observations that were used to compose the table, with standard deviation and number of observations;
- the amino acid pattern according to the CVB Feed Table 2016, with standard deviation;
- the calculated standardized ileal digestibility, with standard deviation, number of observations, lowest and highest value;
- the amount of standardized ileal digested amino acid per kg of product, using the amino acid composition and DM content as published in the CVB Feed Table 2016.
- A comparison of the rounded standardized ileal amino acid digestibility of CVB with the standardized ileal digestibility according to the Table published by Evonik (Wiltafsky et al., 2016. AminoDat® 5.0, Evonik Nutrition & Care GmbH).

4.1 Correlations with chemical composition per ingredient

In the database derived from this literature survey, insufficient chemical characteristics – apart from dry matter and crude protein – could be collected for the feedstuffs studied for a more detailed investigation, e.g., by regression analysis, whether the variation in amino acid digestibility is caused by some factor(s) in the chemical matrix of a feedstuff (e.g. fibre).
Because the crude protein content of all observations is known from the original papers, it was possible to study the correlation between variation in ileal amino acid digestibility and the variation in crude protein content. The correlation between the ileal amino acid digestibility and the crude protein, however, was too low to derive reliable estimation formulas that can be used in practice. The table proposed for practical use, therefore, contains mean values for all feedstuffs.

4.2 Overview of feedstuffs for which observations on ileal amino acid digestibility for broilers are present in the database

In Table 2, an overview is given of the feedstuffs for which one or more observations on ileal amino acid digestibility for broilers are present, and comply with the criteria described in Chapter 3, and were, therefore, included in the database.

Table 2 Feedstuffs for which one or more observations with respect to ileal digestibility are present in the database compiled by CVB. All observations meet the criteria established in Chapter 3.

Feedstuff (*Dutch name in brackets*)	**Number of observations [1)]**
Barley (*Gerst*)	12
Biscuits, ground / bakery by-product (*Biscuitmeel*)	5
Casein (*Caseïne*)	3
Chick pea (*Kikkererwten*)	1
Cotton seed expeller and cotton seed meal, extracted (*Katoenzaadschilfers en katoenzaadschroot)*	13
DDGS maize (*DDGS, mais*)	13

Feedstuff (*Dutch name in brackets*)	**Number of observations [1)]**
DDGS wheat (*DDGS, tarwe*)	7
Fish meal (*Vismeel*)	11
Fish silage (*Vissilage*)	2
Horsebeans, coloured and white flowering (*Paardebonen, bont- en witbloeiend*)	20
Lupins; all qualities (*Lupinen; alle kwaliteiten*)	25
Linseeed (*Lijnzaad*)	1
Maize [2)] (*Mais*)	25
Maize, High Lysin (*Mais, hoog Lysine*)	1
Maize gluten meal (*Maisglutenmeel*)	4
Maize gluten feed [3)] (*Maisglutenvoer*)	1
Maize germ feed meal, solvent extracted [3)] (*Maiskiemzemelschroot*)	1
Maize feed meal [3)] (*Maisvoermeel*)	1
Pearl millet (*Parelgierst*)	4
Palm kernel, solvent extracted (*Palmpitschroot*)	1
Peanut expeller (*Grondnootschilfers*)	1
Peas (*Erwten*)	27
Rape seed and rapeseed expeller (*Raapzaadschilfers*)	5
Rape seed meal, solvent extracted (*Raapzaadschroot*)	40
Rice feed meal, high grade (*Rijstevoermeel, hoge kwaliteit*)	4
Rice pollards (*Rijsteslijpsel*)	1
Rye (*Rogge*)	2
Sesame seed meal, solvent extracted (*Sesamzaadschroot*)	1
Soy beans, heat treated (*Sojabonen, hittebehandeld*)	14
Soy protein concentrate (*Soja-eiwit concentraat*)	1
Soy bean, expeller [4)] (*Sojaschilfers*)	1
Soy bean meal, solvent extracted (*Sojaschroot)*	122
Sorghum (*Sorghum*)	22
Sunflower seed meal, solvent extracted (*Zonnebloemzaadschroot*)	6
Triticale (*Triticale*)	4
Wheat (*Tarwe*)	48
Wheat middling's (*Tarwegries*)	5
Wheat feed flour [5)] (*Tarwevoerbloem*)	1
Wheat bran (*Tarwezemelgrint*)	4
Feedstuffs not allowed in The Netherlands	
Blood meal (*Bloedmeel*)	3
Feather meal (*Verenmeel*)	4
Meat meal and meat-and-bone meal (*Diermeel en Vleesbeendermeel*)	26

[1)] : The 'Number of observations' column shows the maximum number of observations on which the digestibility of the majority of the amino acids can be based. For some amino acids (mainly CYS, TRP and PRO), the number of observations is often smaller than the number stated in this table (see also Appendix 3).

[2)] : Excluding the observation with a high Lys content.

[3)] : For this product one observation was available, but the results were questionable. Therefore the SIDC AA values have been estimated (see Appendix 4)

[4)] : For Soybean expeller one observation was available. However, it is recommended to use the SIDC-AA values of soybean meal, solvent extracted. For this product a large number of observations is present in the database.

[5)] : For wheat feed flour the SIDC values are estimated, using regression formulas (see Appendix 5).

5. Estimation of standardized ileal amino acid digestibility of feedstuffs for which no experimental results are available

5.1 Products for which ileal digestibility had been estimated

The database of observations from scientifically published studies concerning ileal digestibility of amino acid in feedstuffs for poultry contains many, but not all, feedstuffs that are used in poultry nutrition. For feedstuffs that are quantitatively important in Dutch poultry nutrition, in almost all cases a reasonable (n >10) to high number of observations is available, at least a sufficient number to derive mean SIDC values for the Table 'Standardized Ileal Digestibility of Amino Acid in Feedstuffs for Poultry' (see Chapter 4).

However, for certain feedstuffs that are fed to poultry – mostly less frequent and/or to a lesser extent – no experimental observations were available. These feedstuffs are listed in Table 3. As it is desirable that also for these feedstuffs digestibility values for amino acids are represented in the Table, the standardized ileal amino acid digestibility were estimated for these feedstuffs.
As a criterion whether or not an estimated value for the standardized ileal amino acid digestibility should be derived for a certain feedstuff, we used as a criterion the presence of a metabolizable energy value for a feedstuff in the CVB Feed Table 2016 for one of the poultry categories (adult poultry/layers and broilers).

Table 3. Feedstuffs for which no experimental observations with respect to ileal amino acid digestibility for broilers are contained in the CVB database, and for which, therefore, the standardized ileal amino acid digestibility is estimated.

Table 3.a: Feedstuffs with a ME value in the CVB Feed Table and for which Terpstra et al. (1977) determined the apparent fecal amino acid digestibility in adult roosters.

Feedstuff
Barley feed, high grade; Barley mill by-product; Coconut expeller, CFAT < 100 and CFAT>100 g/kg; Coconut, extracted; Maize feed flour; Maize germ meal, solvent extracted; Maize germ meal feed, solvent extracted; Peanuts, without shell; Peanut, with shell; Peanut, extracted, with and without shell; Potato protein, CASH<10 and CASH>10; Rice, without hulls; Sesame seed expeller

Table 3.b. Feedstuffs with a ME value in the CVB Feed Table and but for which Terpstra et al. (1977) did not determine the apparent fecal amino acid digestibility in adult roosters.

Feedstuff
Alfalfa meal, three qualities with respect to CP content; Beans (Phaseolus vulgaris), heat treated; Bread meal; Brewer's yeast, dehydrated; Cottonseed, without husk; Grass meal, four qualities with respect to CP content; Linseed expeller; Linseed, extracted; Maize, chemical/heat treated; Maize germ feed expeller; Maize bran; Milk powder, skimmed; Millet; Molasses, sugar beet and Molasses, sugarcane molasses, SUG<475 and SUG>275 g/kg; Oats grain; Oats grain, peeled; Rice, with hulls; Sorghum gluten meal; Sweet potatoes, dehydrated; Tapioca, three qualities with respect to STA content; Whey powder, low lactose, two qualities with respect to CASH content; Whey powder

The procedure that was followed to estimate the ileal amino acid digestibility is described in detail in Appendix 4.
For some wheat by-products (wheat germs;, wheat feed flour, high fibre; wheat germ feed and wheat feed meal) the SIDC AA values were obtained by regression analysis (see Appendix 5)

6. Ileal amino acid digestion in other categories of chickens and other types of poultry as compared to broilers

For the compilation of a Table 'Standardized ileal amino acid digestibility of feedstuffs for poultry', as described in the previous chapters, only observations from broilers have been used. For the poultry industry it is relevant whether this - broiler-based - Table may also be used for other categories of chickens and other types of poultry. To answer this question, data are required concerning the ileal amino acid digestibility of feedstuffs in different categories of chickens and poultry *within one experiment*. Such studies are scarcely published.
The results of studies where the ileal amino acid digestibility is *only* determined in other poultry categories than broilers or in other types of poultry have not been included in the comparison, because in those cases too many other factors may have been responsible for possible differences.
Kluth and Rodehutscord (2009) also addressed this issue. They stated that insufficient data are available to conclude that values of broiler-derived standardized amino acid digestibility may also be used for other categories of chickens or other types of poultry. Since than this situation has not improved significantly.

6.1 Ileal amino acid digestibility in laying hens compared to broilers

In four experiments, the ileal amino acid digestibility in laying hens and broilers was compared (Adedokun et al., 2009; Huang et al. (2006, 2007); Scheele and Kwakernaak, 1992b). The ratio between the (apparent or standardized) ileal amino acid digestibility in laying hens and in broilers (AIDC-laying hens / AIDC-broilers or SIDC-laying hens / SIDC-broilers) is given in Figures 10, 11, 12 and 13, for each study. Huang et al. (2006) compared laying hens and broilers, as well as roosters and broilers. Therefore, Figure 10 also shows the comparison between roosters and broilers.

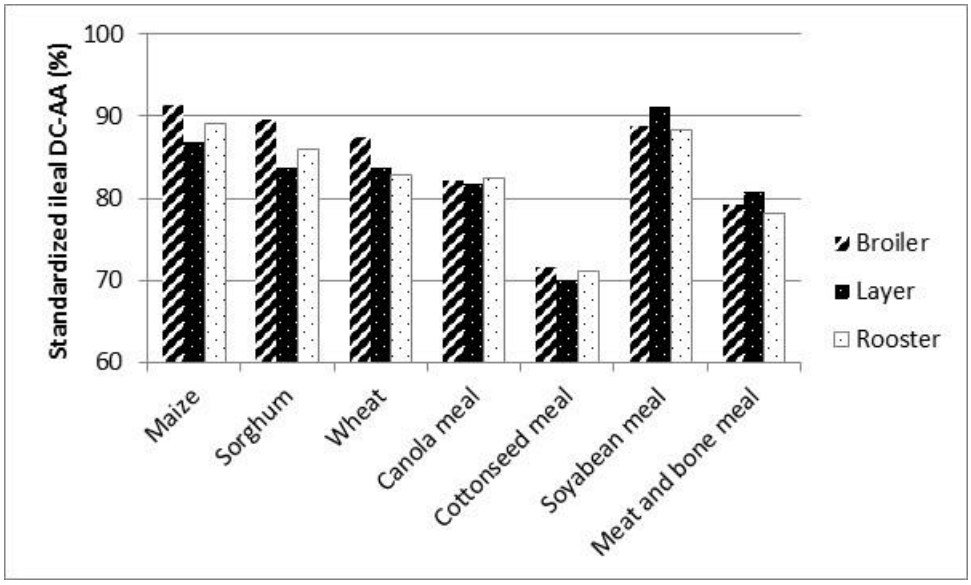

Figure 10. Comparison of the (calculated) standardized ileal amino acid digestibility (SIDC-AA) [6] in broilers (Cobb 500), laying hens and roosters (both ISA Brown) in percent-units for a number of feedstuffs (Huang et al., 2006).

[6] The 'mean amino acid digestibility', as presented in these and other figures, has been calculated by adding all standardized ileal digestible amino acid contents, and dividing this sum by the sum of all gross amino acids (= Σ (contents of SID-AA 1 … n) / Σ (contents of gross AA 1 … n) * 100). Next to

In three of the four studies, the mean standardized ileal amino acid digestibility for soybean meal in laying hens was consistently somewhat higher (approximately 2%) than in broilers. In one study (Adedokun et al., 2009), the digestibility was lower in laying hens compared to broilers. For the other protein-rich product (meat-and-bone meal), the standardized ileal amino acid digestibility was higher in laying hens than in broilers in all four studies, although the differences were more variable in this case.

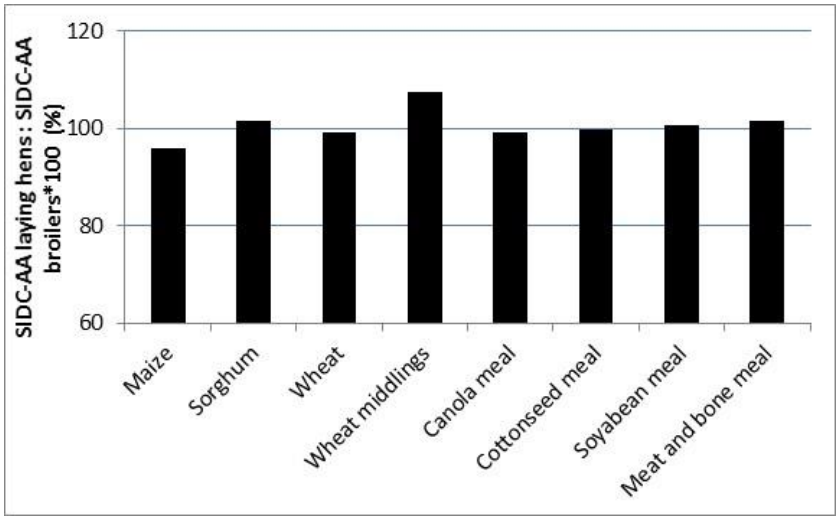

Figure 11. Ratio of the mean (calculated) Standardized ileal amino acid digestibility (SIDC-AA) in laying hens (ISA Brown) to the mean SIDC-AA in broilers (Cobb 500) in percent-units for a number of feedstuffs (Huang et al., 2007)

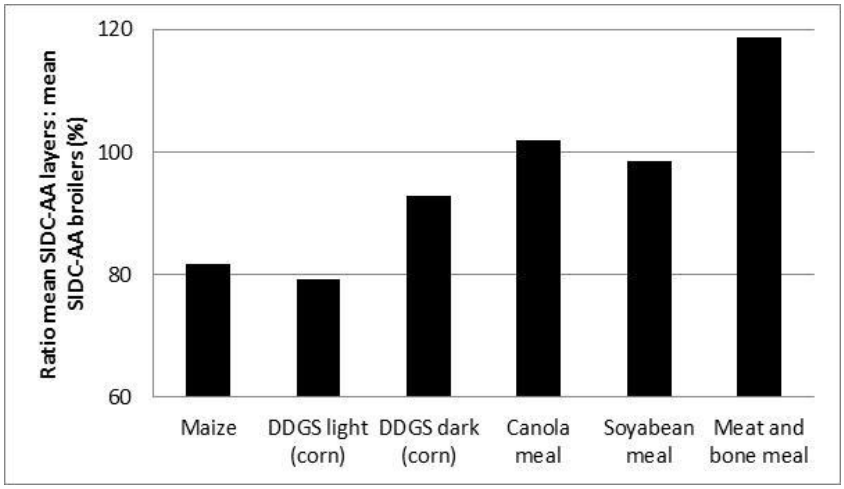

Figure 12. Ratio of the mean Standardized ileal amino acid digestibility (SIDA-AA) in laying hens (White leghorns) to the mean SIDC-AA in broilers (Ross 308) for a number of feedstuffs (%; Adedokun et al.; 2009).

The study of Adedokun et al. (2009) showed a higher ileal amino acid digestion for all amino acids in maize and light-coloured maize-DDGS in broilers as compared to laying hens. The amino acids in meat-and-bone meal were digested to a higher degree in laying hens as compared to broilers.

The trial by Scheele and Kwakernaak (1992) revealed that the ileal amino acid digestion of most amino acids was significantly higher in laying hens as compared to broilers for both

this, also the 'mean of all amino acid digestibility's' may be calculated (= Mean (SIDC-AA 1 … SIDC-AA n).

feedstuffs (soybean meal and meat-and-bone meal) tested. Huang et al. (2006) found in soybean meal, for nearly all amino acids, a significantly higher ileal digestion in laying hens as compared to broilers. For meat-and-bone meal, cottonseed extracted, and rapeseed solvent extracted, no differences in digestibility between these animal categories were found for any of the amino acids.

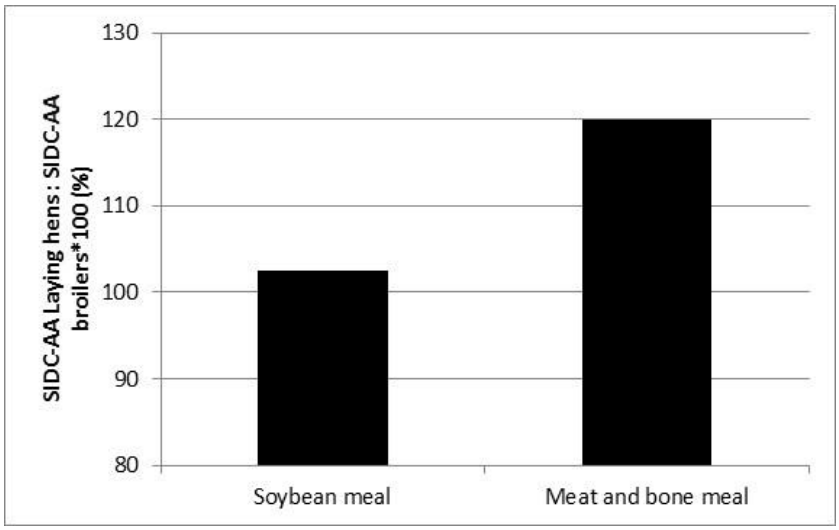

Figure 13. Ratio of the mean calculated Standardized ileal amino acid digestibility (SIDC-AA) in laying hens to the mean SIDC AA in broilers for soybean meal and meat-and-bone meal in percent units (Scheele and Kwakernaak (1992))

In the study of Huang et al. (2006) the cereal grains wheat, sorghum and maize (less protein-rich feedstuffs) showed a significantly lower digestibility for all amino acids in laying hens as compared to broilers. In a follow-up study by Huang et al. (2007), the differences were less clear. For soybean meal, no significant difference in amino acid digestibility was found between laying hens and broilers. For meat-and-bone meal, the ileal digestibility was higher in laying hens only for the amino acids HIS, GLY and ALA as compared to broilers. For wheat, sorghum, maize and rape seed solvent extracted, the significant differences between laying hens and broilers were not consistent. Only for wheat bran, the ileal amino acid digestibility was significantly higher in laying hens as compared to broilers, for nearly all amino acids.
Figure 14 shows the relationship between the mean SIDC-AA in laying hens to the mean SIDC-AA in broilers is presented.

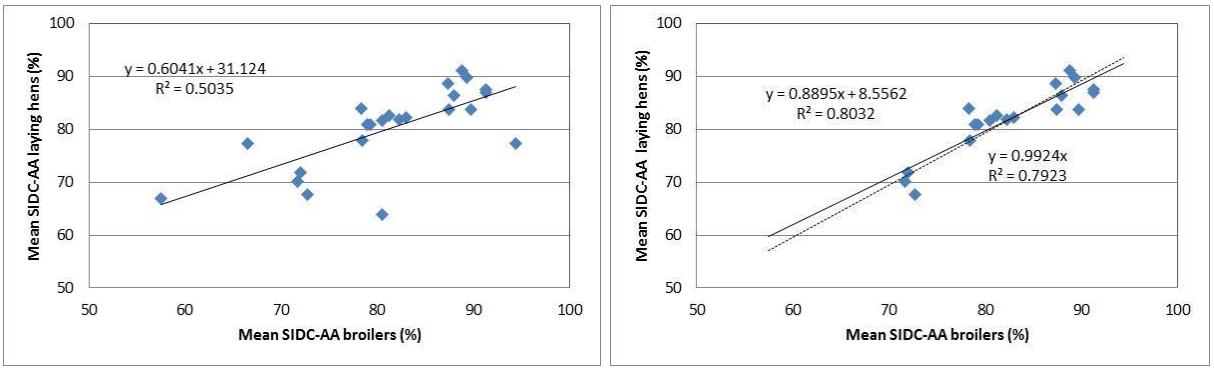

Figure 14. Relation between mean Standardized ileal amino acid digestibility (SIDC_AA) in laying hens and SIDC-AA in broilers. In the left panel all observations from the 4 studies in Figure 10 – 13 are depicted; in the right panel 4 observations (2 meat-and-bone meal, 1 DDGS and 1 maize) are eliminated.

As can be seen by comparing both panels of Figure 14, 4 observations are responsible for the rather weak relation in the left panel between the mean SIDC-AA in laying hens and broilers,

being 2 observations for meat-and-bone meal (both with higher digestibility in laying hens compared to broilers and with a SIDC-AA <70% in broilers), 1 observations for DDGS and 1 observation for maize (both with the highest digestibility in broilers). Especially the observation with maize (SIDC-AA of 94% and 77% in broilers and laying hens, respectively) is striking because two other observations for maize in the dataset have comparable digestibility in laying hens and broilers (difference ≤4%). After elimination of the 4 observations mentioned, the SIDC-AA in laying hens and broilers is very comparable.
More recently Adedokun et al (2014) determined the standardized ileal digestibility of 7 batches of meat-and-bone meal and of 3 batches of soybean meal in layers and 21-day old broilers. For the meat-and-bone meals it was found that for four out of the seven batches the digestibility of many amino acids was lower in 30-weeks old layers compared to 21-day old broilers. For the soybean meals the standardized ileal amino acid digestibility was determined in 50-week old layers and 21-day old broilers. For batch 1 the digestibility of 7 amino acids was significantly lower in layers compared to broilers; in batch 2 this was the case for 1 amino acid and in batch 3 for 9 amino acids. In 2015 Adedokun et al. published a paper in which they compared the standardized ileal amino acid digestibility between layers and broilers of a number of feed ingredients: maize (3 batches), DDGS (5 batches), wheat middling's (1 batch), and bakery by-products (5 batches). For the five DDGS batches it was found that the digestibility of 5 to all amino acids was significantly lower in layers than in broilers. For the four batches bakery by-products no significant difference for any amino acids was found, whereas for the other batches the digestibility in layers was significantly lower for (almost) all amino acids. For the three batches of maize evaluated in one batch there was a significant difference for 7 amino acids between layers and broilers, whereas in another batch all amino acids had a significantly lower digestibility in layers. For wheat middling's (1 batch) there was no significant difference for any amino acid. For amino acids where the difference in digestibility between layers and broilers was not significantly different, the digestibility in layers was mostly numerically lower than in broilers for most feed ingredients tested.
From the studies in which the amino acid digestibility between laying hens and broilers was compared it can be concluded that – overall speaking – the digestibility in layers is lower than in broilers. At this moment no sufficient data is available to construct a separate table for layers. It also remains to be seen whether the ranking in digestibility of most relevant feed ingredients for layers differs from that of broilers.

6.2 Adult roosters compared to broilers

In one experiment, a comparison was made between broilers, laying hens and (intact) roosters (Huang et al., 2006). Figure 10 shows that the mean SIDC-AA in roosters is numerical somewhat lower as compared to broilers. For wheat, sorghum and maize, a significantly lower SIDC-AA was found in roosters (as compared to broilers) for almost all amino acids. For rapeseed meal, cottonseed meal, soybean meal and meat-and-bone meal, however, no significant differences in mean SIDC-AA were detected between the two poultry categories.

6.3 Local breeds compared to (modern) broilers

In two experiments by Al-Marzooqi et al.(2010, 2011), the ileal amino acid digestibility in a local breed was compared to that in a commercial broiler strain (Cobb 500) (Figure 15). The local breed showed a significantly lower SIDC-AA, on average 87% of that of commercial broilers.

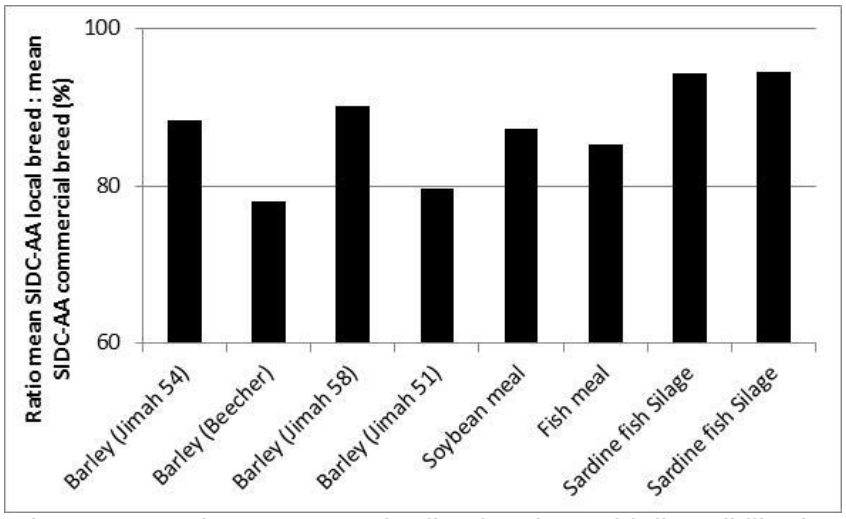

Figure 15. Ratio mean Standardized amino acid digestibility (SIDC-AA), at 23 days of age, in a local broiler breed: mean SIDC-AA in commercial broiler breed for a number of selected feed ingredients (Al-Marzooqi et al. (2010, 2011).

6.4 Turkeys and ducks compared to broilers

In two experiments Adedokun et al. (2007b, 2008) made a comparison of standardized ileal amino acid digestion between turkeys and broilers. As can be seen in Figure 16, Adedokun et al. (2007b, 2008) found in turkeys (Nicolas), an ileal amino acid digestibility at 5 and 21 days of age that, *on average,* was at a level of 90% of the digestibility in broilers (Ross 308). For maize and dark-coloured DDGS, the values differed the most between the two bird species.
Kluth and Rodehutscord (2006) compared ileal digestibility of amino acids in turkeys (British United) and ducks (White Peking) to that in broilers (Ross 308) (Figure 17), using the regression technique. They found no significant difference in ileal amino acid digestibility between broilers and turkeys. The standardized ileal amino acid digestibility was, however, significantly lower in Peking ducks as compared to broilers and turkeys.

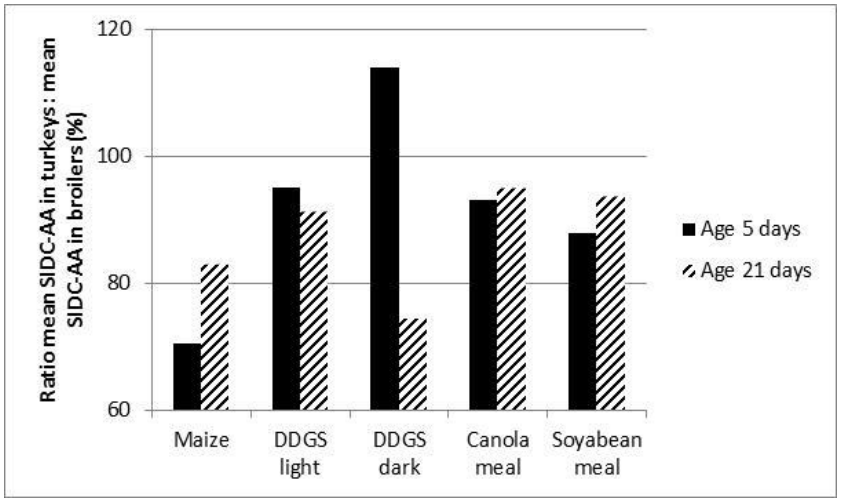

Figure 16. Ratio mean Standardized ileal amino acid digestibility (SIDC-AA) in turkeys : mean SIDC-AA in broilers (%), at 5 and 23 days of age, for some selected feedstuffs (Adedokun et al., (2007b, 2008).

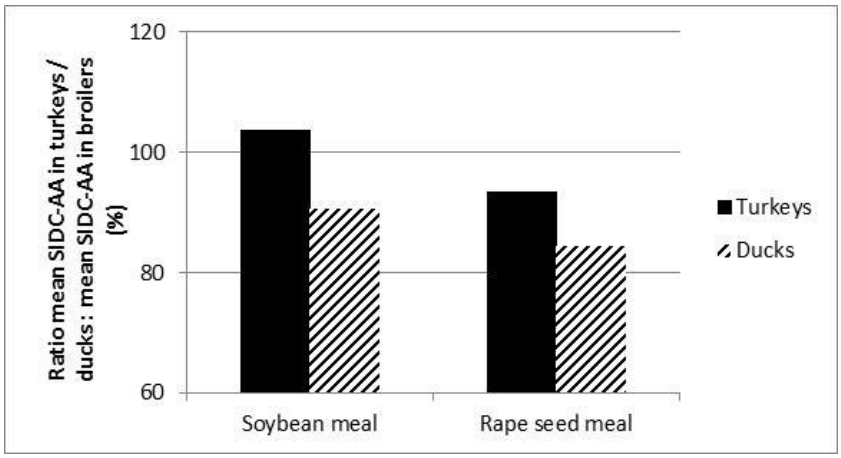

Figure 17. Standardized ileal amino acid digestibility in turkeys and ducks, as compared to broilers, at 21 days of age (%; Kluth and Rodehutscord, 2006).

Adebiyi and Olukosi (2015) compared the digestibility of a batch of wheat-DDGS in broilers and turkeys, without and with an exogenous protease. They conclude that both the apparent and standardized ileal amino acid digestibility are variable and are generally higher in broilers compared to turkeys at 28 d of age. Further, protease improved the ileal digestibility of a large number of amino acids in wheat-DDGS of both animals.
Also for turkeys and ducks much more observations are needed to answer the question whether the differences in digestibility between these species and broilers obliges the construction of separate Tables for turkeys and ducks.

6.5 Comparison of ileal digestibility of amino acids in caecectomized roosters compared to fecal digestibility of amino acid in intact roosters

Schutte and Beelen (1992) compared the ileal digestibility of amino acids in five raw materials in caecectomized roosters to the fecal digestibility of amino acid in intact roosters. Figure 18 shows the following characteristics for these feedstuffs:

a. The first bar within each feedstuff represents the apparent ileal amino acid digestibility for broilers (AIDC-broilers$_{\text{new table based}}$). This value has been recalculated from the data on standardized amino acid digestibility (SIDC) for the feedstuff in the new database.
b. The second bar within each feedstuff represents the apparent ileal amino acid digestibility in caecectomized roosters as reported by Schutte (AIDC-roosters$_{\text{Schutte}}$).
c. The third bar within each feedstuff represents the apparent fecal digestibility in adult roosters, as stated in the available CVB Feed Table (AFDC-roosters$_{\text{CVB}}$).
d. The fourth bar within each feedstuff represents the apparent fecal digestibility in adult roosters as reported by Schutte (AFDC-roosters$_{\text{Schutte}}$).

From a comparison between the AIDC-broilers$_{\text{new table based}}$ and the AIDC-caecectomized roosters$_{\text{Schutte\&Beelen}}$ it may be concluded that these values are very similar for soybean meal and sunflower meal (difference limited to approximately 1 percent-unit). For meat-and-bone meal, there are large differences between batches.
The AFDC-adult roosters$_{\text{CVB Feed Table}}$ for soybean meal and sunflower seed meal is slightly higher than the AFDC-intact adultroosters$_{\text{Schutte\&Beelen}}$, the difference being 1 and 2 percent-units, respectively. For meat-and-bone meal, Schutte and Beelen reported for all three batches a higher AFDC than given in the CVB-table, the difference ranging from +3 - +5 percent-units. It is difficult to explain and evaluate these differences. On the one hand it concerns only one study, which is important to note especially for meat-and-bone meal where the amino acid digestibility may vary considerably depending on processing conditions. Further, with respect to the comparison of the AIDC-CVB$_{\text{new table}}$ with the AIDC-caecectomized roosters$_{\text{Schutte\&Beelen}}$ it is important to note that in experiments with caecectomized roosters extra finely-ground diets

(1 mm sieve) are used in order to prevent blockage of the cannulas. The particle size of the feed may affect the post-ileal fermentation, especially with less well digestible feedstuffs.
With respect to the comparison between AIDC-broilers $_{\text{new table based}}$ and AIDC-roosters$_{\text{Schutte}}$ it should be noted that this concerns a comparison between broiler experiments in the database and the study by Schutte and Beelen (1992). The other comparisons in this chapter are based on research in broilers and other categories of chickens or other types of poultry within one study. Therefore, it is concluded that the comparison of the AIDC-roosters$_{\text{Schutte}}$ and the AIDC-broilers $_{\text{new table based}}$ does not make much sense.

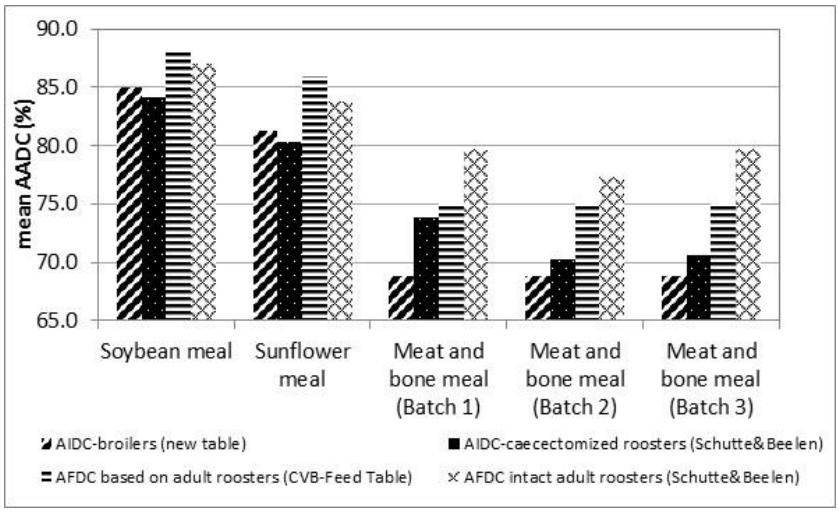

Figure 18. Comparison of apparent ileal digestibility in broilers (AIDC-broilers, recalculated from SIDC-AA in the new Table) and in caecectomized roosters (AIDC—caecectomized roosters (Schutte and Beelen, 1992), and fecal amino acid digestibility in intact roosters according to the current CVB-Table (AFDC-adult roosters (CVB Feed Table) and according to Schutte&Beelen (AFDC-intact adult roosters (Schutte and Beelen, 1992).

6.6 Conclusions

- The studies published in scientific literature with respect to ileal digestibility of amino acids in feedstuffs for poultry mainly consist of studies with broilers.
- The number of studies with other categories of chickens (laying hens, broiler breeders and roosters), and other types of poultry (turkeys, ducks) is (very) limited. Even more limited is the number of studies in which a comparison is made of amino acid digestibility at ileal level between broilers and one of the other categories of chickens or types of poultry. In any case, the number of comparative studies is insufficient to enable further evaluation of possible differences in ileal amino acid digestibility between the various categories of chickens and other types of poultry.

In some cases the comparative studies that are available from literature, especially the comparison between layers and broilers, show differences in ileal amino acid digestibility between certain categories of chickens or types of poultry as compared to broilers. However, for this moment it was decided to declare the new table, that is based on research with broilers, also applicable for all other categories of chickens (laying hens, broilers, broiler breeders, and adult roosters), and for all other types of poultry (turkeys, geese, ducks). Therefore, the new table is referred to as Table 'Standardized ileal digestibility of amino acids in feedstuffs for poultry'.

7. Table 'Standardized ileal digestibility of amino acids in feedstuffs for poultry'

7.1 Standardized ileal digestibility of amino acids in feedstuffs for poultry.

In Table 4 the standardized ileal digestibility values of amino acids are given for all feedstuffs for which digestibility coefficients has been established. For a part of the feedstuffs, the values are based on ileal digestibility studies as included in the database, for other feedstuffs (quantitatively less important in practice) the values are based on an estimation. For more detailed information on the feedstuffs for which the SIDC values are derived from ileal digestibility studies, the reader is referred to Appendix 3.
Feedstuffs for which the standardized ileal amino acid digestibility has been estimated are listed in italics, and an asterisk (*) has been added to the name of the feedstuff. For a further motivation of these estimations, the reader is referred to Appendix 4 and 5.
For comparison, for each feedstuff also the apparent fecal digestibility (AFDC, %) in the current CVB Feed Table are given as well.

Table 4. Overview of the feedstuffs to be incorporated in the Table "Standardized ileal digestibility of amino acids in feedstuffs for poultry" (SIDC, %). For comparison, also the apparent fecal digestibility (AFDC, %) – as used up to now – are given [1)]

Feed Ingredient	System[2)]	LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
Alfalfa meal, CP 140-160 g/kg *	SIDC	*54*	*55*	*50*	*53*	*51*	*53*	*51*	*52*	*52*	*52*	*52*	*53*	*55*	*52*	*53*	*54*	*53*	*52*
(CVB code: 4005.610/2/0)	AFDC	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52
Alfalfa meal, CP 160-180 g/kg *	SIDC	*63*	*63*	*58*	*61*	*59*	*61*	*59*	*60*	*60*	*60*	*60*	*61*	*63*	*60*	*61*	*62*	*61*	*60*
(CVB code: 4005.610/3/0)	AFDC	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Alfalfa meal, CP >180 g/kg *	SIDC	*70*	*71*	*65*	*68*	*66*	*69*	*66*	*67*	*67*	*67*	*68*	*68*	*70*	*67*	*68*	*69*	*68*	*67*
(CVB code: 4005.610/4/0)	AFDC	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67
Barley	SIDC	81	91	76	75	79	82	78	81	79	81	75	80	75	72	87	72	83	78
(CVB code: 1005.000/0/0)	AFDC	65	75	70	67	73	73	79	77	69	75	73	74	68	67	85	63	81	73
Barley feed, high grade *	SIDC	*71*	*70*	*60*	*67*	*64*	*70*	*62*	*69*	*63*	*68*	*63*	*68*	*71*	*68*	*66*	*67*	*55*	*64*
(CVB code: 1005.112/0/0)	AFDC	69	73	72	68	79	75	80	78	69	76	73	75	69	67	85	66	81	73
Barley mill by-product *	SIDC	*68*	*67*	*57*	*64*	*61*	*67*	*59*	*66*	*60*	*65*	*60*	*65*	*68*	*65*	*63*	*64*	*52*	*61*
(CVB code: 1005.105/0/0)	AFDC	68	72	69	66	77	74	79	77	69	74	73	73	67	66	84	65	80	72
Beans (Phaseolus vulgaris), heat treated *	SIDC	*78*	*66*	*59*	*67*	*67*	*67*	*78*	*64*	*68*	*69*	*67*	*66*	*70*	*65*	*72*	*64*	*68*	*69*
(CVB code: 2001.616/0/0)	AFDC	83	67	61	79	80	78	87	82	81	83	76	77	76	83	86	74	81	81
Biscuits, ground	SIDC	70	81	77	72	75	79	79	78	74	81	77	76	75	72	88	71	81	78
(CVB Code: 9011.001/0/0 and 9011.002/0/0)	AFDC	79	86	79	74	81	82	84	85	81	82	78	79	73	73	94	74	89	87
Bread meal *	SIDC	*70*	*81*	*77*	*72*	*75*	*79*	*79*	*78*	*74*	*81*	*77*	*76*	*75*	*72*	*88*	*71*	*81*	*78*
(CVB code: 1010.612/0/0)	AFDC	86	90	86	81	85	87	88	89	85	86	84	84	78	79	96	79	91	91
Brewers' yeast, dehydrated *	SIDC	*90*	*84*	*80*	*81*	*86*	*85*	*88*	*86*	*82*	*85*	*87*	*84*	*88*	*85*	*88*	*85*	*85*	*82*
(CVB code: 9001.315)	AFDC	86	79	61	80	83	82	89	84	82	83	86	82	83	84	87	83	87	82
Casein	SIDC	98	98	96	93	98	95	96	98	92	95	98	95	94	97	96	94	96	90
(CVB code: 8010.000)	AFDC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chick peas	SIDC	77	80	75	72	75	70	85	76	78	72	74	73	74	75	79	77	80	75
	AFDC																		

Feed Ingredient	System[2)]	LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
Coconut expeller, both qualities *	SIDC	*60*	*68*	*62*	*62*	*67*	*69*	*71*	*68*	*62*	*69*	*65*	*69*	*67*	*62*	*64*	*64*	*57*	*62*
(CVB code: 3015.401)	AFDC	47	79	52	60	71	75	86	81	77	79	76	77	70	68	74	60	65	68
Coconut, extracted *	SIDC	*60*	*68*	*62*	*62*	*67*	*69*	*71*	*68*	*62*	*69*	*65*	*69*	*67*	*62*	*64*	*64*	*57*	*62*
(CVB code: 3015.407/0/0)	AFDC	46	81	50	60	75	75	86	81	69	79	76	77	70	68	74	60	65	68
Cottonseed, decorticated *	SIDC	*58*	*77*	*71*	*66*	*77*	*69*	*86*	*80*	*75*	*71*	*77*	*71*	*70*	*75*	*83*	*70*	*74*	*73*
(CVB code: 3018.000/1/0)	AFDC	58	67	67	68	72	71	83	79	77	72	76	73	67	77	83	65	69	75
Cottonseed expeller	SIDC	58	77	71	66	77	69	86	80	75	71	77	71	70	75	83	70	74	73
(CVB code: 3018.401)	AFDC	59	68	68	69	73	72	84	80	78	73	77	74	68	78	84	66	70	76
Cottonseed, extracted	SIDC	58	77	71	66	77	69	86	80	75	71	77	71	70	75	83	70	74	73
(CVB code: 3018.407)	AFDC	59	68	68	69	73	72	84	80	78	73	77	74	68	78	89	66	70	76
DDGS maize	SIDC	61	81	73	66	78	74	78	79	73	83	80	72	80	63	81	69	76	77
(CVB code: 1002.310)	AFDC																		
DDGS wheat	SIDC	49	77	67	63	78	74	75	81	71	79	79	71	72	56	83	65	82	71
(CVB code: 1010.310)	AFDC																		
Grass meal, CP 45-140 g/kg *	SIDC	47	48	43	45	44	46	44	45	45	45	45	46	47	45	46	47	46	45
(CVB code: 5010.610/1/0)	AFDC	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Grass meal, CP 140-160 g/kg *	SIDC	*47*	*48*	*43*	*45*	*44*	*46*	*44*	*45*	*45*	*45*	*45*	*46*	*47*	*45*	*46*	*47*	*46*	*45*
(CVB code: 5010.610/2/0)	AFDC	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Grass meal, CP 160-200 g/kg *	SIDC	*62*	*62*	*57*	*60*	*58*	*60*	*58*	*59*	*59*	*59*	*59*	*60*	*62*	*59*	*60*	*61*	*60*	*59*
(CVB code: 5010.610/3/0)	AFDC	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59
Grass meal, CP >200 g/kg *	SIDC	*71*	*72*	*66*	*69*	*67*	*70*	*67*	*68*	*68*	*68*	*69*	*69*	*71*	*68*	*69*	*70*	*69*	*68*
(CVB code: 5010.610/4/0)	AFDC	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68
Fish meal	SIDC	85	83	71	81	79	83	85	82	80	85	82	83	83	74	82	77	82	78
(CVB code: 8015.000)	AFDC	90	91	89	85	91	89	92	89	84	91	88	91	91	83	89	84	84	84
Fish silage	SIDC	96	95	92	91	92	94	93	93	92	94	94	94	93	88	89	86	86	90
	AFDC																		
Horsebeans coloured	SIDC	86	87	72	78	66	80	87	81	79	80	82	79	88	87	90	82	76	85
(CVB code: 2002.000)	AFDC	78	80	66	76	80	81	86	80	81	84	76	79	79	79	83	71	83	78
Horsebeans, white flowering	SIDC	86	87	72	78	66	80	87	81	79	80	82	79	88	87	90	82	76	85
(CVB code: 2017.000)	AFDC	84	86	71	81	86	87	92	86	87	90	81	85	85	85	89	76	89	84
Linseed	SIDC	69	68	64	66	63	60	66	61	59	63	63	58	60	58	70	61	69	58
(CVB code: 3006.000/0/0)	AFDC																		
Linseed expeller *	SIDC	*83*	*88*	*67*	*79*	*80*	*77*	*74*	*78*	*74*	*77*	*77*	*78*	*77*	*74*	*74*	*76*	*77*	*74*
(CVB code: 3006.401/0/0)	AFDC	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56
Linseed, extracted *	SIDC	83	88	67	78	80	77	74	77	74	77	77	77	77	74	74	75	77	73
(CVB code: 3006.401/0/0)	AFDC	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56
Lupins (both quality's)	SIDC	87	82	81	81	82	84	90	85	81	85	83	82	83	82	89	81	79	82
(CVB code: 2004.000)	AFDC	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
Maize	SIDC	90	94	86	83	85	93	93	93	90	94	88	90	93	89	95	86	91	91

Feed Ingredient	System[2)]	LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
(CVB code: 1002.000)	AFDC	61	88	75	75	80	84	88	88	83	90	83	80	86	79	87	77	84	83
Maize, chemical/heat treated *	SIDC	*90*	*94*	*86*	*83*	*85*	*93*	*93*	*93*	*90*	*94*	*88*	*90*	*93*	*89*	*95*	*86*	*91*	*91*
(CVB code: 1002.629/0/0)	AFDC	61	88	75	75	80	84	88	88	83	90	83	80	86	79	87	77	84	83
Maize, high lysine	SIDC	89	93	88	83	79	90	92	90	89	92	88	88	90	89	94	83	88	84
	AFDC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maize bran *	SIDC	*71*	*88*	*76*	*69*	*79*	*83*	*83*	*83*	*78*	*85*	*79*	*80*	*86*	*75*	*82*	*72*	*79*	*78*
(CVB code: 1002.108/0/0)	AFDC	66	82	70	68	75	81	85	85	81	87	79	80	84	76	86	72	83	79
Maize feed flour *	SIDC	*93*	*95*	*89*	*85*	*93*	*95*	*91*	*92*	*92*	*99*	*93*	*92*	*98*	*90*	*98*	*88*	*84*	*91*
(CVB code: 1002/103/0/0)	AFDC	64	87	72	67	100	79	85	82	82	86	80	74	83	77	86	73	84	78
Maize feed meal *	SIDC	*69*	*83*	*71*	*69*	*79*	*80*	*87*	*81*	*81*	*88*	*80*	*80*	*83*	*77*	*87*	*70*	*83*	*77*
(CVB code: 1002.105)	AFDC	65	84	73	70	78	79	85	85	81	87	81	81	85	76	86	71	84	80
Maize gluten feed *	SIDC	72	82	70	76	82	83	88	86	83	90	83	85	86	76	87	71	84	80
(CVB code: 1002.205)	AFDC	74	83	69	75	85	81	85	85	83	90	85	83	86	76	87	72	84	82
Maize gluten meal	SIDC	79	89	74	79	74	85	86	88	82	89	89	84	89	81	88	74	88	86
(CVB code: 1002.204)	AFDC	82	95	84	88	83	87	91	90	84	90	91	85	88	92	87	72	88	96
Maize germ meal, solvent extracted *	SIDC	*62*	*71*	*54*	*62*	*67*	*66*	*66*	*69*	*63*	*66*	*66*	*64*	*65*	*62*	*61*	*62*	*64*	*59*
(CVB code: 1002.418/0/0)	AFDC	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58
Maize germ feed meal expeller *	SIDC	*61*	*71*	*53*	*59*	*66*	*65*	*65*	*68*	*59*	*66*	*67*	*63*	*64*	*61*	*60*	*61*	*63*	*59*
(CVB code: 1002.419/0/0)	AFDC	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54
Maize germ feed meal, solvent extracted *	SIDC	*62*	*85*	*64*	*67*	*79*	*78*	*85*	*83*	*78*	*86*	*81*	*78*	*82*	*75*	*84*	*67*	*80*	*77*
(CVB Code: 1002.420)	AFDC	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58
Milkpowder, skimmed *	SIDC	*99*	*100*	*88*	*92*	*94*	*92*	*95*	*97*	*95*	*96*	*96*	*92*	*95*	*93*	*90*	*96*	*93*	*86*
(CVB code: 8008.000/0/0)	AFDC	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
Millet *	SIDC	*87*	*83*	*73*	*79*	*86*	*83*	*89*	*79*	*80*	*82*	*86*	*81*	*81*	*82*	*82*	*80*	*76*	*81*
(CVB code: 1006.000/0/0)	AFDC	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84
Molasses, sugar beet *	SIDC	*96*	*98*	*92*	*92*	*95*	*96*	*89*	*94*	*88*	*95*	*93*	*95*	*98*	*95*	*94*	*94*	*84*	*91*
(CVB code: 4004.210/0/0)	AFDC	-50	25	-	33	-	36	-100	17	-	31	33	50	57	66	61	44	-50	33
Molasses, sugarcane, both qualities *	SIDC	*93*	*98*	*92*	*91*	*95*	*94*	*83*	*90*	*84*	*93*	*90*	*95*	*98*	*95*	*92*	*92*	*81*	*88*
(CVB code: 7002.210)	AFDC	-100	-100	-	-67	-	-33	-300	-100	-100	-75	-100	-	30	58	38	-25	-100	-50
Oats grain *	SIDC	*84*	*86*	*67*	*74*	*73*	*84*	*84*	*87*	*83*	*84*	*80*	*82*	*79*	*76*	*82*	*76*	*73*	*76*
(CVB code: 1004.000/0/0)	AFDC	60	76	64	63	73	70	79	72	71	74	75	68	60	67	82	58	71	64
Oats grain, peeled *	SIDC	*90*	*92*	*73*	*80*	*79*	*90*	*90*	*93*	*89*	*90*	*86*	*88*	*85*	*82*	*88*	*82*	*79*	*82*
(CVB code: 1004.116/0/0)	AFDC	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83
Palm kernel, solvent extracted	SIDC	63	75	74	71	74	78	83	80	65	78	69	82	77	66	77	72	74	75
(CVB code: 3001.401)	AFDC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Peanuts, decorticated *	SIDC	*81*	*89*	*72*	*80*	*87*	*87*	*90*	*91*	*81*	*87*	*91*	*88*	*84*	*87*	*89*	*75*	*87*	*84*
(CVB code: 2013.000/1/0)	AFDC	80	81	76	78	86	84	90	90	86	86	89	83	81	89	90	79	81	84
Peanut expeller, all qualities *	SIDC	*81*	*89*	*72*	*80*	*87*	*87*	*90*	*91*	*81*	*87*	*91*	*88*	*84*	*87*	*89*	*75*	*87*	*84*
(CVB code: 2013.401)	AFDC	79	87	79	80	87	86	88	89	87	87	89	88	83	89	91	76	84	85

Feed Ingredient	System[2)]	LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
Peanut extracted, decorticated and partly decorticated * (CVB code: 2013.407)	SIDC	*81*	*89*	*72*	*80*	*87*	*87*	*90*	*91*	*81*	*87*	*91*	*88*	*84*	*87*	*89*	*75*	*87*	*84*
	AFDC	79	87	79	80	87	86	88	89	87	87	89	88	83	89	91	76	84	85
Pearl millet (CVB code: 1013.000)	SIDC	87	83	73	79	86	83	89	79	80	82	86	81	81	82	82	80	76	81
	AFDC	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84
Peas (CVB code: 2006.000)	SIDC	88	85	73	81	79	82	90	83	85	83	84	82	86	86	91	84	85	84
	AFDC	83	87	75	81	86	84	88	87	85	87	81	86	86	85	89	78	86	82
Potato protein, both qualities * (CVB code: 4001.203)	SIDC	*92*	*97*	*72*	*91*	*90*	*93*	*93*	*92*	*92*	*92*	*94*	*92*	*93*	*88*	*92*	*88*	*91*	*90*
	AFDC	88	92	73	90	90	91	94	92	92	92	93	91	89	88	91	85	90	90
Rapeseed (00) (CVB code: 3009.000)	SIDC	78	88	73	75	81	82	84	84	83	82	80	81	81	73	84	79	72	79
	AFDC	78	81	66	75	79	77	88	79	80	85	75	77	74	81	84	76	80	81
Rapeseed expeller (CVB code: 3009.401)	SIDC	78	88	73	75	81	82	84	84	83	82	80	81	81	73	84	79	72	79
	AFDC	79	83	69	77	80	79	89	81	81	86	77	79	76	83	85	78	81	83
Rapeseed, solvent extracted, both qualities (CVB code: 3009.407)	SIDC	78	88	75	73	80	78	85	80	82	80	79	77	80	76	86	78	77	76
	AFDC	80	84	70	78	81	80	90	82	82	87	78	80	77	84	86	79	82	84
Rice, with hulls (paddy rice) * (CVB code: 1003.000/2/0)	SIDC	*73*	*84*	*67*	*69*	*75*	*79*	*84*	*84*	*81*	*83*	*79*	*77*	*74*	*76*	*82*	*72*	*70*	*75*
	AFDC	60	77	70	63	77	73	85	81	80	81	78	73	66	75	82	67	67	74
Rice, without hulls * (CVB code: 1003.000)	SIDC	91	90	84	93	89	95	93	91	90	93	92	93	94	93	91	93	80	92
	AFDC	67	86	79	71	86	81	94	89	89	90	87	81	74	84	90	75	75	83
Rice feed meal (CVB code: 1003.122)	SIDC	74	72	69	67	70	68	78	67	74	69	65	66	74	71	75	72	71	72
	AFDC	70	70	63	63	71	69	82	70	76	70	75	68	68	65	75	64	57	69
Rice feed meal, solvent extracted * (CVB code: 1003.122)	SIDC	*62*	*73*	*52*	*60*	*73*	*67*	*77*	*67*	*66*	*67*	*70*	*67*	*68*	*62*	*72*	*60*	*59*	*67*
	AFDC	67	71	61	63	71	67	81	70	74	69	72	67	67	64	74	63	56	69
Rye (CVB code: 1007.000)	SIDC	71	82	56	54	51	67	66	73	65	71	65	64	59	45	82	40	69	54
	AFDC	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Sesameseed expeller * (CVB code: 3005.401)	SIDC	*80*	*88*	*69*	*77*	*85*	*88*	*85*	*91*	*76*	*88*	*88*	*87*	*84*	*80*	*83*	*72*	*82*	*79*
	AFDC	68	93	83	82	88	88	94	92	91	90	92	90	84	87	92	81	82	86
Sesameseed meal, solvent extracted (CVB code: 3005.407)	SIDC	*78*	*88*	*77*	*76*	*84*	*87*	*87*	*89*	*84*	*87*	*90*	*84*	*82*	*77*	*83*	*82*	*86*	*75*
	AFDC	68	93	83	82	88	88	94	92	91	90	92	90	84	87	92	81	82	86
Soybeans, heat treated (CVB code: 3012.616)	SIDC	85	84	68	77	75	83	87	84	84	83	81	82	81	81	84	77	83	81
	AFDC	85	84	80	82	85	84	88	87	86	85	84	83	78	86	84	79	85	82
Soybean expeller * (CVB code: 3012.401)	SIDC	88	90	75	83	89	87	90	87	87	87	88	86	86	84	89	84	86	86
	AFDC	86	84	79	83	85	86	88	87	86	86	86	85	81	87	90	80	86	85
Soybean meal, solvent extracted (CVB code: 3012.407)	SIDC	88	90	75	83	89	87	90	87	87	87	88	86	86	84	89	84	86	86
	AFDC	88	88	82	85	89	88	89	89	89	88	89	87	83	89	91	81	89	88
Soyprotein concentrate	SIDC	89	90	88	85	88	86	88	87	87	89	88	90	88	88	88	88	88	88
	AFDC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sorghum (CVB code: 1008.000)	SIDC	88	88	90	83	82	90	87	89	79	89	84	87	89	88	89	83	92	88
	AFDC	55	69	65	44	70	73	69	72	70	78	75	68	75	70	76	58	72	68
Sorghum gluten meal * (CVB code: 1008.204/0/0)	SIDC	*82*	*92*	*80*	*86*	*85*	*90*	*83*	*90*	*81*	*90*	*88*	*87*	*89*	*85*	*93*	*82*	*88*	*89*
	AFDC	76	87	82	83	85	86	85	88	82	89	89	85	84	83	92	79	92	89

Feed Ingredient	System[2)]	LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
Sunflower seed meal, solv. extr., all qual.	SIDC	82	92	73	76	84	85	91	87	77	84	86	83	83	80	87	71	94	78
(CVB code:3003.407)	AFDC	78	86	78	81	80	88	91	89	87	87	85	86	81	86	92	78	86	84
Sunflower seed expeller, all qualities *	SIDC	*82*	*92*	*69*	*76*	*84*	*84*	*90*	*87*	*78*	*84*	*87*	*84*	*85*	*81*	*88*	*73*	*94*	*77*
(CVB code: 3003.401)	AFDC	78	86	78	81	80	88	91	89	87	87	85	86	81	86	92	78	86	84
Sweet potatoes, dehydrated *	SIDC	*57*	*58*	*51*	*53*	*52*	*55*	*51*	*56*	*51*	*55*	*53*	*55*	*58*	*54*	*53*	*53*	*54*	*51*
(CVB code: 4007.611/0/0)	AFDC	30	40	-25	31	33	38	30	43	25	39	30	38	30	51	33	25	20	27
Tapioca, all qualities *	SIDC	*53*	*56*	*50*	*50*	*55*	*53*	*51*	*54*	*48*	*54*	*51*	*53*	*56*	*50*	*50*	*51*	*47*	*48*
(CVB code: 4008.611)	AFDC	-	-	-150	-14	-	14	27	-	-	9	-	-	20	25	29	13	-14	10
Triticale	SIDC	82	91	75	79	83	83	80	87	79	85	82	85	80	77	93	79	89	84
(CVB code: 1012.000)	AFDC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wheat	SIDC	82	89	85	82	87	89	83	90	83	89	85	87	82	82	95	84	94	88
(CVB code: 1010.000)	AFDC	84	89	84	79	83	85	86	87	83	84	82	82	76	77	94	77	89	89
Wheat bran	SIDC	75	78	73	70	74	78	79	76	73	77	69	74	74	75	85	70	74	73
(CVB code: 1010.108)	AFDC	71	72	76	69	77	75	84	77	82	77	77	74	70	72	84	75	79	75
Wheat middling's	SIDC	77	82	76	71	77	78	78	79	74	77	74	75	74	76	87	71	78	75
(CVB code: 1010.107)	AFDC	72	73	77	68	78	75	85	78	83	77	77	75	70	72	85	76	80	76
Wheat germ bran *	SIDC	*80*	*85*	*80*	*77*	*82*	*85*	*82*	*85*	*80*	*84*	*79*	*82*	*79*	*79*	*91*	*79*	*87*	*82*
(CVB code: 1010.114/0/0)	AFDC	72	73	77	68	78	75	85	78	83	77	77	75	70	72	85	76	80	76
Wheat feed flour (CFIBRE <35 g/kg *	SIDC	*82*	*88*	*84*	*82*	*86*	*89*	*84*	*89*	*84.6*	*88*	*85*	*86*	*82*	*81*	*95*	*84*	*94*	*88*
(CVB code: 1010.103/1/0)	AFDC	74	75	79	68	79	75	86	80	84	79	79	76	70	72	85	76	81	77
Wheat feed flour (CFIBRE >35 g/kg) *	SIDC	*80*	*86*	*81*	*79*	*83*	*86*	*82*	*86*	*81*	*85*	*81*	*83*	*79*	*79*	*92*	*81*	*89*	*84*
(CVB code: 1010.103/2/0)	AFDC	74	75	79	68	79	75	86	80	84	79	79	76	70	72	85	76	81	77
Wheat feed meal *	SIDC	*78*	*83*	*78*	*75*	*80*	*82*	*80*	*82*	*77*	*81*	*76*	*79*	*77*	*77*	*89*	*76*	*83*	*79*
(CVB code: 1010.105/0/0)	AFDC	71	72	77	69	77	75	85	78	82	77	77	74	70	71	84	75	79	75
Wheat germs *	SIDC	*81*	*87*	*82*	*80*	*84*	*87*	*83*	*88*	*82*	*87*	*82*	*85*	*80*	*80*	*94*	*82*	*92*	*86*
(CVB code: 1010.102/0/0)	AFDC	74	75	79	68	79	75	86	80	84	79	79	76	70	72	85	76	81	77
Whey powder *	SIDC	*94*	*97*	*86*	*88*	*90*	*90*	*89*	*90*	*89*	*90*	*90*	*90*	*93*	*89*	*88*	*90*	*86*	*88*
(CVB code: 8009.000/0/0)	AFDC	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
Whey powder, low lactose (both qualities)*	SIDC	*95*	*97*	*87*	*89*	*92*	*91*	*90*	*91*	*90*	*91*	*91*	*91*	*94*	*90*	*89*	*91*	*87*	*89*
(CVB code: 8009.626)	AFDC	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90

[1)]: Feedstuffs that are not allowed in poultry feeds in The Netherlands (blood meal, feather meal, meat-and-bone meal) are not included in this table. Data for these feedstuffs are given in Appendix 3 and 4.

[2)]: SIDC and AFDC values are given in % units.

*: For feedstuffs indicated with * the SIDC values are estimated and have to be considered as an educated guess.

7.2 Standardized ileal digestibility of crystalline amino acids.

Batal and Parsons (2002) have shown (see Figure 6) that the apparent fecal digestibility of the crystalline amino acids that are of practical importance in poultry nutrition from day 14 and onwards is 95% or higher. Lemme et al (2005) reported that the SIDC of crystalline amino acids, fed as a mixture is 100%, Based on the latter results a complete SID of crystalline amino acids is assumed.

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Appendix 1: Effect of killing method on standardized ileal amino acid digestibility (SIDC) of soybean meal, solvent extracted

Amino acid	CO_2 asphyxiation			Intracardial injection			Intravenous injection			Cervical dislocation		
	N*	Mean	stdev	N*	Mean	stdev	N*	Mean	stdev	N*	Mean	stdev
ALA	54	85.3	3.40	67	83.9	3.42	4	80.7	6.59	0		
ARG	59	90.1	2.59	69	89.0	2.64	4	88.1	3.12	2	93.9	3.62
ASP	54	83.6	4.07	67	83.2	3.63	4	80.4	4.67	0		
CYS	57	*74.3*	*7.07*	46	*68.3*	*8.14*	4	73.6	6.97	2	88.5	8.75
GLU	54	88.8	2.60	67	87.4	2.91	4	81.5	2.69	0		
GLY	42	81.6	7.03	68	81.1	5.50	4	80.7	8.02	2	84.3	10.50
HIS	61	86.6	3.74	69	84.6	3.05	4	82.6	5.79	2	78.9	1.40
ILE	62	84.7	5.73	69	84.6	3.56	4	83.1	5.66	2	91.1	4.13
LEU	62	86.5	3.94	69	84.7	3.15	4	81.8	6.68	2	87.5	5.23
LYS	66	87.0	3.75	69	86.7	4.00	4	86.2	3.82	2	92.1	7.91
MET	65	87.9	4.51	68	88.4	3.85	4	85.3	7.63	2	92.8	5.75
PHE	56	86.9	3.84	69	86.0	2.99	4	82.5	4.70	2	91.4	7.90
PRO	47	86.9	4.97	47	83.7	3.51	2	81.3	8.65	2	83.0	11.62
SER	54	85.8	5.40	69	83.9	3.73	4	81.6	5.19	2	88.8	10.10
THR	66	80.7	5.23	69	80.0	4.19	4	78.6	5.76	2	84.3	4.85
TRP	*17*	*97.4*	*6.79*	11	86.4	2.96	2	68.0	14.48	0		
TYR	28	85.1	8.39	69	86.7	3.05	2	81.0	7.60	2	90.2	8.60
VAL	62	85.1	4.15	69	83.4	3.69	4	81.4	6.03	0		
All**		85.1	6.02		84.0	4.57		81.0	4.45		88.2	4.45

*: number of observations.
**: Mean of mean values for all amino acids

This Table only relates to observations on soybean meal, solvent extracted. For other feedstuffs, insufficient data were available per killing method to make an accurate comparison. In 17 studies with 66 observations the CO_2 asphyxiation was applied as killing method. The number of observations reported per amino acid ranged from 66 (for LYS and THR) to 17 (for TRP). In one study with 8 observations the SIDC-TRP was some units above 100%. Omitting these observations resulted in a mean SIDC-TRP of 91.4% (STDEV 2.24) for the remaining 9 observations. For none of the other amino acids a digestibility >100% was reported in none of the publications collected.

In 12 studies with 82 observations intracardial injection with an euthanaticum was applied as killing method. In one of these studies (Ravindran et al., 2014) a large number of batches from different origins was studies. In this study also 11 batches soybean meal from India were tested. Soybean meal from India, which had a lower digestibility, is not a major source for The Netherlands, and was therefore omitted from the database. The number of observations reported per amino acid ranged from 69 (for most amino acids) to 11 (for TRP). The number of observations for TRP is limited, also because in the large study of Ravindran et al. (2014) this amino acid was not determined.

For most amino acids the difference in the mean SIDC is small and not significant taking into consideration the stdev values. For CYS the difference is larger: 73.3 (± 7.07) and 68.3 (±8.14) %-units for CO_2 asphyxiation and intracardial injection, respectively, but the stdev of the mean value is also larger for both methods, compared to other amino acids.

Intravenous injection was applied in only 2 studies with 2 observations per study. In one of the studies no data were given for PRO, TYR and TRP. Cervical dislocation was used in only one study. The number of studies using these two killing methods is too limited for a realistic comparison with the two other methods.
We decided not to exclude data of studies in which any of these killing methods was applied.

Appendix 2: Effect of marker on standardized ileal amino acid digestibility (SIDC)

There are no studies reported in the literature in which a direct comparison was made between several markers. To get some insight in a possible effect of the marker used on the SIDC of amino acids, we analyzed the datasets for the three feed ingredients with the largest number of observations, which were soybean meal, wheat and rapeseed meal. In the case of wheat and rapeseed meal the datasets used in this analysis were inclusive possible outliers.

a. Effect of marker on ileal amino acid digestibility of **soybean meal**, solvent extracted

Amino acid	AIA			Cr2O3			TiO2		
	(17 studies; 59 observations)			(12 studies; 22 observations)			(11 studies; 60 observations)		
	N*	Mean	stdev	N*	Mean	stdev	N*	Mean	stdev
ALA	57	85.1	3.68	16	85.4	3.0	53	83.6	3.66
ARG	59	90.2	2.41	20	89.6	4.4	55	88.8	2.87
ASP	57	83.3	4.29	17	83.7	4.4	53	83.3	3.41
CYS	37	73.2	6.64	15	76.0	9.6	56	69.6	8.43
GLU	57	88.1	3.18	17	89.2	2.4	53	87.3	2.78
GLY	46	83.1	4.76	14	85.1	4.7	56	79.2	6.96
HIS	59	85.7	4.00	22	84.8	4.4	55	85.1	2.99
ILE	59	85.6	4.49	22	84.5	7.5	56	84.0	3.59
LEU	59	86.5	3.56	22	86.3	4.8	56	84.4	3.47
LYS	59	87.9	2.87	22	87.2	4.8	60	86.1	4.28
MET	58	89.5	3.62	22	87.2	6.4	59	87.0	3.76
PHE	57	87.2	3.32	22	87.6	4.8	52	85.2	3.10
PRO	35	85.6	3.99	13	85.7	4.5	51	84.4	4.37
SER	57	84.5	4.04	20	84.8	4.6	53	84.8	5.16
THR	59	81.4	4.35	21	80.3	6.3	60	79.4	4.43
TRP	16	90.1	12.68	5	94.4	8.6	8	93.2	4.32
TYR	37	86.8	5.07	14	87.9	4.6	52	86.0	4.29
VAL	59	85.4	3.69	22	84.0	5.8	56	82.8	3.76
All**		85.5	2.25		85.8	1.81		84.1	1.44

*: number of observations.
**: Mean of mean values for all amino acids

The above Table relates to observations on soybean meal, solvent extracted. All observations of soybean meal, originating from India, were eliminated in this analysis.
In 17 studies with 59 observations AIA was used as a marker. The study with the largest number of observations was that of Frikha et al. (2012), who also analyzed the digestibility of CYS, but not that of TRP and TYR. The number of observations reported per amino acid ranged from 59 (for seven amino acids) to 16 (for TRP).
In 12 studies with 22 observations Cr2O3 was used as a marker. The number of observations reported per amino acid ranged from 22 (for seven amino acids) to 5 (for TRP).
In 11 studies with 60 observations TiO2 was used as a marker. The number of observations reported per amino acid ranged from 60 (for LYS and THR) to 8 (for TRP). The number of observations for TRP is limited, also because in the large study of Ravindran et al. (2014) with 42 observations this amino acid was not determined.
For most amino acids the difference in the mean SIDC between the various markers used is small, also taking into consideration the size of the stdev. Also here for CYS the difference is

larger: 73.2 (± 6.64), 76.0 (±9.6) and 69.6 (±8.43) %-units for AIA, Cr2O3 and TiO2, respectively, but the stdev values of the mean values are also larger for these three methods, compared to other amino acids.

b. Effect of marker on ileal amino acid digestibility of **wheat**

Amino acid	**AIA**			**Cr2O3**			**TiO2**		
	(9 studies; 34 observations)			(5 studies; 7 observations)			(5 studies; 8 observations)		
	N*	Mean	stdev	N*	Mean	stdev	N*	Mean	stdev
ALA	33	83.3	4.32	5	74.6	9.33	8	77.8	7.42
ARG	33	83.1	4.29	7	81.8	3.83	4	85.1	5.92
ASP	33	82.2	5.25	5	76.7	7.53	4	77.2	12.71
CYS	1	86.9		5	84.3	4.07	8	83.0	5.73
GLU	33	95.3	2.32	5	93.9	2.52	4	93.0	3.89
GLY	33	84.6	4.68	7	79.9	6.79	4	79.6	10.64
HIS	34	84.2	5.19	7	82.4	6.41	7	73.6	13.10
ILE	34	89.4	4.54	7	86.9	4.74	4	85.6	4.02
LEU	34	89.5	3.82	7	84.3	6.10	8	87.0	4.95
LYS	34	82.1	6.29	7	82.1	4.43	8	76.3	13.71
MET	33	89.1	5.14	7	86.1	5.69	8	86.6	7.50
PHE	34	89.9	4.38	7	86.1	3.84	4	88.9	6.01
PRO				5	94.7	3.04	3	93.9	2.25
SER	33	88.6	3.60	7	86.5	3.79	2	81.0	7.13
THR	34	82.8	5.11	7	78.3	7.37	8	76.0	10.45
TRP	8	88.1	2.30	4	87.8	5.05	2	91.0	3.58
TYR	32	84.1	6.27	4	75.1	7.79	3	90.8	3.89
VAL	34	86.8	4.10	7	84.6	4.49	4	82.4	8.17
All**		86.5	4.48		83.7	5.38		83.8	7.28

As can be seen from the above table, in the case of Cr2O3 and TiO2 as marker the mean SIDC of several amino acids deviates considerably from the mean SIDC obtained with AIA as a marker. This difference is primarily caused by the limited number of observations with these two markers, as also when AIA was used as marker the difference between observations with the highest and lowest SIDC was of comparable order of magnitude is with the two other markers.

In the RIRDC report of Bryden et al (2009) the digestibility of 24 batches of wheat are published. AIA was used as a marker in all cases. For 8 amino acids the SIDC the difference between the highest and the lowest observation was more than 15% units, and for three of them even more than 20% units.

This suggests that in wheat the difference in digestibility between batches is higher than for other feed ingredients.

c. Effect of marker on ileal amino acid digestibility of **rapeseed meal**

Amino acid	AIA			Cr2O3			TiO2		
	(7 studies; 17 observations)			(10 studies; 13 observations)			(5 studies; 12 observations)		
	N*	Mean	stdev	N*	Mean	stdev	N*	Mean	stdev
ALA	17	80.1	4.79	8	75.2	7.92	12	79.8	3.65
ARG	17	85.3	3.87	13	82.0	4.23	12	83.9	5.86
ASP	17	75.9	5.12	8	70.3	8.44	12	76.3	4.30
CYS	1	75.7		9	72.2	10.48	12	74.1	4.73
GLU	17	86.3	4.10	8	82.1	5.54	12	86.1	4.21
GLY	17	78.7	5.52	8	74.3	8.69	12	77.9	2.68
HIS	17	80.2	3.88	13	79.4	6.02	10	83.5	3.61
ILE	16	78.3	4.57	13	75.0	5.52	12	77.7	3.75
LEU	16	80.8	4.24	13	76.2	4.81	12	81.4	3.99
LYS	17	78.7	4.90	13	74.3	7.01	12	79.2	3.14
MET	16	91.3	5.01	13	83.8	5.49	12	87.9	1.56
PHE	17	81.3	3.38	13	78.1	4.77	12	79.4	2.19
PRO	1	73.3		8	66.7	22.84	10	78.1	1.55
SER	17	74.2	4.64	10	72.5	7.82	12	78.4	3.33
THR	17	71.4	5.29	13	68.3	8.23	12	75.2	5.38
TRP	7	79.6	2.45	8	82.8	4.13	2	67.9	7.57
TYR	17	78.6	3.43	10	75.7	6.72	4	78.2	6.24
VAL	17	76.4	4.92	13	72.0	7.83	12	77.6	4.26
All**		79.2	4.38		75.6	7.58		79.0	4.00

Of the three ingredients analyzed for a possible effect of the marker used, the number of observations was most equally distributed over the three markers in the dataset of rape seed meal. The number of publications per marker was 7, 10 and 5 for AIA, Cr2Os and TiO2, respectively. In the dataset with AIA as marker there were 10 observations from one publication (Bryden et al., 2009). In the dataset with TiO2 as marker the publication of Toghyani et al. (2015) had the highest number of observations (namely 6)

When considering the mean SIDC's of all amino acids of the three feed ingredients analyzed, there is no consistent picture as to which marker gave the highest or the lowest figure, as is shown in the Table below.

	Marker with highest mean AA SIDC	Marker with highest mean AA SIDC
Soybean meal	Cr2O3 (85.8) and AIA (85.5)	TiO2 (84.1)
Wheat	AIA (86.5)	TiO2 (83.8) and Cr2O3 (83.7)
Rape seed meal	AIA (79.2) and TiO2 (79.0)	Cr2O3 (75.6)

Although there is no good information for a clear cut decision as to whether there is a significant effect of the marker used, it was concluded from the above analysis that there is no reason to exclude certain studies from the database because a certain marker was used.

Appendix 3: Amino acid pattern and amino acid digestibility per feedstuff for feedstuffs listed in the newly constructed table

3.1 General remarks

- In this Appendix more detailed information from the database on the standardized ileal digestibility of feed ingredients for poultry is presented. In Table A feed ingredients are listed that are included in the CVB Table 2016 with an energy evaluation for broilers and/or adult poultry / laying hens.
- In Table B information is presented for feed ingredients that are not included in the CVB Table 2016 or for which no energy evaluation for broilers and/or adult poultry / laying hens is included, but for which information is available in the database on SIDC of amino acids in broilers.
- Before presenting Tables A and B attention is paid to the estimation of SIDC values for the amino acids CYS and TRP which are less frequent analyzed.

3.2 Estimation of SIDC CYS and SIDC TRP in ingredients for which no information is present in the database on ileal digestibility of amino acids in broilers

Some amino acids are less frequently analyzed than other amino acids. This is an important issue especially for the amino acids CYS and TRP. TRP is an essential amino acid. However, a separate run has to be executed to determine the TRP content in an amino acid mixture, which is only done in a relatively small number of studies. Although CYS can be synthesized from MET it is not an essential amino acid. However, the animal's requirement to S-containing amino acids is determined by the sum of MET+CYS. Also for S-containing amino acids, but especially for CYS, a separate run is necessary.

To get a better insight in the differences in CYS and TRP digestibility compared to the mean amino acid digestibility, the SIDC CYS and SIDC TRP of feed ingredients in the Database with broiler studies was compared with the mean SIDC AA (omitting CYS, TRP and PRO from the calculation)[7]. Subsequently the feed ingredients in the database were subdivided in the following groups: Full fat seeds, By-products of oil seeds, Legume seeds, Grains, Grain by-products, DDGS, Products of animal origin. For each group the weighed mean difference of the SIDC CYS and SIDC TRP to the weighed mean of the SIDC of all AA was calculated. Based on these calculations decisions were made for the SID CYS and SID TRP table values for a number of feed ingredients for which the digestibility of these amino acids had to be estimated.

The results of these calculations are presented in the next Table.

[7] In the calculation of the mean SIDC AA that had to be compared to the mean SIDC CYS of a feed ingredient only those observations were used in which also the SIDC CYS was determined. In a comparable manner the mean SIDC AA was calculated for a comparison with the mean SIDC TRP. PRO was omitted because for this amino acid relatively often a figure is omitting.

Group of ingredients	Weighed mean difference (SIDC CYS – SIDC AA)	Difference in SIDC CYS in Feed Table to mean SIDC AA	Weighed mean difference (SIDC TRP – SIDC AA)	Difference in SIDC TRP in Feed Table to mean SIDC AA
Seeds, full fat	-9.6	-10	-3.2	-3
Oil seed expellers and meals, solvent extracted	-9.7	-10	+2.7	+3
Legume seeds	-9.9	-10	-6.0	-6
Cereals	-3.6	-3	-0.6	0
Cereal by-products	-1.9	-3	-2.2	+2
DDGS	-4.6	-5	+2.1	+2
Animal by-products*	-23.1	-23	-0.8	0
Feather meal			-18.8	-18
Highly digestible animal products**			+3.0	+3

3.3 Framework of the Tables A and B in this Appendix.

The Tables A and B in this Appendix contain the following information for each feedstuff

Information in first column	Further explanation
Amino acid pattern (g/16 gN)	
Mean content	Mean of the reported amino acid content in the studies contained in the database
SD	Standard deviation of the mean of the reported amino acid content in the studies contained in the database
Number of observations	Number of observations for amino acid content in the database
CVB Feed Table 2016: Mean content	Mean of the amino acid content according to the CVB Feed Table 2016
SD	Standard deviation of the mean of the amino acid content according to the CVB Feed Table 2016
Standardized ileal digestibility (SIDC) (%)	
Mean (with one decimal)	Values obtained from published studies with respect to ileal amino acid digestibility in broilers; Values in grey; no experimental data available; the value given is equal to the mean SIDC-AA calculated for all amino acids according to MEAN 1.
SD	Standard deviation of the mean values obtained from published studies with respect to ileal amino acid digestibility in broilers
Number of observations	Idem
Min	Idem

Information in first column	Further explanation
Max	Idem
Amount of SID-AA (g/kg)	Calculated from the SIDC-AA values(before rounding-off) from published studies and AA contents from CVB Feed Table 2016 (calculated to content in DM). In Table B the SID-AA amount was calculated using the AA (mean) contents from the published study / studies.
Rounded off digestibility coefficients (%)	
SIDC (this table)	Rounded values presented in the row 'Mean (with one decimal)' of the section Standardized ileal digestibility (SIDC) (%). Values in grey; no experimental data available; the value given is equal to the mean SIDC-AA calculated for all amino acids according to MEAN 1
SIDC according to Evonik table	SIDC values presented in the tables published by (Wiltafsky et al., 2016. AminoDat® 5.0, Evonik Nutrition & Care GmbH)

In the latter columns of Tables A. and B.:

- **In the section 'Amino acid pattern (g/16g N)':**
  In the last column 'CP in DM' = crude protein content in dry matter.
  - Calculated for the observations on ileal digestibility of amino acids (with SD and number of observations) in the database
  - As given in the CVB Feed Table 2016.

  These values may be used to evaluate whether the batches that were investigated *in vivo* fall within the CP-range of the batches represented in the CVB Feed Table 2016.
- **In the section 'Rounded off digestibility coefficients (%)':**
  MEAN1 = the mean of the amino acid digestibility's (= Mean (SIDC-AA 1 … SIDC-AA n).
  MEAN2 = the 'mean amino acid digestibility' (= Σ (content of standardized ileal digestible AA 1 … n) / Σ (content of gross AA 1 … n) * 100).

A. Feedstuffs listed in the CVB Feed Table.

Product: Barley (CVB code: 1005.000/0/0)																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**3.5**	**1.5**	**2.2**	**3.1**	**1.3**	**3.3**	**4.5**	**4.7**	**2.3**	**6.4**	**2.4**	**4.7**	**3.9**	**6.3**	**22.5**	**3.8**	**10.7**	**3.8**		91	**127**
SD	**0.6**	**0.2**	**0.1**	**0.4**	**0.1**	**0.4**	**0.8**	**0.6**	**0.2**	**0.8**	**0.6**	**0.4**	**0.5**	**0.5**	**2.1**	**0.5**	**0.5**	**0.8**			**16**
Number of observations	**14**	**14**	**5**	**14**	**5**	**14**	**14**	**14**	**14**	**14**	**13**	**14**	**14**	**14**	**14**	**14**	**5**	**14**			**14**
CVB Feed Table 2016: Mean	3.6	1.7	2.2	3.4	1.2	3.5	4.9	5.0	2.2	6.9	3.1	4.9	4.1	6.0	23.5	4.0	10.8	4.2		95	**115**
SD	0.3	0.1	0.2	0.2	0.1	0.2	0.3	0.3	0.2	0.3	0.2	0.3	0.3	0.5	1.7	0.2	0.9	0.2			**9**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**80.7**	**90.5**	**75.8**	**74.7**	**79.3**	**81.8**	**78.0**	**81.3**	**78.7**	**81.1**	**74.5**	**79.5**	**75.4**	**72.2**	**87.2**	**72.3**	**82.8**	**77.9**			
SD	**4.82**	**9.39**	**6.20**	**6.43**	**1.52**	**3.83**	**3.56**	**3.37**	**6.24**	**3.81**	**5.39**	**4.68**	**4.81**	**5.41**	**2.52**	**5.55**	**4.59**	**4.53**			
Number of observations	**12**	**12**	**5**	**12**	**4**	**11**	**12**	**12**	**12**	**12**	**10**	**12**	**10**	**10**	**10**	**12**	**3**	**10**			
Min	74.9	77.6	67.9	65.3	77.7	76.2	73.6	75.2	70.7	74.0	66.4	71.1	69.5	64.6	83.5	64.3	77.8	72.4			
Max	88.9	103.6	84.7	82.2	80.6	86.9	86.1	85.9	87.5	87.7	81.4	87.1	83.5	80.2	91.8	78.5	86.9	83.4			
Amount of SID-AA (g/kg DM)	3.4	1.8	1.9	2.9	1.1	3.3	4.4	4.7	2.0	6.5	2.7	4.5	3.6	5.0	23.6	3.3	10.3	3.8		88.7	
Rounded off digestibility coefficients (%)																			MEAN1	MEAN2	
SIDC (this table)	**81**	**91**	**76**	**75**	**79**	**82**	**78**	**81**	**79**	**81**	**75**	**80**	**75**	**72**	**87**	**72**	**83**	**78**	80.5	80.8	
SIDC (Evonik table)	84	92	88	75	69	85	80	81	81	83	-	82	-	-	-	-	-	-			

Product: Biscuits, ground / bakery by-product (CVB Code: 9011.001/0/0 and 9011.002/0/0)																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**2.6**	**1.5**		**3.6**		**3.9**	**5.0**	**4.9**	**2.9**	**8.5**	**2.9**	**5.1**	**5.3**	**6.7**	**24.4**	**4.4**		**5.9**		88	**123**
SD																					
Number of observations	**1**	**1**	**1**	**1**		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**		**1**			**1**
CVB Feed Table 2016: Mean	2.5	1.5	2.1	3.3	1.0	3.6	4.1	4.6	2.4	6.6	2.8	4.5	3.7	5.8	27.7	3.9	9.7	4.7		95	**88**
SD	0.3	0.2	0.1	0.4		0.1	0.6	0.5	0.2	0.1		0.4	0.3	0.5	1.3	0.3	0.2	0.3			**4**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**70.1**	**81.4**	**77.1**	**71.7**		**79.4**	**78.7**	**77.7**	**74.4**	**81.5**	**77.0**	**76.2**	**75.5**	**71.7**	**88.2**	**71.2**	**81.5**	**78.5**			
SD	**5.85**	**2.37**	**5.82**	**5.17**		**4.05**	**4.56**	**3.36**	**4.76**	**2.2**		**3.52**	**2.97**	**4.18**	**3.66**	**4.14**	**6.42**	**4.23**			
Number of observations	**5**	**5**	**5**	**5**		**5**	**5**	**5**	**5**	**5**		**5**	**5**	**5**	**5**	**5**	**5**	**5**			
Min	63.9	79.4	70.4	66		74.6	72.3	74.8	69.3	79.4		72.5	70.3	68.2	83.4	66.8	73.9	74.3			
Max	77.2	85.3	85	78.7		84.9	84.5	82.1	80.1	84.9		81.1	77.7	76.4	92.5	76	89.4	84			
Amount of SID-AA (g/kg DM)	1.5	1.1	1.4	2.1	0.7	2.5	2.8	3.1	1.6	4.7	1.9	3.0	2.5	3.7	21.5	2.4	7.0	3.2		66.8	
Rounded off digestibility coefficients (%)																			MEAN1	MEAN2	
SIDC (this table)	**70**	**81**	**77**	**72**	**75**	**79**	**79**	**78**	**74**	**81**	**77**	**76**	**75**	**72**	**88**	**71**	**81**	**78**	77.0	80.3	
SIDC (Evonik table)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			

Product: Cotton seed expeller and cotton seed meal extracted (CVB code: 3018.401 and 3018.407)																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**4.5**	**1.2**	**1.8**	**3.3**	**1.2**	**3.4**	**11.7**	**5.5**	**3.1**	**6.1**	**3.1**	**4.8**	**4.1**	**9.5**	**19.9**	**4.4**	**4.7**	**4.1**		96	**227**
SD	**0.4**	**0.5**		**0.3**	**0.0**	**0.2**	**0.5**	**0.4**	**0.3**	**0.4**	**0.3**	**0.3**	**0.3**	**0.6**	**1.5**	**0.3**		**0.8**			**16**
Number of observations	**12**	**10**	**1**	**12**	**3**	**11**	**12**	**11**	**12**	**12**	**10**	**12**	**11**	**12**	**12**	**11**	**1**	**11**			**2**
CVB Feed Table 2016: Mean	2.5	1.5	1.5	3	0.7	3.2	10.9	4.2	1.8	6.2	2.4	4.8	4.2	7.9	18.2	4.2	3.5	4.2		85	**274**
SD	0.3	0.1	0.1	0.1	0.1	0.2	0.7	0.3	0.1	0.2	0.1	0.2	0.2	0.3	0.8	0.2	0.2	0.2			**4**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**58.4**	**76.9**	**70.9**	**66.0**	**77.4**	**68.8**	**86.4**	**79.6**	**75.4**	**71.0**	**77.4**	**71.4**	**69.8**	**74.7**	**82.5**	**70.4**	**74.0**	**73.3**			
SD	**2.98**	**1.83**	**11.00**	**2.26**	**0.85**	**3.22**	**1.12**	**1.97**	**1.70**	**2.42**	**1.86**	**2.35**	**2.32**	**2.98**	**5.70**	**1.59**		**1.67**			
Number of observations	**13**	**11**	**2**	**13**	**4**	**12**	**13**	**12**	**12**	**13**	**11**	**13**	**12**	**13**	**13**	**12**	**1**	**12**			
Min	52.7	73.4	63.1	62.7	76.3	64.6	84.6	77.4	72.4	67.9	74.1	68.2	67.0	70.8	64.0	66.5		69.2			
Max	61.8	79.8	78.7	70.5	78.1	73.1	88.4	83.0	78.3	75.2	81.0	74.5	73.6	82.3	85.5	73.0		75.3			
Amount of SID-AA (g/kg DM)	4.0	3.2	2.9	5.4	1.5	6.0	25.8	9.2	3.7	12.1	5.1	9.4	8.0	16.2	41.2	8.1	7.1	8.4		177.5	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**58**	**77**	**71**	**66**	**77**	**69**	**86**	**80**	**75**	**71**	**77**	**71**	**70**	**75**	**83**	**70**	**74**	**73**	73.6	76.2	
SIDC (Evonik table)	52	84	52	60	51	78	84	84	70	80	-	79	-	-	-	-	-	-			

Product: Feather meal (CVB code: 8003.629/0/0) (The use of feaher meal in poultry feeds is at present not allowed in the EU; See Regulation (EC) No 1069/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 laying down health rules as regards animal by-products and derived products not intended for human consumption and repealing Regulation (EC) No 1774/2002 (Animal by-products Regulation))																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**2.3**	**0.6**	**4.7**	**4.6**	**0.6**	**5.0**	**6.5**	**4.6**	**0.9**	**8.0**	**2.7**	**7.4**	**4.5**	**6.5**	**10.4**	**7.7**	**10.4**	**10.9**		98	**923**
SD	**0.3**	**0.1**	**0.7**	**0.3**	**0.1**	**0.4**	**0.3**	**0.3**	**0.2**	**0.3**	**0.4**	**0.8**	**0.2**	**0.6**	**0.6**	**0.4**	**1.2**	**1.4**			**17**
Number of observations	**5**	**5**	**4**	**5**	**3**	**4**	**5**	**5**	**5**	**4**	**4**	**5**	**5**	**5**	**5**	**4**	**3**	**5**			**5**
CVB Feed Table 2016: Mean	2.5	0.7	5	4.7	0.7	4.8	6.9	4.9	1	8.3	3.1	7.3	4.7	7	10.9	7.7	9.6	10.7		101	**888**
SD	0.4	0.1	0.6	0.1	0.1	0.2	0.3	0.2	0.3	0.2	0.1	0.4	0.2	0.3	0.5	0.4	0.7	0.6			**21**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**74.1**	**71.7**	**69.4**	**67.4**	**69.8**	**68.3**	**78.2**	**67.4**	**73.8**	**69.1**	**65.3**	**66.2**	**74.1**	**70.7**	**75.2**	**72.3**	**71.0**	**71.7**			
SD	**5.84**	**3.56**		**8.65**		**6.93**	**7.42**	**7.44**	**2.7**	**5.72**	**7.85**	**5.08**	**4.99**	**6.68**	**1.53**	**7.99**		**7.88**			
Number of observations	**4**	**3**	**2**	**4**	**1**	**4**	**4**	**4**	**4**	**4**	**3**	**4**	**4**	**4**	**3**	**4**		**4**			
Min	68.9	67.5	68.0	60.0	69.8	60.8	67.7	60.1	69.9	62.1	59.1	60.8	68.5	64.2	73.7	65.0		63.0			
Max	81.7	73.7	70.9	76.9	69.8	74.7	84.0	75.9	76.0	75.9	74.1	71.4	80.6	78.4	76.8	83.4		81.8			
Amount of SID-AA (g/kg DM)	16.5	4.5	30.8	28.1	4.3	29.1	47.9	29.3	6.6	50.9	18.0	42.9	30.9	44.0	72.8	49.4	60.5	68.1		634.7	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**74**	**72**	**69**	**67**	**70**	**68**	**78**	**67**	**74**	**69**	**65**	**66**	**74**	**71**	**75**	**72**	**71**	**72**	70.8	71.1	
SIDC (Evonik table)	57	65	48	56		74	70	72	59	69	-	70	-	-	-	-	-	-			

Product: Fish meal (CVB code: 8015.000)																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**7.1**	**2.6**	**1.0**	**4.1**	**1.6**	**4.0**	**6.1**	**3.8**	**2.5**	**7.1**	**3.4**	**5.2**	**6.4**	**8.7**	**12.7**	**7.6**	**5.3**	**4.1**		93	**667**
SD	**1.0**	**0.4**	**0.3**	**0.5**	**1.0**	**0.4**	**1.0**	**0.3**	**0.5**	**0.6**	**0.7**	**0.6**	**0.6**	**0.8**	**1.3**	**1.4**	**1.2**	**0.8**			**61**
Number of observations	**14**	**14**	**7**	**14**	**7**	**14**	**14**	**14**	**14**	**14**	**13**	**14**	**14**	**14**	**14**	**13**	**7**	**14**			**14**
CVB Feed Table 2016: Mean	7.6	2.8	0.9	4.2	1.1	4.2	5.9	3.9	2.6	7.3	3.1	4.9	6.3	9.3	13	6.5	4.4	4		92	**689**
SD	0.5	0.2	0.1	0.2	0.1	0.3	0.4	0.3	0.5	0.4	0.3	0.4	0.3	0.5	0.7	0.7	0.5	0.3			**11**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**84.6**	**83.0**	**71.5**	**80.9**	**79.4**	**83.1**	**84.7**	**82.4**	**80.3**	**85.0**	**81.6**	**83.3**	**82.9**	**74.4**	**82.4**	**76.8**	**82.3**	**78.2**			
SD	**6.34**	**4.27**	**9.42**	**5.56**	**9.82**	**4.84**	**4.32**	**3.54**	**5.6**	**5.51**	**4.94**	**5.58**	**4.72**	**7.23**	**5.44**	**5.95**	**6.44**	**6.1**			
Number of observations	**11**	**10**	**5**	**11**	**3**	**11**	**10**	**10**	**11**	**11**	**9**	**11**	**9**	**10**	**10**	**8**	**6**	**10**			
Min	74.2	75.9	56.2	72.6	68.3	74.9	79.0	76.6	72.6	76.3	75.6	75.6	77.2	65.5	74.4	67.2	73.7	69.1			
Max	94.4	87.9	80.6	87.2	86.8	89.5	90.1	87.1	87.7	95.6	88.2	94.4	89.5	85.4	89.6	86.3	90.2	86.6			
Amount of SID-AA (g/kg DM)	44.3	16.0	4.4	23.4	6.0	24.0	34.4	22.1	14.4	42.7	17.4	28.1	36.0	47.7	73.8	34.4	24.9	21.5		515.8	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**85**	**83**	**71**	**81**	**79**	**83**	**85**	**82**	**80**	**85**	**82**	**83**	**83**	**74**	**82**	**77**	**82**	**78**	80.8	81.4	
SIDC (Evonik table)	86	86	71	80	78	85	82	82	78	85	-	83	-	-	-	-	-	-			

Product: Horse beans, coloured and white flowering (CVB code: 2002.000 and 2017.000)																					
Remark: The CP content in DM and the amount of SID-AA (in g/kg DM) relate to Horse beans, coloured flowering.																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**5.8**	**0.4**	**1.1**	**3.2**	**0.9**	**3.7**	**8.3**	**4.1**	**2.4**	**6.7**	**2.8**	**4.2**	**3.6**	**9.5**	**15.4**	**3.7**	**3.3**	**3.9**		83	**303**
SD	**0.8**	**0.3**	**0.2**	**0.4**	**0.1**	**0.5**	**0.9**	**1.0**	**0.2**	**0.7**	**0.3**	**0.5**	**0.4**	**0.9**	**1.2**	**0.4**	**0.6**	**0.8**			**42**
Number of observations	**27**	**27**	**18**	**27**	**4**	**27**	**27**	**27**	**27**	**27**	**19**	**27**	**19**	**19**	**19**	**19**	**18**	**19**			**26**
CVB Feed Table 2016: Mean	6.3	0.8	1.3	3.5	0.9	4.1	9.1	4.1	2.6	7.3	3.3	4.5	4.1	10.9	16.4	4.2	4.3	4.8		93	**289**
SD	0.2	0.1	0.1	0.2	0.1	0.2	0.7	0.2	0.2	0.2	0.2	0.5	0.2	0.5	0.7	0.2	0.3	0.2			**14**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**86.4**	**86.9**	**72.2**	**77.8**	**65.8**	**79.6**	**87.4**	**81.2**	**78.7**	**80.3**	**82.3**	**79.2**	**87.7**	**87.3**	**90.3**	**82.0**	**75.8**	**85.0**			
SD	**5.29**	**2.85**	**9.17**	**7.31**	**3.25**	**7.9**	**4.76**	**8.24**	**5.79**	**6.75**	**3.72**	**7.4**	**3.99**	**3.54**	**2.37**	**3.41**	**10.18**	**3.88**			
Number of observations	**20**	**11**	**12**	**20**	**6**	**20**	**20**	**20**	**20**	**20**	**12**	**20**	**10**	**10**	**10**	**11**	**9**	**12**			
Min	76.6	79.8	59.4	64.9	62.9	65.4	80.4	68.5	67.1	68.7	73.6	65.5	79.6	78.1	84.4	73.6	61	77.4			
Max	93.1	90.3	84.6	89	71.7	89.7	94.1	94.9	88	88.3	87.4	89.8	91.8	90.4	93.1	86.4	87.5	90			
Amount of SID-AA (g/kg DM)	15.7	2.0	2.7	7.9	1.7	9.4	22.9	9.6	5.9	16.9	7.8	10.3	10.4	27.5	42.7	9.9	9.4	11.8		224.5	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**86**	**87**	**72**	**78**	**66**	**80**	**87**	**81**	**79**	**80**	**82**	**79**	**88**	**87**	**90**	**82**	**76**	**85**	81.4	84.1	
SIDC (Evonik table)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			

Product: Lupins (all qualities) (CVB code: 2004.000)	Remark: The CP content in DM and the amount of SID-AA (in g/kg DM) relate to the Lupine quality 250-330 g CP/kg in the CVB table.																			
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**5.0**	**0.7**	**1.8**	**3.5**	**0.5**	**3.8**	**10.3**	**3.8**	**2.8**	**6.9**	**3.4**	**3.8**	**3.3**	**9.6**	**21.5**	**3.9**	**4.8**	**4.5**		94	**366**
SD	**0.5**	**0.2**	**0.5**	**0.4**	**0.4**	**0.5**	**0.9**	**0.3**	**0.3**	**0.4**	**0.6**	**0.4**	**0.4**	**0.6**	**2.6**	**0.4**	**1.4**	**0.5**			**52**
Number of observations	**24**	**24**	**18**	**24**	**13**	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**16**	**24**			**24**
CVB Feed Table 2016: Mean	4.8	0.7	1.5	3.5	0.8	4.1	10.8	3.9	2.5	7	4	3.9	3.4	10.1	20.9	4.1	4.1	4.9		95	**346**
SD	0.2	0.1	0.2	0.2	0.1	0.3	0.7	0.2	0.3	0.3	0.5	0.3	0.1	0.4	1.4	0.2	0.2	0.3			**10**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**87.2**	**82.3**	**81.2**	**81.1**	**82.3**	**83.9**	**89.7**	**85.4**	**80.6**	**85.2**	**83.1**	**81.6**	**82.8**	**82.1**	**89.4**	**81.3**	**78.8**	**82.1**			
SD	**3.53**	**4.97**	**5.26**	**3.98**	**1.74**	**3.88**	**3.64**	**5.23**	**4.43**	**3.95**	**4.79**	**3.84**	**3.38**	**4.55**	**3.3**	**5.5**	**4.65**	**4.67**			
Number of observations	**24**	**24**	**17**	**25**	**6**	**25**	**25**	**25**	**24**	**25**	**24**	**24**	**24**	**24**	**25**	**25**	**15**	**24**			
Min	80.0	74.8	73.4	73.4	80.5	76.7	82.9	77.0	73.6	77.7	73.5	73.9	75.4	73.3	83.5	71.6	73.5	73.3			
Max	92.2	89.7	87.4	88	85.6	91.5	95.6	95.1	88.1	92.5	90.4	87.3	89.5	90.0	95.6	89.3	88.4	90.1			
Amount of SID-AA (g/kg DM)	14.5	2.0	4.2	9.8	2.3	11.9	33.5	11.5	7.0	20.6	11.5	11.0	9.7	28.7	64.6	11.5	11.2	13.9		279.4	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**87**	**82**	**81**	**81**	**82**	**84**	**90**	**85**	**81**	**85**	**83**	**82**	**83**	**82**	**89**	**81**	**79**	**82**	83.3	85.1	
SIDC (Evonik table)	91	86	83	87	82	89	94	92	85	90	-	87	**-**	**-**	**-**	**-**	**-**	**-**			

Product: Maize (CVB code: 1002.000)																				
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**3.1**	**2.0**	**2.2**	**3.8**	**0.7**	**3.6**	**4.8**	**5.0**	**2.9**	**12.4**	**3.2**	**5.0**	**7.6**	**6.9**	**18.9**	**3.9**	**8.2**	**4.7**		99	**92**
SD	**0.5**	**0.4**	**0.4**	**0.8**	**0.1**	**0.5**	**0.6**	**0.6**	**0.4**	**1.7**	**0.8**	**0.6**	**1.0**	**0.8**	**2.4**	**0.4**	**1.3**	**0.8**			**8.7**
Number of observations	**24**	**23**	**14**	**24**	**10**	**24**	**24**	**24**	**24**	**24**	**19**	**24**	**24**	**24**	**24**	**21**	**11**	**24**			**24**
CVB Feed Table 2016: Mean	2.9	2.1	2.2	3.6	0.7	3.4	4.7	4.8	3	12.1	3.7	4.8	7.5	6.7	18.1	3.9	8.9	4.8		98	**88**
SD	0.3	0.2	0.2	0.2	0.1	0.2	0.4	0.3	0.2	0.7	0.4	0.3	0.4	0.4	1	0.3	0.7	0.2			**5**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**89.9**	**94.3**	**86**	**83.1**	**85.4**	**92.7**	**92.6**	**92.6**	**90.0**	**94.0**	**87.8**	**90.1**	**92.8**	**89.1**	**95.2**	**85.7**	**90.7**	**91.0**			
SD	**3.63**	**3.00**	**4.93**	**4.71**	**4.69**	**3.66**	**1.94**	**2.65**	**2.64**	**1.53**	**4.4**	**2.74**	**1.84**	**3.02**	**1.87**	**3.34**	**2.55**	**3.79**			
Number of observations	**23**	**24**	**13**	**23**	**7**	**24**	**23**	**25**	**24**	**23**	**17**	**23**	**22**	**21**	**22**	**21**	**10**	**23**			
Min	82.3	89.1	79.6	74.1	77.9	85.7	88.8	88.1	84.8	91.3	80.7	84.2	89.1	82.9	91.8	78.4	86.9	83.8			
Max	96.8	98.5	94.2	91.6	90.1	100.4	95.9	96.7	94.8	96.3	95.0	94.2	96.1	94.2	98.0	92.1	94.5	97.4			
Amount of SID-AA (g/kg DM)	2.3	1.7	1.7	2.6	0.5	2.8	3.8	3.9	2.4	10.0	2.8	3.8	6.1	5.2	15.1	2.9	7.1	3.8		78.5	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**90**	**94**	**86**	**83**	**85**	**93**	**93**	**93**	**90**	**94**	**88**	**90**	**93**	**89**	**95**	**86**	**91**	**91**	90.2	91.5	
SIDC (Evonik table)	91	95	89	89	83	98	89	93	97	93	-	95	-	-	-	-	-	-			

Product: Maize gluten meal (CVB code: 1002.204)																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**1.7**	**2.4**	**1.8**	**3.3**	**0.6**	**4.2**	**3.3**	**6.3**	**2.2**	**16.6**	**5.2**	**4.7**	**8.6**	**6.2**	**20.6**	**2.7**	**9.2**	**4.6**		104	**703**
SD	**0.1**	**0.2**	**0.2**	**0.1**		**0.2**	**0.2**	**0.1**	**0.2**	**0.7**	**0.2**	**0.2**	**0.3**	**0.2**	**1.1**	**0.0**	**1.1**	**0.7**			**18**
Number of observations	**4**	**4**	**3**	**4**	**1**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**2**	**3**	**4**			**4**
CVB Feed Table 2016: Mean	1.7	2.4	1.8	3.4	0.5	4.1	3.2	6.3	2.1	16.6	5.2	4.7	8.9	6.3	21.6	2.7	9.4	5.3		106	**669**
SD	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.7	0.4	0.3	0.4	0.2	1.1	0.2	0.5	0.2			**22**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**78.7**	**88.8**	**74.0**	**79.0**	**74.2**	**84.6**	**85.9**	**88.2**	**82.4**	**89.4**	**89.0**	**84.3**	**88.6**	**80.6**	**88.1**	**74.4**	**87.8**	**85.5**			
SD	**3.24**	**3.18**	**8.83**	**2.61**		**3.79**	**3.07**	**3.41**	**4.13**	**4**	**2.58**	**4.48**	**3.83**	**3.55**	**4.03**	**2.62**	**5.81**	**2.89**			
Number of observations	**4**	**4**	**3**	**4**	**1**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**2**	**3**	**4**			
Min	75.5	86.1	67.0	76.9	74.2	81.8	82.4	85.2	78.7	85.0	87.0	80.5	85.1	76.3	84.4	72.6	81.2	83.0			
Max	82.4	93.0	84.0	82.7	74.2	90.1	89.9	92.9	88.1	94.5	92.4	89.7	93.7	85.0	93.2	76.3	92.2	89.4			
Amount of SID-AA (g/kg DM)	9.0	14.3	8.9	18.0	2.5	23.2	18.4	37.2	11.6	99.3	31.0	26.5	52.8	34.0	127.4	13.4	55.2	30.3		612.9	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**79**	**89**	**74**	**79**	**74**	**85**	**86**	**88**	**82**	**89**	**89**	**84**	**89**	**81**	**88**	**74**	**88**	**86**	83.4	86.2	
SIDC (Evonik table)	80	91	82	83	66	89	89	91	88	93	-	87	-	-	-	-	-	-			

Product: Meat-and-bone meal (CVB code: 8001.001, 8001.003 and 8004.000) (The use of MBM is at present not allowed in the EU: See Regulation (EC) No 999/2001 of 22 May 2001, laying down rules for the prevention, control and eradication of certain transmissible spongiform encephalopathies)																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**5.0**	**1.5**	**0.9**	**3.2**	**0.5**	**3.0**	**6.8**	**3.7**	**2.1**	**6.2**	**2.4**	**4.3**	**7.4**	**7.5**	**12.3**	**12.7**	**7.4**	**3.7**		91	**552**
SD	**0.6**	**0.2**	**0.2**	**0.3**	**0.2**	**0.3**	**0.3**	**0.9**	**0.3**	**0.5**	**0.2**	**0.5**	**0.4**	**0.4**	**0.8**	**1.3**	**0.7**	**0.6**			**45**
Number of observations	**28**	**28**	**15**	**28**	**14**	**28**	**28**	**28**	**28**	**28**	**21**	**28**	**28**	**28**	**28**	**28**	**16**	**28**			**28**
CVB Feed Table 2016: Mean	4.8	1.3	0.8	3	0.5	2.6	7.5	3.2	1.8	5.5	2	4	8.1	7.5	12	15.7	9.4	3.8		94	**483**
SD	0.4	0.1	0.2	0.3	0.1	0.3	0.6	0.3	0.3	0.5	0.3	0.4	0.6	0.4	1.1	1.9	1.1	0.4			**15**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**75.1**	**76.7**	**37.6**	**68.5**	**68.7**	**73.5**	**76.9**	**76.5**	**72.7**	**74.7**	**72.6**	**73.7**	**75.3**	**58.3**	**72.3**	**72.1**	**68.7**	**66**			
SD	**5.54**	**7.12**	**8.34**	**8.31**	**5.09**	**6.71**	**6.09**	**5.07**	**5.89**	**6.01**	**8.39**	**6.46**	**6.06**	**9.65**	**6.09**	**5.7**	**6.91**	**9.8**			
Number of observations	**25**	**26**	**11**	**26**	**9**	**26**	**26**	**26**	**25**	**26**	**19**	**26**	**26**	**26**	**25**	**22**	**12**	**26**			
Min	63.9	64.7	25.1	50.2	61.0	60.9	65.0	69.1	61.6	61.9	56.4	62.4	63.0	36.3	58.0	59.7	58.4	44.1			
Max	84.6	89.6	50.8	80.4	74.2	84.6	86.9	86.6	82.7	83.8	85.3	84.2	85.0	71.8	80.8	81.3	78.1	81.8			
Amount of SID-AA (g/kg DM)	17.4	4.8	1.5	9.9	1.7	9.2	27.8	11.8	6.3	19.8	7.0	14.2	29.4	21.1	41.9	54.6	31.2	12.1		321.7	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**75**	**77**	**38**	**68**	**69**	**74**	**77**	**76**	**73**	**75**	**73**	**74**	**75**	**58**	**72**	**72**	**69**	**66**	70.1	71.3	
SIDC (Evonik table)	68	71	28	62	55	69	76	70	70	70	-	69	-	-	-	-	-	-			

Product: Pearl millet (CVB code: 1013.000) **Amino acid pattern (g/16 gN)**	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**2.0**	**2.9**	**1.7**	**3.3**	**1.9**	**4.2**	**3.8**	**5.8**	**2.3**	**12.6**	**3.5**	**4.8**	**10.4**	**6.5**	**22.8**	**2.5**	**7.3**	**6.5**		105	**161**
SD																					
Number of obser*vation*s	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**			**1**
CVB Feed Table 2016: Mean	1.8	2.7	1.8	3	1.2	3.7	3.7	5.3	2.1	11.5	3.7	5	10.1	6.4	21.1	2.5	6.6	5.9		98	**143**
SD																					
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**86.7**	**83.5**	**75.4**	**79.3**	**85.6**	**83.0**	**88.6**	**79.1**	**80.0**	**81.6**	**85.6**	**81.0**	**81.2**	**81.6**	**82.1**	**80.4**	**76.0**	**81.2**			
SD	**1.42**	**5.63**	**4.6**	**3.94**	**3.87**	**3.04**	**1.37**	**3.65**	**4.8**	**4.58**	**3.91**	**2.61**	**6.59**	**5.84**	**4.4**	**3.32**	**5.68**	**6.7**			
Number of observations	**2**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**			
Min	85.7	77.2	69.4	76.1	82	80.1	86.6	74.1	74.3	75.3	81.9	77.7	72.8	76.2	76.5	76.0	70.8	72.5			
Max	87.7	90.9	79.7	84.9	89.9	87.1	89.4	82.2	84.4	86.3	90.9	83.8	88.9	89.8	86.0	84.0	81.1	87.8			
Amount of SID-AA (g/kg DM)	2.2	3.2	1.9	3.4	1.5	4.4	4.7	6.0	2.4	13.4	4.5	5.8	11.7	7.5	24.8	2.9	7.2	6.9		114.4	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**87**	**83**	**75**	**79**	**86**	**83**	**89**	**79**	**80**	**82**	**86**	**81**	**81**	**82**	**82**	**80**	**76**	**81**	81.8	81.5	
SIDC (Evonik table)	80	82	87	83		87	87	88	90	91	-	86	-	-	-	-	-	-			

Product: Peanut expeller (CVB code: 2013.401)	Remark: 1. The SIDC-AA values will be applied also to Peanut meal, solvent extracted 2. The batch studied had a high CP content and a low CFAT content. Possibly a batch of Peanut meal, solvent extracted was examined.																				
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**2.6**	**1.5**	**1.7**	**3.0**	**1.1**	**3.6**	**11.7**	**4.7**	**2.5**	**6.6**	**3.6**	**4.6**	**4.1**	**10.8**	**17.8**	**5.2**	**4.5**	**4.4**		94	**576**
SD																					
Number of observations	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**			**1**
CVB Feed Table 2016 Mean	3.3	1.2	1.4	2.6	1	3.3	10.9	4.9	2.3	6.3	3.7	4	3.9	11.3	18.5	5.5	4.3	4.7		93	***493***
SD	0.3	0.2	0.2	0.1	0.1	0.2	0.6	0.2	0.1	0.2	0.3	0.2	0.1	0.3	0.7	0.3	0.3	0.2			
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**78.5**	**92.0**	**73.2**	**80.4**	**86.8**	**84.9**	**90.0**	**86.7**	**80.0**	**84.5**	**88.2**	**83.7**	**83.9**	**80.3**	**83.6**	**76.9**	**93.1**	**83.0**			
SD																					
Number of observations	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**			
Min																					
Max																					
Amount of SID-AA (g/kg DM)	13.2	5.6	5.2	10.7	4.4	14.3	50.1	21.7	9.4	27.2	16.7	17.1	16.7	46.3	79.0	21.6	20.4	19.9		399.7	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**79**	**92**	**73**	**80**	**87**	**85**	**90**	**87**	**80**	**85**	**88**	**84**	**84**	**80**	**84**	**77**	**93**	**83**	83.9	84.1	
SIDC (Evonik table)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			

Product: Peas (CVB code: 2006.000)																				
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**7.3**	**0.9**	**1.4**	**3.8**	**1.0**	**4.1**	**9.0**	**5.2**	**2.6**	**7.2**	**3.2**	**4.7**	**4.3**	**11.4**	**16.7**	**4.3**	**4.0**	**4.6**		96	**242**
SD	**0.3**	**0.1**	**0.1**	**0.2**	**0.1**	**0.3**	**0.8**	**1.0**	**0.2**	**0.4**	**0.4**	**0.3**	**0.2**	**0.9**	**1.0**	**0.2**	**0.2**	**0.5**			**19**
Number of observations	**28**	**28**	**25**	**28**	**5**	**28**	**28**	**28**	**24**	**28**	**13**	**28**	**14**	**14**	**14**	**14**	**11**	**14**			**28**
CVB Feed Table 2016: Mean	7.1	1	1.5	3.7	0.9	4.1	8.8	4.7	2.5	7.1	3.3	4.6	4.4	11.7	16.7	4.4	4	4.7		95	**234**
SD	0.3	0.1	0.1	0.2	0.1	0.2	0.7	0.2	0.1	0.2	0.2	0.3	0.2	0.5	0.7	0.2	0.3	0.2			**13**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**88.1**	**85.3**	**72.8**	**80.6**	**78.6**	**82.0**	**90.4**	**83.3**	**84.6**	**82.7**	**83.9**	**81.6**	**86.4**	**85.7**	**90.7**	**84.0**	**85.4**	**83.9**			
SD	**2.86**	**4.64**	**5.49**	**3.6**	**2.6**	**4.54**	**2.37**	**4.69**	**3.27**	**4.2**	**3.18**	**4.76**	**3.42**	**3.21**	**2.46**	**2.57**	**5.1**	**3.34**			
Number of observations	**27**	**16**	**14**	**26**	**10**	**27**	**27**	**27**	**22**	**27**	**12**	**26**	**10**	**11**	**11**	**13**	**8**	**13**			
Min	81.2	75.0	65.3	75.9	76.3	72.0	86.0	73.0	79.5	72.0	79.7	70.0	81.5	80.2	87.1	80.6	76.9	79.2			
Max	93.5	92.2	80.2	89.3	83.9	89.9	94.3	91.0	91.2	90.2	89.6	89.7	91.0	90.8	94.3	90.4	91.7	90.5			
Amount of SID-AA (g/kg DM)	14.7	2.0	2.6	7.0	1.7	7.9	18.6	9.2	5.0	13.8	6.5	8.8	8.9	23.5	35.5	8.7	8.0	9.2		191.4	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**88**	**85**	**73**	**81**	**79**	**82**	**90**	**83**	**85**	**83**	**84**	**82**	**86**	**86**	**91**	**84**	**85**	**84**	83.9	85.8	
SIDC (Evonik table)	87	78	71	80	75	81	89	81	84	80	-	78	**-**	**--**	**--**	**-**	**-**	**-**			

Product: Rape seed 00 and Rape seed expeller (CVB code: 3009.000 and 3009.401)	Remark: The CP content in DM and the amount of SID-AA (in g/kg DM) relate to Rape seed expeller.																			
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**5.6**	**2.0**	**2.3**	**4.7**	**1.4**	**3.9**	**6.4**	**4.1**	**2.7**	**7.0**	**3.0**	**5.1**	**4.5**	**7.6**	**16.3**	**6.5**	**6.1**	**4.5**		95	**368**
SD	**0.47**	**0.09**	**0.10**	**0.20**	**0.06**	**0.29**	**0.89**	**0.15**	**0.24**	**0.21**	**0.26**	**0.37**	**0.08**	**0.24**	**1.20**	**2.59**	**0.38**	**0.36**			**40**
Number of observations	**5**	**5**	**5**	**5**	**3**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**			**6**
CVB Feed Table 2016: Mean	5.5	2	2.5	4.4	1.3	3.9	6.1	4.1	2.8	7	3.1	5.1	4.5	7.5	16.9	5.2	6	4.4		92	**350**
SD	0.3	0.1	0.2	0.2	0.1	0.1	0.3	0.2	0.2	0.2	0.3	0.2	0.2	0.4	0.9	0.2	0.4	0.2			**14**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**78.5**	**88.2**	**73.2**	**74.6**	**81.2**	**82.2**	**84.2**	**84.0**	**83.1**	**82.1**	**79.8**	**80.6**	**81.3**	**72.5**	**84.0**	**79.3**	**71.8**	**78.6**			
SD	**7.00**	**4.91**	**9.87**	**6.14**	**0.83**	**3.47**	**5.54**	**3.17**	**4.81**	**1.94**	**6.58**	**4.50**	**7.07**	**6.63**	**4.66**	**5.99**	**10.37**	**5.83**			
Number of observations	**5**	**5**	**5**	**5**	**3**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**2**	**2**	**2**	**5**	**2**	**5**			
Min	70.1	82.8	56.1	67.7	80.6	76.3	75.8	80.3	76.8	79.1	68.4	73.1	76.3	67.8	80.7	68.6	64.5	68.8			
Max	87.4	93.0	81.4	80.9	82.2	85.3	91.1	87.8	88.1	83.9	84.9	84.2	86.3	77.2	87.3	82.1	79.1	84.5			
Amount of SID-AA (g/kg DM)	15.1	6.2	6.4	11.5	3.7	11.2	18.0	12.0	8.1	20.1	8.6	14.4	12.8	19.0	49.6	14.4	15.1	12.1		258.2	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**78**	**88**	**73**	**75**	**81**	**82**	**84**	**84**	**83**	**82**	**80**	**81**	**81**	**73**	**84**	**79**	**72**	**79**	79.9	80.0	
SIDC (Evonik table)	80	89	74	80	81	83	90	87	86	87	-	83	-	-	-	-	-	-			

Product: Rape seed 00, meal, solvent extracted (CVB code: 3009.407)																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**5.8**	**1.7**	**2.3**	**4.3**	**1.3**	**4.5**	**6.1**	**4.1**	**2.9**	**7.1**	**3.0**	**5.2**	**4.4**	**7.3**	**17.4**	**5.2**	**5.9**	**4.2**		93	**394**
SD	**0.5**	**0.3**	**0.3**	**0.4**	**0.2**	**1.0**	**0.5**	**0.3**	**0.3**	**0.4**	**0.4**	**0.4**	**0.3**	**0.7**	**1.1**	**1.3**	**0.4**	**0.7**			**29**
Number of observations	**41**	**40**	**24**	**41**	**19**	**40**	**41**	**41**	**40**	**40**	**34**	**41**	**41**	**41**	**41**	**41**	**24**	**41**			**42**
CVB Feed Table 2016: Mean	5.5	2	2.5	4.4	1.3	3.9	6.1	4.1	2.8	7	3.1	5.1	4.5	7.5	16.9	5.2	6	4.4		92	**387**
SD	0.3	0.1	0.2	0.2	0.1	0.1	0.3	0.2	0.2	0.2	0.3	0.2	0.2	0.4	0.9	0.2	0.4	0.2			**13**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**78.4**	**88.5**	**74.9**	**73.1**	**80.3**	**78.2**	**84.9**	**80.0**	**81.8**	**80.3**	**78.9**	**76.8**	**80.2**	**76.2**	**86.1**	**78.5**	**77.3**	**76.4**			
SD	**4.51**	**4.69**	**4.08**	**5.16**	**3.55**	**3.9**	**3.55**	**3.29**	**3.41**	**4.04**	**3.28**	**4.28**	**3.46**	**4.27**	**2.98**	**3.12**	**3.29**	**3.73**			
Number of observations	**40**	**38**	**22**	**40**	**14**	**38**	**39**	**39**	**38**	**39**	**29**	**40**	**35**	**35**	**33**	**34**	**18**	**37**			
Min	68.0	78.1	66.3	59.8	73.3	69.2	76.7	73.9	73.7	72.0	72.3	65.6	70.8	65.1	78.6	71.5	72.0	70.0			
Max	87.6	95.6	79.9	82.7	84.3	84.3	91.0	87.2	88.9	87.0	87.5	83.7	87.1	84.9	90.7	86.6	84.9	82.0			
Amount of SID-AA (g/kg DM)	16.7	6.8	7.2	12.4	4.0	11.8	20.0	12.7	8.9	21.8	9.5	15.2	14.0	22.1	56.3	15.8	17.9	13.0		286.2	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**78**	**88**	**75**	**73**	**80**	**78**	**85**	**80**	**82**	**80**	**79**	**77**	**80**	**76**	**86**	**78**	**77**	**76**	79.3	80.1	
SIDC (Evonik table)	80	84	77	73	81	79	87	83	85	82	-	79	-	-	-	-	-	-			

Product: Rice feed meal (CVB code: 1003.122)																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**4.8**	**1.9**	**2.1**	**4.0**	**1.2**	**3.7**	**8.0**	**4.3**	**3.1**	**6.9**	**3.2**	**5.7**	**5.9**	**9.4**	**13.8**	**5.3**		**4.6**		88	**146**
SD	**0.5**	**0.1**		**0.4**		**0.4**	**0.8**	**0.3**	**0.5**	**0.3**	**0.1**	**0.7**	**0.2**	**1.1**	**0.8**	**0.2**		**1.2**			**15**
Number of observations	**3**	**2**	**1**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**0**	**3**			**3**
CVB Feed Table 2016: Mean	4.2	2.1	2.2	3.7	1.1	3.7	7.8	4.7	2.7	7.3	3.4	5.5	5.9	9	14.6	5.1	4.5	4.7		92	**155**
SD	0.6	0.3	0.2	0.3	0.2	0.3	0.6	0.4	0.3	0.5	0.5	0.4	0.4	0.5	1.7	0.5	0.3	0.4			**8**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**74.1**	**71.7**	**69.4**	**67.4**	**69.8**	**68.3**	**78.2**	**67.4**	**73.8**	**69.1**	**65.3**	**66.2**	**74.1**	**70.7**	**75.2**	**72.3**		**71.7**			
SD	**5.84**	**3.56**		**8.65**		**6.93**	**7.42**	**7.44**	**2.7**	**5.72**	**7.85**	**5.08**	**4.99**	**6.68**	**1.53**	**7.99**		**7.88**			
Number of observations	**4**	**3**	**2**	**4**	**1**	**4**	**4**	**4**	**4**	**4**	**3**	**4**	**4**	**4**	**3**	**4**		**4**			
Min	68.9	67.5	68.0	60.0	69.8	60.8	67.7	60.1	69.9	62.1	59.1	60.8	68.5	64.2	73.7	65.0		63.0			
Max	81.7	73.7	70.9	76.9	69.8	74.7	84.0	75.9	76.0	75.9	74.1	71.4	80.6	78.4	76.8	83.4		81.8			
Amount of SID-AA (g/kg DM)	4.8	2.3	2.4	3.9	1.2	3.9	9.5	4.9	3.1	7.8	3.4	5.6	6.8	9.9	17.0	5.7	5.0	5.2		102.4	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**74**	**72**	**69**	**67**	**70**	**68**	**78**	**67**	**74**	**69**	**65**	**66**	**74**	**71**	**75**	**72**	**71**	**72**	70.8	71.7	
SIDC (Evonik table)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			

Product: Rye (CVB code: 1007.000)																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**5.1**	**1.8**	**2.6**	**4.0**	**1.3**	**3.7**	**5.8**	**4.8**	**2.6**	**6.7**	**2.7**	**5.0**	**5.3**	**8.7**	**19.6**	**5.3**	**7.9**	**4.7**		97	**83**
SD																					
Number of observations	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**			**1**
CVB Feed Table 2016: Mean	3.8	1.7	2.4	3.3	1	3.4	5.1	4.6	2.4	6.2	2.6	4.7	4.3	7.2	22.7	4.4	9.4	4.3		94	**111**
SD	0.2	0.1	0.2	0.1	0.1	0.2	0.3	0.3	0.2	0.2	0.2	0.3	0.2	0.5	1.5	0.2	0.8	0.2			**8**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**70.8**	**81.6**	**56.4**	**54.0**	**51.4**	**67.1**	**66.0**	**72.8**	**65.3**	**71.3**	**65.2**	**63.6**	**58.7**	**45.3**	**81.9**	**40.0**	**68.7**	**54.1**			
SD	**5.8**		**13.4**	**0.0**	**7.7**	**8.6**	**1.1**	**6.8**	**11.7**	**8.2**	**7.5**	**3.3**	**2.2**	**1.7**	**8.7**	**9.1**		**5.0**			
Number of observations	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**2**			
Min	66.8	81.6	46.9	54.0	46.0	61.0	65.2	68.0	57.1	65.5	59.9	61.2	57.1	44.1	75.8	33.6	68.7	50.5			
Max	74.9	81.6	65.8	54.0	56.8	73.1	66.7	77.6	73.6	77.1	70.5	65.9	60.2	46.5	88.1	46.4	68.7	57.6			
Amount of SID-AA (g/kg DM)	3.0	1.5	1.5	2.0	0.6	2.5	3.8	3.7	1.7	4.9	1.9	3.3	2.8	3.6	20.7	2.0	7.2	2.6		69.5	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**71**	**82**	**56**	**54**	**51**	**67**	**66**	**73**	**65**	**71**	**65**	**64**	**59**	**45**	**82**	**40**	**69**	**54**	63.0	66.7	
SIDC (Evonik table)	80	79	84	78	81	81	84	82	73	85	-	81	-	-	-	-	-	-			

Product: Sesame seed meal, solvent extracted (CVB code: 3005.407)																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**2.5**	**2.4**	**1.6**	**3.2**	**1.3**	**3.3**	**10.3**	**4.5**	**2.6**	**6.2**	**3.4**	**4.4**	**3.5**	**9.0**	**16.7**	**5.3**	**3.6**	**4.6**		88	**551**
SD																					
Number of observations	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**			**1**
CVB Feed Table 2016: Mean	2.5	2.7	1.9	3.4	1.3	3.6	11.6	4.4	2.4	6.5	3.5	4.6	4.7	8.1	17.9	4.8	3.5	4.5		92	**482**
SD	0.2	0.2	0.2	0.2	0.1	0.1	0.8	0.2	0.1	0.2	0.3	0.3	0.3	0.6	1.2	0.3	0.2	0.3			**40**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**78.0**	**88.2**	**56.1**	**76.5**	**83.6**	**87.0**	**87.4**	**88.9**	**69.4**	**86.8**	**89.7**	**83.9**	**82.2**	**76.8**	**83.5**	**59.6**	**86.0**	**75.3**			
SD																					
Number of observations	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**			
Min																					
Max																					
Amount of SID-AA (g/kg DM)	9.4	11.5	5.1	12.5	5.2	15.1	48.8	18.8	8.0	27.2	15.1	18.6	18.6	30.0	72.0	13.8	14.5	16.3		360.5	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (based on the above observation)	**78**	**88**	**56**	**77**	**84**	**87**	**87**	**89**	**69**	**87**	**90**	**84**	**82**	**77**	**83**	**60**	**86**	**75**	79.9	81.5	
SIDC (%) of CYS, HIS and GLY are very low, compared to AFDC values found by Terpstra et al. for Sesame seed expeller (83, 91 and 81, respectively) and SIDC for sesame seed expeller and meal in pigs in the CVB Feed Table (84, 84 and 84, respectively). Therefore it was decided to use the estimated SIDC values for sesame seed expeller (see Appendix 4, Table C)																					
SIDC (this table)	78	88	**77**	76	84	87	87	89	**84**	87	90	84	82	77	83	**82**	86	75			
SIDC (Evonik table)	88	94	82	87	90	92	92	90	89	91	-	91	-	-	-	-	-	-			

Product: Soybeans, heat treated (CVB code: 3012.616)																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**6.1**	**1.4**	**1.5**	**4.0**	**1.4**	**4.6**	**7.8**	**4.9**	**2.8**	**7.8**	**3.8**	**5.1**	**4.3**	**11.6**	**18.3**	**4.1**	**5.3**	**5.0**		100	**406**
SD	**0.4**	**0.1**	**0.1**	**0.2**		**0.3**	**0.6**	**0.6**	**0.2**	**0.4**	**0.6**	**0.4**	**0.2**	**0.4**	**1.3**	**0.5**	**0.5**	**0.3**			**18**
Number of observations	**15**	**15**	**11**	**15**	**1**	**11**	**11**	**11**	**11**	**11**	**8**	**11**	**7**	**8**	**8**	**12**	**8**	**8**			**15**
CVB Feed Table 2016: Mean	6.2	1.4	1.5	3.9	1.3	4.6	7.4	5.1	2.7	7.7	3.7	4.8	4.4	11.6	18.1	4.3	5.1	5.2		99	**405**
SD	0.2	0.1	0.1	0.1	0.1	0.2	0.3	0.2	0.1	0.2	0.3	0.2	0.2	0.4	0.8	0.2	0.3	0.2			**9**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**84.8**	**83.9**	**67.7**	**77.0**	**74.5**	**83.3**	**86.7**	**84.1**	**83.5**	**82.6**	**81.2**	**81.9**	**80.5**	**80.5**	**84.1**	**77.4**	**82.6**	**80.6**			
SD	**3.48**	**4.12**	**3.73**	**5.5**		**3.5**	**2.02**	**2.82**	**5**	**3.59**	**4.14**	**5.49**	**3.56**	**2.27**	**1.38**	**4.14**	**3.55**	**2.2**			
Number of observations	**14**	**14**	**10**	**14**	**1**	**10**	**10**	**10**	**10**	**10**	**6**	**10**	**7**	**7**	**6**	**10**	**7**	**7**			
Min	77.8	77.5	62.1	68.4	74.5	77.8	84.0	79.6	75.5	76.6	74.8	71.9	77.1	78.3	83.0	70.1	78.5	77.2			
Max	88.6	89.3	71.4	84.1	74.5	87.3	90.0	87.2	88.9	86.4	87.0	87.7	86.9	84.5	86.1	83.1	88.2	84.0			
Amount of SID-AA (g/kg DM)	21.3	4.8	4.1	12.2	3.9	15.5	26.0	17.4	9.1	25.7	12.2	15.9	14.3	37.8	61.6	13.5	17.0	17.0		329.2	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**85**	**84**	**68**	**77**	**80***	**83**	**87**	**84**	**84**	**83**	**81**	**82**	-	-	-	-	-	-	81.1	82.2	
SIDC (Evonik table)	86	87	69	83	83	85	86	84	87	84	-	85	-	-	-	-	-	-			

*: The figure from the single observation is considered to be too low; therefore the TRP value has been adapted to 80 (close to the mean AA digestibility).

Product: Soybean meal, solvent extracted (CVB code: 3012.407)																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**6.1**	**1.4**	**1.5**	**4.0**	**1.4**	**4.6**	**7.4**	**5.2**	**2.8**	**7.7**	**3.7**	**4.9**	**4.4**	**11.5**	**17.9**	**4.2**	**5.2**	**5.0**		99	**532**
SD	**0.5**	**0.2**	**0.1**	**0.2**	**0.1**	**0.3**	**0.4**	**0.3**	**0.2**	**0.4**	**0.3**	**0.4**	**0.4**	**0.7**	**1.5**	**0.4**	**0.4**	**0.5**			**27**
Number of observations	**123**	**122**	**97**	**123**	**43**	**119**	**119**	**119**	**118**	**119**	**110**	**119**	**113**	**114**	**114**	**118**	**87**	**115**			**123**
CVB Feed Table 2016: Mean	6.2	1.4	1.5	3.9	1.3	4.6	7.4	5.1	2.7	7.7	3.7	4.8	4.4	11.6	18.1	4.3	5.1	5.2		99	**556**
SD	0.2	0.1	0.1	0.1	0.1	0.2	0.3	0.2	0.1	0.2	0.3	0.2	0.2	0.4	0.8	0.2	0.3	0.2			**3**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**88.4**	**89.6**	**75.0**	**82.7**	**88.6**	**86.5**	**90.4**	**87.2**	**86.7**	**86.7**	**87.7**	**85.7**	**85.8**	**84.4**	**88.9**	**84.4**	**86.5**	**86.1**			
SD	**2.61**	**2.68**	**5.73**	**3.8**	**3.19**	**3.08**	**2.23**	**2.58**	**2.99**	**2.75**	**3.22**	**3.12**	**2.74**	**3.15**	**2.42**	**4.13**	**2.65**	**3.52**			
Number of observations	**120**	**117**	**95**	**122**	**24**	**118**	**118**	**113**	**119**	**120**	**87**	**120**	**111**	**111**	**112**	**100**	**86**	**116**			
Min	82.0	83.3	58.9	73.2	82.5	77.6	84.1	80.4	80.1	79.5	78.6	76.8	78.7	77.3	82.8	72.4	78.2	77.7			
Max	94.9	94.9	87.6	90.6	93.5	93.5	95.2	92.8	93.0	92.4	93.5	91.1	91.4	91.4	93.2	92.5	92.0	92.1			
Amount of SID-AA (g/kg DM)	30.5	7.0	6.3	17.9	6.4	22.1	37.2	24.7	13.0	37.1	18.0	22.9	21.0	54.5	89.5	20.2	24.5	24.9		477.8	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**88**	**90**	**75**	**83**	**89**	**87**	**90**	**87**	**87**	**87**	**88**	**86**	**86**	**84**	**89**	**84**	**86**	**86**	86.2	86.8	
SIDC (Evonik table)	89	90	79	83	89	87	92	89	90	88	-	87	-	-	-	-	-	-			

Product: Sorghum (CVB code: 1008.000)																				
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**2.1**	**1.6**	**2.1**	**3.1**	**1.0**	**4.1**	**3.7**	**5.2**	**2.3**	**13.4**	**3.3**	**5.0**	**9.0**	**6.5**	**20.7**	**3.0**	**6.6**	**4.4**		97	**117**
SD	**0.4**	**0.3**	**0.1**	**0.3**	**0.1**	**0.6**	**0.7**	**0.8**	**0.3**	**1.6**	**0.9**	**0.8**	**1.2**	**0.9**	**2.4**	**0.5**	**2.0**	**0.7**			**16**
Number of observations	**23**	**22**	**2**	**23**	**7**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**23**	**2**	**23**			**23**
CVB Feed Table 2016: Mean	2.4	1.8	1.9	3.3	1.1	4	4	5.3	2.4	13	3.9	5	8.9	7.1	20	3.4	8.1	4.6		100	**100**
SD	0.3	0.1	0.1	0.1	0.1	0.2	0.3	0.3	0.2	0.6	0.3	0.3	0.4	0.3	1.1	0.3	0.5	0.2			**8**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**87.8**	**88.2**	**89.6**	**82.7**	**82.1**	**89.7**	**86.8**	**88.7**	**78.5**	**88.5**	**83.6**	**86.6**	**88.6**	**88.3**	**88.9**	**83.4**	**92.4**	**88.0**			
SD	**4.83**	**3.94**		**4.81**	**3.11**	**3.52**	**4.3**	**3.43**	**4.74**	**3.13**	**4.75**	**3.55**	**2.94**	**3.39**	**4.21**	**5.91**		**3.87**			
Number of observations	**22**	**21**	**1**	**22**	**6**	**22**	**22**	**22**	**22**	**22**	**22**	**22**	**22**	**22**	**22**	**22**	**1**	**22**			
Min	78.6	81.5		75.5	77.9	83.3	79.4	80.8	68.1	82.5	73.3	79.7	82.9	81.9	76.1	74.0		79.9			
Max	96.8	97.0		92.5	87.0	96.3	99.3	94.5	86.2	94.5	92.7	94.1	95.0	94.2	94.6	103.0		93.8			
Amount of SID-AA (g/kg DM)	2.1	1.6	1.7	2.7	0.9	3.6	3.5	4.7	1.9	11.5	3.3	4.3	7.9	6.3	17.7	2.8	7.5	4.0		87.9	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**88**	**88**	**90**	**83**	**82**	**90**	**87**	**89**	**79**	**89**	**84**	**87**	**89**	**88**	**89**	**83**	**92**	**88**	86.8	87.9	
SIDC (Evonik table)	90	89	79	83	87	90	88	89	84	88	-	87	-	-	-	-	-	-			

Product: Sunflower seed meal, solvent extracted (CVB code:3003.407) Remark: The CP content in DM and the amount of SID-AA (in g/kg DM) relate to Sunflower meal, CP 160-200 g/kg in CVB Feed Table																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**3.5**	**2.2**	**1.9**	**3.7**	**1.2**	**4.1**	**8.1**	**4.5**	**2.6**	**6.4**	**2.7**	**5.0**	**4.2**	**8.8**	**19.1**	**5.6**	**4.8**	**4.3**		93	**377**
SD	**0.2**	**0.5**	**0.1**	**0.1**	**0.2**	**0.3**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.4**	**0.2**	**0.3**	**1.0**	**0.4**		**0.4**			**53**
Number of observations	**7**	**6**	**2**	**7**	**4**	**7**	**7**	**7**	**7**	**7**	**6**	**7**	**7**	**7**	**7**	**7**	**1**	**7**			**7**
CVB Feed Table 2016: Mean	3.5	2.2	1.7	3.7	1.2	4.1	8.1	4.6	2.5	6.3	2.5	4.9	4.3	9.2	19.3	5.7	4.3	4.3		92	**395**
SD	0.2	0.1	0.1	0.2	0.1	0.2	0.5	0.2	0.2	0.2	0.2	0.2	0.2	0.4	0.9	0.3	0.3	0.2			**24**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**81.8**	**91.8**	**73.0**	**76.4**	**84.0**	**85.1**	**90.8**	**87.1**	**77.4**	**84.0**	**85.7**	**83.2**	**82.9**	**80.3**	**87.4**	**71.5**	**93.7**	**78.0**			
SD	**1.55**	**1.89**	**2.6**	**1.66**	**1.21**	**2.68**	**2**	**3.04**	**1.98**	**2.41**	**3.8**	**3.6**	**2.47**	**2.81**	**2.61**	**9.4**		**3.27**			
Number of observations	**6**	**5**	**2**	**5**	**3**	**6**	**6**	**5**	**4**	**6**	**5**	**6**	**6**	**6**	**5**	**5**	**1**	**5**			
Min	79.5	89.4	71.1	74.4	82.6	82.2	88.2	84.7	75.5	81.8	80.8	79.5	81.1	76.2	83.7	61.6		73.8			
Max	84.1	93.7	74.8	78.0	84.9	89.9	94.2	92.3	80.2	88.4	90.0	88.9	87.6	84.4	90.7	82.6		81.9			
Amount of SID-AA (g/kg DM)	11.3	8.0	4.9	11.2	4.0	13.8	29.0	15.8	7.6	20.9	8.5	16.1	14.1	29.2	66.6	16.1	15.9	13.2		306.0	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**82**	**92**	**73**	**76**	**84**	**85**	**91**	**87**	**77**	**84**	**86**	**83**	**83**	**80**	**87**	**71**	**94**	**78**	82.9	83.9	
SIDC (Evonik table)	87	92	80	82	87	89	93	90	88	88	-	87	-	-	-	-	-	-			

Product: Triticale (CVB code: 1012.000)																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**3.8**	**1.6**	**2.6**	**3.5**	**1.0**	**3.7**	**5.4**	**4.8**	**2.6**	**6.9**	**2.8**	**4.8**	**4.3**	**6.5**	**26.4**	**4.6**	**9.9**	**5.1**		100	**113**
SD	**0.5**	**0.3**		**0.2**	**0.2**	**0.0**	**0.3**	**0.3**	**0.0**	**0.2**	**0.3**	**0.1**	**0.4**	**0.5**	**1.1**	**0.5**		**0.1**			**12**
Number of observations	**2**	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**2**			**2**
CVB Feed Table 2016: Mean	3.3	1.7	2.3	3.1	1.1	3.4	5	4.5	2.3	6.5	2.8	4.6	4	6.1	25.3	4.2	9.4	4.5		94	**123**
SD	0.3	0.1	0.1	0.2	0.1	0.1	0.3	0.3	0.1	0.1	0.2	0.3	0.2	0.4	1.8	0.2	0.7	0.2			**20**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**81.6**	**90.6**	**74.6**	**79.2**	**83.0**	**83.4**	**80.1**	**87.2**	**78.6**	**84.6**	**82.1**	**84.6**	**80.1**	**77**	**93.3**	**78.7**	**88.7**	**84.4**			
SD	**3.88**	**4.08**		**5.19**		**6.39**	**4.08**	**3.47**	**4.97**	**3.4**		**1.37**	**2.71**	**7.77**	**1.17**	**4.36**		**3.5**			
Number of observations	**4**	**4**	**1**	**4**		**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**3**	**4**	**1**	**4**			
Min	76.1	84.7		73.6		75.1	74.3	84.1	74.1	81.4		82.6	76.2	66.9	91.9	74.4		80.3			
Max	85.1	93.7		84.9		88.5	83.2	90.4	85.4	87.8		85.7	82.2	83.9	94.1	83.9		88.7			
Amount of SID-AA (g/kg DM)	3.3	1.9	2.1	3.0	1.1	3.5	4.9	4.8	2.2	6.8	2.8	4.8	3.9	5.8	29.0	4.1	10.3	4.7		99.0	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**82**	**91**	**82**	**79**	**83**	**83**	**80**	**87**	**79**	**85**	**82**	**85**	**80**	**77**	**93**	**79**	**89**	**84**	82.9	85.6	
SIDC (Evonik table)	85	90	87	86	86	90	84	86	89	88	-	87	-	-	-	-	-	-			

*: The figure from the single observation is considered to be too low; therefore the TRP value has been adapted to 82 (= value for wheat minus 3%; this is the difference between Mean 1 for wheat and triticale).

Product: Wheat (CVB code: 1010.000)																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**3.0**	**1.5**	**2.3**	**3.1**	**1.2**	**3.8**	**4.9**	**4.9**	**2.6**	**7.1**	**2.6**	**4.6**	**3.8**	**5.3**	**30.5**	**4.3**	**9.9**	**5.2**		101	**137**
SD	**0.4**	**0.2**	**0.2**	**0.2**	**0.1**	**0.4**	**0.4**	**0.3**	**0.2**	**0.5**	**0.6**	**0.4**	**0.3**	**0.4**	**3.6**	**0.4**	**1.9**	**0.8**			**23**
Number of observations	**45**	**44**	**11**	**45**	**14**	**45**	**45**	**45**	**44**	**45**	**42**	**45**	**45**	**45**	**45**	**44**	**10**	**45**			**45**
CVB Feed Table 2016: Mean	2.8	1.6	2.2	2.9	1.2	3.4	4.7	4.5	2.3	6.6	2.8	4.3	3.7	5.3	28.3	4	9.7	4.6		95	**131**
SD	0.2	0.1	0.2	0.2	0.1	0.2	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.4	2.5	0.2	0.8	0.2			**10**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**81.7**	**88.6**	**85.1**	**82.0**	**87.5**	**89.4**	**82.8**	**89.8**	**83.3**	**89.3**	**84.6**	**86.6**	**81.9**	**81.9**	**95.4**	**84.3**	**94.5**	**88.4**			
SD	**6.5**	**5.2**	**3.7**	**5.5**	**2.3**	**4.0**	**3.6**	**3.9**	**6.1**	**3.6**	**6.2**	**4.0**	**5.1**	**5.4**	**1.9**	**4.6**	**1.8**	**3.1**			
Number of observations	**48**	**47**	**12**	**48**	**12**	**43**	**42**	**44**	**47**	**46**	**37**	**44**	**44**	**41**	**40**	**43**	**7**	**39**			
Min	62.0	79.0	80.6	70.0	84.4	80.0	75.0	81.0	69.4	80.3	70.0	78.3	69.8	71.5	91.2	75.1	91.7	80.8			
Max	95.1	97.7	91.6	93.4	92.1	97.0	88.7	95.3	93.6	96.7	95.2	94.7	90.8	93.7	98.9	94.5	96.2	93.5			
Amount of SID-AA (g/kg DM)	3.0	1.9	2.4	3.1	1.4	4.0	5.1	5.3	2.5	7.7	3.1	4.9	4.0	5.7	35.2	4.4	12.0	5.3		110.8	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**82**	**89**	**85**	**82**	**87**	**89**	**83**	**90**	**83**	**89**	**85**	**87**	**82**	**82**	**95**	**84**	**94**	**88**	86.5	89.4	
SIDC (Evonik table)	86	91	91	88	86	94	86	91	90	91	-	91	-	-	-	-	-	-			

Product: Wheat middling's (CVB code: 1010.107)																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**4.4**	**1.1**	**2.1**	**3.4**		**3.2**	**6.7**	**3.7**	**2.8**	**6.1**	**2.3**	**4.7**	**4.9**	**7.1**	**20.3**	**5.3**		**4.5**		83	**164**
SD	**0.3**	**0.5**	**0.1**	**0.3**		**0.1**	**0.5**	**0.4**	**0.3**	**0.3**	**0.4**	**0.3**	**0.3**	**0.5**	**2.3**	**0.4**		**0.4**			**11**
Number of observations	**4**	**4**	**2**	**4**	**0**	**4**	**4**	**4**	**4**	**4**	**3**	**4**	**4**	**4**	**4**	**4**	**0**	**4**			**4**
CVB Feed Table 2016: Mean	4	1.6	2.1	3.3	1.4	3.2	6.7	4	2.7	6.2	2.9	4.7	4.7	7.1	19.4	5.1	6.5	4.4		90	**176**
SD	0.3	0.1	0.1	0.2	0.1	0.2	0.5	0.3	0.2	0.3	0.3	0.3	0.4	0.5	2.2	0.4	0.8	0.3			**8**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**77.3**	**82.1**		**70.6**	**77.4**	**78.5**	**77.6**	**78.9**	**74.3**	**77.5**	**73.9**	**75.3**	**73.6**		**86.9**	**71.3**	**77.6**	**74.9**			
SD	**4.33**	**7.51**		**4.14**	**2.93**	**3.37**	**2.79**	**3.62**	**4.77**	**5.22**	**2.45**	**2.84**	**4.67**		**3.78**	**1.67**		**4.4**			
Number of observations	**5**	**4**		**5**	**2**	**5**	**5**	**5**	**5**	**5**	**4**	**5**	**5**		**5**	**5**	**1**	**5**			
Min	70.8	71.0		64.6	75.3	72.9	75.3	72.9	65.8	68.4	70.2	70.7	65.3		80.7	68.9		68.6			
Max	83.0	87.6		74.6	79.5	80.9	82.5	81.5	77.2	80.7	75.2	77.4	76.3		89.7	73.0		78.9			
Amount of SID-AA (g/kg DM)	5.4	2.3		4.1	1.9	4.4	9.2	5.6	3.5	8.5	3.8	6.2	6.1		29.7	6.4	8.9	5.8		123.5	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**77**	**82**	**76**	**71**	**77**	**78**	**78**	**79**	**74**	**77**	**74**	**75**	**74**	**76**	**87**	**71**	**78**	**75**	75.9	77.9	
SIDC (Evonik table)	73	80	**74**	74	82	79	82	84	81	80	-	77	-	-	-	-	-	-			

Remark: Figure for CYS and ASP are predicted with regression formulas (see Appendix 5).

Product: Wheat bran (CVB code: 1010.108)																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**4.1**	**1.3**	**2.1**	**3.3**	**1.4**	**3.3**	**6.2**	**3.9**	**2.8**	**6.0**	**2.5**	**4.7**	**4.6**	**6.8**	**19.2**	**5.2**	**6.4**	**4.4**		88	**178**
SD	**0.4**	**0.4**	**0.2**	**0.1**	**0.0**	**0.1**	**0.8**	**0.2**	**0.2**	**0.1**	**0.3**	**0.2**	**0.1**	**0.4**	**1.1**	**0.1**	**0.2**	**0.4**			**11**
Number of observations	**6**	**5**	**2**	**6**	**2**	**6**	**6**	**6**	**6**	**6**	**5**	**6**	**6**	**6**	**6**	**6**	**2**	**6**			**6**
CVB Feed Table 2016: Mean	4	1.6	2.1	3.3	1.4	3.2	6.7	4	2.7	6.2	2.9	4.7	4.7	7.1	19.4	5.1	6.5	4.4		90	**178**
SD	0.3	0.1	0.1	0.2	0.1	0.2	0.5	0.3	0.2	0.3	0.3	0.3	0.4	0.5	2.2	0.4	0.8	0.3			**9**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**75.4**	**78.4**		**70.1**		**78.3**	**78.7**	**76**	**73.1**	**77.0**	**68.8**	**73.8**	**74.4**	**75.3**	**84.9**	**70.4**		**73.4**			
SD	**7.86**	**8.84**		**8.62**		**4.7**	**5.22**	**5.95**	**5.62**	**3.65**	**11.91**	**4.02**	**4.6**	**6.61**	**2.75**	**6.2**		**6.88**			
Number of observations	**4**	**4**		**4**		**4**	**4**	**4**	**4**	**4**	**3**	**4**	**4**	**4**	**4**	**4**		**4**			
Min	64.8	67.2		58.4		71.2	71.3	68.5	65.0	72.1	55.0	68.2	67.7	66.0	82.4	61.4		64.2			
Max	82.8	87.2		78.4		80.9	83.2	81.0	77.0	80.1	76.2	77.2	78.3	81.6	88.8	74.9		79.0			
Amount of SID-AA (g/kg DM)	5.4	2.2		4.1		4.5	9.4	5.4	3.5	8.5	3.6	6.2	6.2	9.5	29.3	6.4	8.7	5.8		123.4	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**75**	**78**	**73**	**70**	**74**	**78**	**79**	**76**	**73**	**77**	**69**	**74**	**74**	**75**	**85**	**70**	**74**	**73**	75.2	77.0	
SIDC (Evonik table)	73	80	**74**	74	82	79	82	84	81	80	-	77	-	-	-	-	-	-			

Remark: Figure for CYS, TRP and PRO are predicted with regression formulas (see Appendix 5).

B. Feedstuffs present in the database but not listed in the CVB Feed Table with an evaluation for poultry

Product: Blood meal (CVB code: 8002.657) (The use of blood meal in poultry feeds is regulated through **Regulation (EC) No 999/2001 of 22 May 2001, laying down rules for the prevention, control and eradication of certain transmissible spongiform encephalopathies**

Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**9.6**	**1.6**	**1.4**	**5.6**	**1.5**	**1.0**	**4.3**	**6.9**	**6.3**	**12.7**	**3.1**	**9.0**	**7.8**	**10.3**	**9.1**	**4.3**	**4.0**	**5.8**		104	**954**
SD	**1.0**	**0.6**		**0.2**	**0.0**	**0.1**	**0.2**	**0.7**	**0.5**	**1.1**	**0.3**	**0.5**	**0.4**	**1.0**	**0.6**	**0.1**		**0.5**			**68**
Number of observations	**4**	**4**	**1**	**4**	**2**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**1**	**4**			**4**
CVB Feed Table 2016: Mean	8.9	1.2	1.2	4.4	1.5	1.2	4.3	6.9	6.4	12.8	2.9	8.6	7.9	11	9.3	4.5	3.9	5		102	**983**
SD	0.4	0.2	0.2	0.5	0.2	0.3	0.3	0.4	0.4	0.6	0.4	0.6	0.4	0.4	0.5	0.2	0.4	0.3			**21**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**90.5**	**89.2**		**85.4**	**84.9**	**60.6**	**88.1**	**90.8**	**87.2**	**89.8**	**87.5**	**88.5**	**86.3**	**88.2**	**84.0**	**87.6**		**87.7**			
SD	**4.54**	**5.45**		**4.54**		**9.9**	**8.02**	**5.3**	**2.79**	**4.43**	**8.19**	**3.66**	**1.15**	**5.03**	**2.36**	**8.16**		**5.22**			
Number of observations	**3**	**3**		**3**	**1**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**		**3**			
Min	86.5	85.1		80.5	84.9	53.6	82	85.6	85.4	85.5	80.1	84.7	85.6	82.9	82.6	81.5		83.4			
Max	95.4	95.3		89.4	84.9	67.6	97.2	96.2	90.4	94.4	96.3	92	87.6	92.9	86.7	96.9		93.5			
Amount of SID-AA (g/kg DM)	79.1	10.5	10.1	36.9	12.5	7.1	37.2	61.6	54.8	112.9	24.9	74.8	67.0	95.3	76.8	38.7	33.0	43.1		876.5	
Rounded off digestibility coefficients (%)																			MEAN1	MEAN2	
SIDC (this table)	**90**	**89**	**80***	**85**	**85**	**61****	**88**	**91**	**87**	**90**	**88**	**88**	**86**	**88**	**84**	**88**	**86**	**88**	86.0	87.5	
SIDC (Evonik table)	86	91	76	88	**85**	78	87	88	84	90	**-**	88	-	-	-	-	-	-			

*: 8% units lower than mean.

**: 27% units lower than mean.

Product: Casein (CVB code: 8010.000)																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**10.1**	**3.2**	**-**	**5.1**	**1.2**	**6.2**	**4.1**	**5.6**	**3.1**	**10.3**	**6.3**	**7.4**	**3.8**	**9.0**	**23.4**	**2.5**	**-**	**6.6**		**108**	**944**
SD	**0.7**	**0.3**	**-**	**0.1**	**0.1**	**0.2**	**0.0**	**0.1**	**0.1**	**0.1**	**0.2**	**0.2**	**0.0**	**0.0**	**0.3**	**0.2**	**-**	**0.0**			**11**
Number of observations	**3**	**3**	**0**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**0**	**3**			**3**
CVB Feed Table 2016: Mean	***8.0***	***3.0***	***0.4***	***4.3***	***1.3***	***5.2***	***3.6***	***5.2***	***3.1***	***9.7***	***5.6***	***6.7***	***3.2***	***7.3***	***22.0***	***2.0***	***11.2***	***5.7***		***108***	***952***
SD	***0.4***	***0.1***	***0.1***	***0.2***	***0.1***	***0.2***	***0.3***	***0.1***	***0.1***	***0.3***	***0.5***	***0.4***	***0.3***	***0.4***	***0.9***	***0.2***	***1.1***	***0.3***			
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**97.7**	**98.1**	**95.5**	**92.9**	**98.1**	**95.1**	**96.4**	**97.9**	**92.3**	**94.7**	**98.4**	**95.5**	**94.1**	**96.7**	**95.8**	**94.3**	**95.5**	**90.1**			
SD	**1.1**	**0.6**	**-**	**1.2**		**2.1**	**1.5**	**1.0**	**2.3**	**1.7**	**1.2**	**0.6**	**0.6**	**0.6**	**1.5**	**1.7**	**-**	**2.6**			
Number of observations	**3**	**3**	**0**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**0**	**3**			
Min	**98.4**	**98.4**		**93.6**		**96.8**	**98.0**	**98.9**	**93.6**	**95.7**	**99.8**	**95.9**	**94.5**	**97.0**	**97.5**	**96.3**		**92.1**			
Max	**96.4**	**97.4**		**91.6**		**92.7**	**95.1**	**96.9**	**89.7**	**92.7**	**97.7**	**94.8**	**93.4**	**96.0**	**94.5**	**93.3**		**87.1**			
Amount of SID-AA (g/kg DM)	**74.4**	**28.0**	**3.6**	**38.0**	**12.1**	**47.1**	**33.0**	**48.5**	**27.2**	**87.5**	**52.5**	**60.9**	**28.7**	**67.2**	**200.7**	**17.9**	**101.8**	**48.9**		**978**	
Rounded off digestibility coefficients (%)																			**MEAN1**	**MEAN2**	
SIDC (this table)	**98**	**98**	**96**	**93**	**98**	**95**	**96**	**98**	**92**	**95**	**98**	**95**	**94**	**97**	**96**	**94**	**96**	**90**	**96**	**96**	
SIDC (Evonik table)	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**			

Product: Chick peas																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**6.3**	**0.9**		**3.6**	**0.8**	**4.7**	**10.9**	**5.7**	**2.9**	**7.6**	**2.7**	**4.9**	**4.3**	**11.4**	**16.1**	**4.0**		**5.7**		**93**	**229.0**
SD																					
Number of observations	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**			**1**
CVB Feed Table 2016: Mean	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**			
SD	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**			
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**76.6**	**79.7**	**75.3**	**71.6**	**75.5**	**70.5**	**85.0**	**76.2**	**77.8**	**71.5**	**74.3**	**73.2**	**74.2**	**75.1**	**78.9**	**71.8**	**75.3**	**72.3**			
SD																					
Number of observations	**1**	**1**		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**		**1**			
Min																					
Max																					
Amount of SID-AA (g/kg DM)	**11.1**	**1.6**	**-**	**5.9**	**1.5**	**7.7**	**21.2**	**10.0**	**5.1**	**12.4**	**4.6**	**8.3**	**7.3**	**19.6**	**29.0**	**6.6**	**-**	**9.5**		**161**	
Rounded off digestibility coefficients (%)																			**MEAN1**	**MEAN2**	
SIDC (this table)	**77**	**80**	**75**	**72**	**75**	**70**	**85**	**76**	**78**	**72**	**74**	**73**	**74**	**75**	**79**	**72**	**75**	**72**	**75**		
SIDC (Evonik table)	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**			

Product: DDGS maize (CVB code: 1002.310)																				
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**2.9**	**1.9**	**2.0**	**3.7**	**0.8**	**3.7**	**4.4**	**4.0**	**2.6**	**11.8**	**3.6**	**4.9**	**7.3**	**6.4**	**15.7**	**4.0**	**7.4**	**4.6**		92	**293**
SD	**0.5**	**0.4**	**0.1**	**0.3**	**0.1**	**0.3**	**0.5**	**1.8**	**0.2**	**0.9**	**0.3**	**0.3**	**0.5**	**0.6**	**2.3**	**0.3**	**0.7**	**0.5**			**18**
Number of observations	**16**	**16**	**15**	**16**	**4**	**16**	**16**	**16**	**16**	**16**	**11**	**16**	**16**	**16**	**16**	**10**	**16**	**16**			**16**
CVB Feed Table 2016: Mean	2.4	1	1.8	3.6	0.7	4	4.1	5	2.5	11.9		5	7.2	6.8	18.1	3.9	7.9	4.6		91	**293**
SD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			**10**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**61.1**	**81.1**	**72.5**	**66.5**	**78.2**	**74.3**	**77.5**	**79.1**	**72.8**	**83.3**	**80.3**	**72.1**	**80.2**	**63.2**	**80.9**	**69.2**	**75.9**	**76.6**			
SD	**6.37**	**3.29**	**5.74**	**4.94**	**5.22**	**4.77**	**3.75**	**5.03**	**5.53**	**2.51**	**4.28**	**4.45**	**2.57**	**4.41**	**4.49**	**6.1**	**4.64**	**5.27**			
Number of observations	**12**	**13**	**12**	**13**	**3**	**13**	**13**	**11**	**14**	**13**	**9**	**12**	**11**	**11**	**13**	**8**	**12**	**14**			
Min	48.9	74.6	61.9	57.2	72.3	65	69.9	71.4	63.6	79.6	73.9	63.3	75.7	55.2	72.5	62.4	67.9	67.9			
Max	72.8	86.1	81.6	74.7	82.1	82.3	83.3	86.7	81.7	87.7	85.6	78.6	85.1	68.9	86.5	82.0	84.2	84.6			
Amount of SID-AA (g/kg DM)	4.3	2.4	3.8	7.0	1.6	8.7	9.3	11.6	5.3	29.1	0.0	10.6	16.9	12.6	43.0	7.9	17.6	10.3		202.2	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**61**	**81**	**73**	**66**	**78**	**74**	**78**	**79**	**73**	**83**	**80**	**72**	**80**	**63**	**81**	**69**	**76**	**77**	74.7	76.1	
SIDC (Evonik table)	65	86	82	72	81	80	82	80	74	86	-	78	-	-	-	-	-	-			

Product: DDGS wheat (CVB code: 1010.310)																				
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**2.3**	**1.7**	**1.9**	**3.3**	**0.7**	**3.6**	**4.3**	**4.8**	**2.3**	**8.6**	**3.7**	**4.6**	**5.0**	**5.4**	**23.1**	**4.1**	**8.6**	**4.5**		93	**365**
SD	**0.6**	**0.3**	**0.1**	**0.5**	**0.1**	**0.2**	**0.3**	**0.3**	**0.4**	**2.8**	**0.1**	**0.5**	**2.0**	**1.0**	**6.2**	**0.2**	**0.4**	**0.1**			**48**
Number of observations	**8**	**8**	**8**	**8**	**3**	**8**	**8**	**8**	**8**	**8**	**3**	**8**	**8**	**8**	**8**	**8**	**8**	**8**			**8**
CVB Feed Table 2016: Mean	2.1	1.5	1.7	3.2	0.9	3.6	4	4.5	2	7.5	3.7	4.3	4.3	5.4	23.7	3.9	8.5	4.4		89	**354**
SD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			**28**
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**48.9**	**77.4**	**67.4**	**62.5**	**77.5**	**73.8**	**75.3**	**81.1**	**70.8**	**79.2**	**78.8**	**71.3**	**71.5**	**55.8**	**82.6**	**64.6**	**81.5**	**71.3**			
SD	**7.79**	**2.42**	**2.87**	**2.77**	**3.01**	**2.09**	**4.9**	**1.9**	**4.33**	**3.56**	**2.79**	**3.28**	**8.14**	**8.73**	**3.38**	**3.64**	**3.29**	**2.41**			
Number of observations	**7**	**7**	**7**	**7**	**3**	**7**	**7**	**7**	**7**	**7**	**3**	**7**	**7**	**7**	**7**	**7**	**6**	**7**			
Min	37.6	74.0	64.0	59.7	74.9	70.8	69.8	78.6	65.5	75.0	76.7	66.6	62.7	45.9	77.9	59.9	76.1	69.0			
Max	59.0	80.9	72.0	66.6	80.8	76.5	82.1	83.6	77.0	84.8	82.0	76.1	82.1	67.5	85.9	69.9	84.8	75.0			
Amount of SID-AA (g/kg DM)	3.6	4.1	4.1	7.1	2.5	9.4	10.7	12.9	5.0	21.0	10.3	10.8	10.9	10.7	69.2	8.9	24.5	11.1		236.8	
Rounded off digestibility coefficients (%)																			GEM 1	GEM 2	
SIDC (this table)	**49**	**77**	**67**	**63**	**78**	**74**	**75**	**81**	**71**	**79**	**79**	**71**	**72**	**56**	**83**	**65**	**82**	**71**	67.8	75.0	
SIDC (Evonik table)	41	76	66	64	-	74	71	82	68	76	-	69	-	-	-	-	-	-			

Product: Fish silage **Amino acid pattern (g/16 gN)**	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**7.3**	**2.6**		**3.7**		**3.9**	**5.6**	**3.6**	**3.5**	**6.3**	**3.0**	**5.0**	**6.4**	**8.3**	**12.0**	**6.6**	**4.2**	**3.3**		**85**	**649**
SD	**0.3**	**0.1**		**0.1**		**0.2**	**0.2**	**0.1**	**0.1**	**0.2**	**0.1**	**0.2**	**0.2**	**0.3**	**0.1**	**0.2**		**0.3**			**26**
Number of observations	**2**	**2**	**0**	**2**	**0**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**2**			**2**
CVB Feed Table 2016: Mean	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**95.7**	**94.6**	**92.0**	**90.7**	**92.0**	**93.5**	**93.0**	**93.2**	**92.2**	**94.5**	**93.9**	**93.5**	**93.0**	**87.9**	**89.2**	**86.1**	**85.8**	**89.8**			
*SD**	**0.0**	**0.0**		**0.0**		**0.0**	**0.0**	**0.7**	**0.7**	**0.0**	**0.0**	**0.0**	**0.1**	**0.7**	**0.0**	**0.1**		**0.2**			
Number of observations	**2**	**2**		**2**		**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**2**			
Min																					
Max																					
Amount of SID-AA (g/kg DM)	**45.3**	**16.0**	**-**	**22.1**	**-**	**23.4**	**33.7**	**21.6**	**21.0**	**38.5**	**18.5**	**30.4**	**38.6**	**47.5**	**69.3**	**36.7**	**23.2**	**19.0**		**505**	
Rounded off digestibility coefficients (%)																			**MEAN1**	**MEAN2**	
SIDC (this table)	**96**	**95**	**92**	**91**	**92**	**94**	**93**	**93**	**92**	**94**	**94**	**94**	**93**	**88**	**89**	**86**	**86**	**90**	**92**		
SIDC (Evonik table)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			

*: Although one batch has been evaluated twice, the SD is remarkably low.

Product: Linseed (CVB code: 3006.000/0/0) **Amino acid pattern (g/16 gN)**	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**3.4**	**2.0**	**1.9**	**3.3**	**-**	**3.7**	**7.4**	**4.6**	**2.1**	**6.0**	**-**	**4.6**	**4.0**	**7.4**	**23.5**	**5.0**	**6.1**	**4.5**		**89**	**191**
SD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Number of observations	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**			**1**
CVB Feed Table 2016: Mean	***3.7***	***1.9***	***1.8***	***3.6***	***1.6***	***4.0***	***8.9***	***4.6***	***2.2***	***5.9***	***2.5***	***4.9***	***4.5***	***9.1***	***18.8***	***5.7***	***3.9***	***4.5***		***92***	***233***
SD	***0.3***	***0.1***	***0.2***	***0.2***	***0.1***	***0.3***	***0.7***	***0.2***	***0.2***	***0.3***	***0.4***	***0.4***	***0.3***	***0.7***	***1.5***	***0.3***	***0.3***	***0.4***			
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**68.8**	**67.6**	**63.7**	**66.3**	**63.0**	**59.5**	**65.6**	**60.6**	**58.5**	**63.1**	**63.0**	**58.4**	**60.2**	**58.0**	**69.5**	**61.3**	**68.8**	**58.0**			
SD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Number of observations	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**			
Min																					
Max																					
Amount of SID-AA (g/kg DM)	**5.9**	**3.0**	**2.7**	**5.6**	**2.4**	**5.5**	**13.6**	**6.5**	**3.0**	**8.7**	**3.7**	**6.7**	**6.3**	**12.3**	**30.5**	**8.1**	**6.3**	**6.1**		**137**	
Rounded off digestibility coefficients (%)																			**MEAN1**	**MEAN2**	
SIDC (this table)	**69**	**68**	**64**	**66**	**63**	**59**	**66**	**61**	**58**	**63**	**63**	**58**	**60**	**58**	**69**	**61**	**69**	**58**	**63**	**64**	
SIDC (Evonik table)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			

Product: Maize, high Lys content																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**4.3**	**1.4**		**4.2**	**0.9**	**4.0**	**6.7**	**4.5**	**3.8**	**9.8**	**3.4**	**6.0**	**7.2**	**9.6**	**17.7**	**5.6**		**5.8**		**95**	**106.5**
SD																					
Number of observations	**1**	**1**		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**		**1**			
CVB Feed Table 2016: Mean	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**89.2**	**93.0**	**88.3**	**83.4**	**78.8**	**89.6**	**92.5**	**90.1**	**89.0**	**92.3**	**87.5**	**87.6**	**90.1**	**89.3**	**93.7**	**82.8**	**88.3**	**84.2**			
SD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Number of observations	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**			
Min																					
Max																					
Amount of SID-AA (g/kg DM)	**4.1**	**1.4**	**-**	**3.7**	**0.8**	**3.8**	**6.6**	**4.3**	**3.6**	**9.6**	**3.1**	**5.6**	**7.0**	**9.1**	**17.6**	**4.9**	**-**	**5.2**			
Rounded off digestibility coefficients (%)																			**MEAN1**	**MEAN2**	
SIDC (this table)	**89**	**93**	**88**	**83**	**79**	**90**	**92**	**90**	**89**	**92**	**88**	**88**	**90**	**89**	**94**	**83**	**88**	**84**	**88**		
SIDC (Evonik table)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			

Product: Palm kernel, solvent extracted (CVB code: 3001.401)																				
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		Sum	**CP in DM**
Mean	**2.9**	**1.3**	**-**	**3.9**	**-**	**4.0**	**14.1**	**4.7**	**2.4**	**7.6**	**1.8**	**5.7**	**4.6**	**9.2**	**22.1**	**4.8**	**-**	**5.7**		95	**144**
SD																					
Number of observations	**1**	**1**	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**			**1**
CVB Feed Table 2016: Mean	**3.0**	**1.9**	**1.5**	**3.1**	**0.8**	**3.3**	**12.0**	**4.1**	**1.7**	**6.3**	**2.6**	**4.8**	**4.0**	**8.3**	**17.9**	**4.6**	**3.4**	**4.2**		88	**168**
SD	**0.4**	**0.1**	**0.2**	**0.1**	**0.1**	**0.1**	**1.1**	**0.2**	**0.1**	**0.2**	**0.2**	**0.2**	**0.1**	**0.3**	**0.7**	**0.2**	**0.3**	**0.2**			
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**62.6**	**75.2**	**74.1**	**71.3**	**74.1**	**77.6**	**83.2**	**80.3**	**64.5**	**77.9**	**68.6**	**82.4**	**76.8**	**66.1**	**77.2**	**72.0**	**74.1**	**75.2**			
SD																					
Number of observations	**1**	**1**	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**			
Min																					
Max																					
Amount of SID-AA (g/kg DM)	**3.2**	**2.4**	**1.9**	**3.7**	**1.0**	**4.3**	**16.8**	**5.5**	**1.8**	**8.3**	**3.0**	**6.7**	**5.2**	**9.2**	**23.2**	**5.6**	**4.2**	**5.3**		111	
Rounded off digestibility coefficients (%)																			**MEAN1**	**MEAN2**	
SIDC (this table)	**63**	**75**	**74**	**71**	**74**	**78**	**83**	**80**	**65**	**78**	**69**	**82**	**77**	**66**	**77**	**72**	**74**	**75**	74	76	
SIDC (Evonik table)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			

Product: Rice pollard (hull + meal; 2nd treatment after dehulling)																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**5.3**	**1.9**		**4.4**	**1.2**	**3.8**	**8.0**	**4.4**	**3.6**	**7.2**	**3.3**	**5.4**	**5.9**	**9.8**	**13.3**	**5.5**		**6.0**		**89**	**143**
SD																					
Number of observations	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**			**1**
CVB Feed Table 2016: Mean *	**4.2**	**2.1**	**2.2**	**3.7**	**1.1**	**3.7**	**7.8**	**4.7**	**2.7**	**7.3**	**3.4**	**5.5**	**5.9**	**9.0**	**14.6**	**5.1**	**4.5**	**4.7**		**92**	**143**
SD	**0.6**	**0.3**	**0.2**	**0.3**	**0.2**	**0.3**	**0.6**	**0.4**	**0.3**	**0.5**	**0.5**	**0.4**	**0.4**	**0.5**	**1.7**	**0.5**	**0.3**	**0.4**			
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**68.2**	**66.9**	**66.3**	**59.4**	**70.2**	**63.0**	**78.2**	**62.6**	**69.3**	**62.2**	**63.8**	**62.6**	**68.7**	**65.9**	**72.7**	**64.4**	**66.3**	**62.1**			
SD																					
Number of observations	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**			
Min																					
Max																					
Amount of SID-AA (g/kg DM) **	**4.1**	**2.0**	**2.1**	**3.1**	**1.1**	**3.3**	**8.7**	**4.2**	**2.7**	**6.5**	**3.1**	**4.9**	**5.8**	**8.5**	**15.2**	**4.7**	**4.3**	**4.2**		**88**	
Rounded off digestibility coefficients (%)																			**MEAN1**	**MEAN2**	
SIDC (this table)	**68**	**67**	**66**	**59**	**70**	**63**	**78**	**63**	**69**	**62**	**64**	**63**	**69**	**66**	**73**	**64**	**66**	**62**	**66**	**67**	
SIDC (Evonik table)	**76**	**71**	**65**	**66**	**50**	**66**	**78**	**65**	**80**	**66**	**-**	**68**	-	-	-	-	-	-			

*: Amino acid pattern of Rice bran in CVB Feed Table (2011). **: Calculated with the amino acid pattern of Rice bran as published in the CVB Feed Table (2016).

Product: Soy protein concentrate																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**5.4**	**1.3**		**4.0**		**4.5**	**7.3**	**4.8**	**2.5**	**7.5**		**4.6**								**42**	**600**
SD																					
Number of observations	**1**	**1**	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**			
CVB Feed Table 2016: Mean	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**			
SD	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**			
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**89.1**	**90.5**	**87.9**	**84.9**	**87.9**	**85.5**	**87.9**	**86.5**	**87.2**	**89.5**	**87.9**	**89.9**	**87.9**	**87.9**	**87.9**	**87.9**	**87.9**	**87.9**			
SD																					
Number of observations	**1**	**1**	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**			
Min																					
Max																					
Amount of SID-AA (g/kg DM)	**28.9**	**7.1**		**20.3**		**22.9**	**38.2**	**24.7**	**13.0**	**40.0**		**24.9**								**220**	
Rounded off digestibility coefficients (%)																			**MEAN1**	**MEAN2**	
SIDC (this table)	**89**	**90**	**88**	**85**	**88**	**86**	**88**	**87**	**87**	**89**	**88**	**90**	**88**	**88**	**88**	**88**	**88**	**88**	**88**		
SIDC (Evonik table)	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**			

Product: Soybean expeller (CVB code: 3012.401) *																					
Amino acid pattern (g/16 gN)	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**		**Sum**	**CP in DM**
Mean	**6.2**	**1.2**	**1.6**	**4.1**	**-**	**4.1**	**7.5**	**5.4**	**3.0**	**8.2**	**3.9**	**4.3**	**4.4**	**11.0**	**19.9**	**4.5**	**5.0**	**5.4**		**100**	**449**
SD	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**			
Number of observations	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**			**1**
CVB Feed Table 2016: Mean	***6.2***	***1.4***	***1.5***	***3.9***	***1.3***	***4.6***	***7.4***	***5.1***	***2.7***	***7.7***	***3.7***	***4.8***	***4.4***	***11.6***	***18.1***	***4.3***	***5.1***	***5.2***		***99***	***490***
SD	***0.2***	***0.1***	***0.1***	***0.1***	***0.1***	***0.2***	***0.3***	***0.2***	***0.1***	***0.2***	***0.3***	***0.2***	***0.2***	***0.4***	***0.8***	***0.2***	***0.3***	***0.2***			
Standardized ileal digestibility (%)																					
Mean (rounded to 1 decimal)	**87.2**	**88.0**	**65.1**	**79.5**	**82.6**	**86.0**	**90.0**	**86.7**	**83.2**	**85.6**	**80.1**	**82.6**	**85.2**	**78.5**	**83.1**	**78.4**	**82.2**	**82.5**			
SD	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**			
Number of observations	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**			
Min																					
Max																					
Amount of SID-AA (g/kg DM)	**26.5**	**6.0**	**4.8**	**15.2**	**5.3**	**19.4**	**32.6**	**21.7**	**11.0**	**32.3**	**14.5**	**19.4**	**18.4**	**44.6**	**73.7**	**16.5**	**20.5**	**21.0**		**403**	
Rounded off digestibility coefficients (%)																			**MEAN1**	**MEAN2**	
SIDC (this table)	**87**	**88**	**65**	**80**	**83**	**86**	**90**	**87**	**83**	**86**	**80**	**83**	**85**	**79**	**83**	**78**	**82**	**82**	**83**	**83**	
SIDC (Evonik table)	90	91	82	85	89	89	93	89	92	89	-	88	-	-	-	-	-	-			

*: In practice the SIDC-AA of Soybean meal, solvent extracted will be used also for Soybean expeller.

Appendix 4: Feedstuffs with estimated standardized ileal amino acid digestibility

For feedstuffs that have an energy evaluation for broilers and/or adult cockerels / laying hens in de CVB Feed Table 2016 but for which no data on the standardized ileal amino acid digestibility are incorporated in the database, the digestibility of amino acids has to be estimated. The same is the case for some feed ingredients for which there are doubts about the validity of the experimental data (e.g. maize gluten feed, maize feed meal and maize germ feed meal, extracted for which one observation from Scheele et al. (1992a) is available).
Feedstuffs for which no experimental data were available have been divided into two groups:

1. Feedstuffs for which one or more observations with respect to the fecal amino acid digestibility in adult roosters are listed in Report 177.77 'De verteerbaarheid van eiwit en aminozuren in producten voor pluimveevoeders' {'The digestibility of protein and amino acids in poultry feed ingredients'} (K. Terpstra et al.,1977) of the Institute for Poultry Research 'Het Spelderholt' in Beekbergen, The Netherlands.
2. Feedstuffs for which no observations are given in the report mentioned above.

With respect to the estimation of the ileal amino acid digestibility, the tools available for an accurate estimation are limited. Therefore, the estimation described in this Appendix mainly aims at a transparent representation of the approach that was applied, without laying claims on a high reliability of the digestibility listed.
A comparison of estimated SIDC-AA with values from the table of Evonik (2016) was made if possible.

4.1 Feedstuffs for which the fecal amino acid digestibility has been studied in adult roosters by Terpstra et al. (1977)

Two approaches were often applied to estimate the standardized ileal amino acid digestibility of this group of feedstuffs:

- Starting-point 1: Comparison of the standardized ileal amino acid digestibility for well-studied feedstuffs in broilers (=SIDC-broilers) with the standardized ileal amino acid digestibility in growing pigs, as published in the CVB Feed Table (2016) (=SIDC-pigs).
  The differences in mean standardized ileal digestibility coefficient are calculated for feedstuffs for which a) observations with broilers are present in the newly constructed database, and b) also values are listed in the CVB Table 'Standardized ileal amino acid digestibility in growing pigs' (see, e.g., CVB Feed Table 2016). Subsequently, the feedstuffs were clustered in groups, and the difference was calculated per cluster.

Table A. Difference between the mean standardized ileal amino acid digestibility in broilers and in pigs, per individual amino acid, for certain product groups.

Product group	Number of feedstuffs per group	Mean SIDC-broilers - Mean SIDC-pigs																	
		LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
1a Cereal grains and by-products	12	3.4	2.0	-7.8	-0.4	-3.9	2.1	-5.7	1.3	-5.0	0.4	-5.1	-0.1	3.6	0.6	-1.8	-1.1	-12.7	-3.8
1b Legume seeds	4	1.8	4.9	-0.5	-0.7	-1.9	0.2	-1.5	2.4	-1.8	1.2	1.0	0.6	5.2	0.1	1.3	1.3	-5.6	0.2
1c Oil-containing seeds and by-products	10	1.0	3.3	-2.8	-1.1	2.7	1.9	-1.4	2.3	-0.9	2.1	1.6	2.3	2.2	-0.9	-1.2	0.3	-4.9	-1.5
1d Feedstuffs of animal origin	4																		
1e All feedstuffs	30	2.3	3.3	-3.2	-1.1	0.3	1.1	-3.3	1.9	-2.9	1.1	-1.3	0.7	3.1	0.0	-0.8	-0.4	-7.5	-2.6

- Starting-point 2: Check for which feedstuffs values for the apparent fecal amino acid digestibility in adult roosters (AFDC-roosters) are available from the research by Terpstra et al. (1977), next to the SIDC-broilers values based on published literature. The ratio SIDC-broilers / AFDC-roosters was then calculated and these ratios are given in Table B.

Table B. Ratio between SIDC-broilers and AFDC-roosters, generated over all feedstuffs. The ratios have been calculated for all feedstuffs for which SIDC-observations for broilers are included in the database and for which also AFDC-roosters values are listed in the CVB Feed Table.

	LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
Ratio SIDC-broilers / AFDC-roosters	1.05	1.06	0.98	1.01	1.00	1.02	0.99	1.00	0.99	1.00	1.01	1.01	1.05	1.00	1.01	1.03	1.01	1.00
STDEV	0.089	0.077	0.107	0.068	0.076	0.060	0.042	0.039	0.086	0.049	0.035	0.061	0.035	0.072	0.042	0.085	0.051	0.053

*: Based on the ratio's for barley, peas, maize (except LYS), rapeseed meal, soybeans, heat treated, soybean meal, solvent extracted, wheat, wheat middling's and sunflower seed meal, solvent extracted.

- Starting-point 3: Check whether related feedstuffs may be identified for which the SIDC-broilers is (well) studied; the SIDC-broilers for these related feedstuffs may then be used to estimate the SIDC-broiler for the feedstuff under consideration.

Estimation of standardized ileal AA digestibility (SIDC-AA) for poultry

Table C offers a stepwise overview of the procedure used to estimate the standardized ileal amino acid digestibility for poultry for this group of feedstuffs. The following steps were taken:

- Firstly, the apparent fecal amino acid digestibility for roosters (AFDC-roosters) is given (with referral to the report by Terpstra et al. (1977) Remark: Terpstra et al. 1977) did not analyse TRP; the DC-TRP listed is the mean value of the digestibility of all amino acids. The AFDC-values for TRP in roosters are underlined in the table below.
- Secondly, the standardized ileal amino acid digestibility in growing pigs (SIDC-pigs) is given, as listed in the present CVB Feed Table (2016). For these feedstuffs, it was not checked whether the evaluation in growing pigs was based on observations or estimation.
- Lastly, information is provided concerning related products. These related products, however, were – in most cases – not taken as a direct starting-point for the estimation; they are merely evaluated to check whether the estimated value lies within a (subjectively to be expected) range.

Table C. Estimation of the SIDC-AA of feedstuffs for which no observations with broilers at the ileal level are listed in the database, but for which an AFDC-AA has been reported by Terpstra et al. (1977). The proposed estimation of the SIDC-AA is presented in bold in the line where the cell in the second column is highlighted in grey.

Product	**Remarks**	**Digestibility of the AA (% units)**																	
Barley feed, high grade (CVB code: 1005.112/0/0)		LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
AFDC-roosters (obtained from the CVB Feed Table)	One observation by Terpstra et al. (CFIBRE 129 g/kg DM)	69	73	72	68	79	75	80	78	69	76	73	75	69	67	85	66	81	73
SIDC-pigs (according to the CVB Feed Table)		67.9	68	68	67.6	68	67.8	67.9	67.7	67.7	67.8	67.8	67.9	67.9	67.6	67.6	67.7	67.6	67.6
Proposed SIDC-poultry	**SIDC-pigs shows a logical order for barley – barley feed, high grade – barley mill by-product. These are taken as starting-point; subtract the mean difference between SIDC-broilers and SIDC-pigs for 'cereal grains'**	**71**	**70**	**60**	**67**	**64**	**70**	**62**	**69**	**63**	**68**	**63**	**68**	**71**	**68**	**66**	**67**	**55**	**64**
Barley mill by-product (CVB code: 1005.105/0/0)		LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
AFDC-roosters (obtained from the CVB Feed Table)		68	72	69	66	77	74	79	77	69	74	73	73	67	66	84	65	80	72
SIDC-pigs (according to the CVB Feed Table)		64.8	65	65	64.6	65	64.8	64.9	64.7	64.6	64.8	64.8	64.9	64.8	64.6	64.6	64.7	64.6	64.5

Product	Remarks	Digestibility of the AA (% units)																	
Proposed SIDC-poultry	**Same approach as for barley feed, high grade**	**68**	**67**	**57**	**64**	**61**	**67**	**59**	**66**	**60**	**65**	**60**	**65**	**68**	**65**	**63**	**64**	**52**	**61**

Product	Remarks	Digestibility of the AA (% units)																	
Coconut expeller CFAT < 100 and CFAT>100 (CVB code: 3015.401)		LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
AFDC-roosters (obtained from the CVB Feed Table)	One observation by Terpstra et al., of a batch containing 95 g CFAT/kg DM	47	79	52	60	71	75	86	81	77	79	76	77	70	68	74	60	65	68
	Coconut expeller, CFAT < 100 g/kg and CFAT>100 g/kg	**57.8**	**58**	**58**	**57.7**	**58**	**57.9**	**58**	**57.8**	**57.8**	**57.9**	**57.8**	**57.9**	**57.9**	**57.8**	**57.8**	**57.8**	**57.5**	**57.7**
Coconut extracted (CVB code: 3015.407/0/0)		**LYS**	**MET**	**CYS**	**THR**	**TRY**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**
AFDC-roosters (obtained from the CVB Feed Table)	No observations by Terpstra et al.; DC in CVB Feed Table differs slightly from that of expeller	46	81	50	60	75	75	86	81	69	79	76	77	70	68	74	60	65	68
SIDC-pigs (according to the CVB Feed Table)	Coconut extracted	**57.8**	**58**	**58**	**57.7**	**58**	**57.9**	**58**	**57.8**	**57.8**	**57.9**	**57.8**	**57.9**	**57.9**	**57.8**	**57.8**	**57.8**	**57.5**	**57.7**
	SIDC-pigs is the same for expeller and extracted. The same approach was chosen for broilers.																		
	Observation for coconut, extracted in Database (n=1)	62	74	68	68	74	78	86	76	67	78	70	78	74	68	72	70	62	68
	Option 1: Take the SIDC-pigs taken as starting-point and add the difference (Mean SIDC-broilers – Mean SIDC-pigs) for 'oil seeds and their by-products'(see 1.c)	59	61	55	57	61	60	57	60	57	60	59	60	60	57	57	58	53	56
Coconut expeller (CFAT<100 g/kg and CFAT >100 g/kg) (CVB code: 3015.401); Coconut meal, solvent extracted (CVB code: 3015.407)	Final proposal: Mean of one observation in Database and Option 1	**60**	**68**	**62**	**62**	**67**	**69**	**71**	**68**	**62**	**69**	**65**	**69**	**67**	**62**	**64**	**64**	**57**	**62**

Product	Remarks	Digestibility of the AA (% units)																	
Maize feed flour (CVB code: 1002/103/0/0)		LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
AFDC-roosters (obtained from the CVB Feed Table)	One batch in report by Terpstra et al. (CFI-BRE 4 and CFAT 29 g/kg DM), as pellet and as meal; In the CVB Feed Table, the DC-Lys is much lower than in the report by Terpstra et al. (DC = 72 and 76%, respectively, for pellets	64	87	72	67	100 (?)	79	85	82	82	86	80	74	83	77	86	73	84	78

Product	Remarks	Digestibility of the AA (% units)																	
	and meal); also, many other DC-AA differ between the table and the report by Terpstra et al..																		
SIDC-pigs (according to the CVB Feed Table)		79.6	92.9	83.1	80.5	80.0	88.9	85.0	85.9	87.5	93.4	90.9	87.5	90.8	82.6	92.0	80.9	74.6	89.6
Related products																			
Maize	*AFDC-roosters (obtained from the CVB Feed Table)*	*61*	*88*	*75*	*75*	*80*	*84*	*88*	*88*	*83*	*90*	*83*	*80*	*86*	*79*	*87*	*77*	*84*	*83*
	SIDC-pigs (according to the CVB Feed Table)	*75.4*	*87.4*	*81.1*	*79.3*	*75.5*	*85.8*	*87.6*	*87.4*	*86*	*88.7*	*86.1*	*85.6*	*86.8*	*81.6*	*89.3*	*78.6*	*84.5*	*88.1*
	SIDC-broilers (for most AA 9 or 10 observations)	*89*	*95*	*87*	*84*	*88*	*92*	*93*	*93*	*90*	*95*	*88*	*90*	*94*	*89*	*95*	*85*	*94*	*89*
Proposed SIDC-poultry for Maize feed flour (CVB code: 1002/103/0/0)	**SIDC-pigs is reasonably similar for maize feed flour and maize; therefore, add the difference (Mean SIDC-broiler – Mean SIDC-pig) to the SIDC-pig for maize feed flour**	**93**	**101 adjust to 95**	**89**	**85**	**93**	**95**	**91**	**92**	**92**	**99**	**93**	**92**	**98**	**90**	**98**	**88**	**84**	**91**

Product	Remarks	Digestibility of the AA (% units)																	
Peanuts, decorticated (CVB code: 2013.000/1/0)		LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
AFDC-roosters (obtained from the CVB Feed Table)	One batch investigated by Terpstra et al., as pellet and as meal (differences in AFDC wre small)	80	81	76	78	86	84	90	90	86	86	89	83	81	89	90	79	81	84
SIDC-pigs (according to the CVB Feed Table)	No table values																		
Peanut expeller, partly decorticated or decorticated (CVB code: 2013/401)		LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
AFDC-roosters (obtained from the CVB Feed Table)	One observation in report by Terpstra et al. (batch that was partly decorticated)	79	87	79	80	87	86	88	89	87	87	89	88	83	89	91	76	84	85
SIDC pig (according to the CVB Feed Table)		*80.6*	*85.0*	*78.0*	*83.0*	*85.9*	*87.9*	*93.8*	*91.8*	*82.7*	*87.1*	*90.9*	*87.4*	*83.9*	*86.9*	*88.9*	*75.9*	*91.8*	*85.9*
SIDC-broilers	*The variety without shell (n=1)*	*84.2*	*89.9*	*80.3*	*73.2*	*83.6*	*76.8*	*79.9*	*84.8*	*84.7*	*78.2*	*91.9*	*86.9*	*93.1*	*82.9*	*80.5*	*87.0*	*88.6*	*83.7*
Peanut meal, solvent extracted, decorticated and		*LYS*	*MET*	*CYS*	*THR*	*TRP*	*ILE*	*ARG*	*PHE*	*HIS*	*LEU*	*TYR*	*VAL*	*ALA*	*ASP*	*GLU*	*GLY*	*PRO*	*SER*

Product	Remarks	Digestibility of the AA (% units)																	
partly decorticated (CVB code: 2013/407)																			
AFDC-roosters (obtained from the CVB Feed Table)	*Four observations in report by Terpstra et al. (three partly decorticated; one decorticated)*	*79*	*87*	*79*	*80*	*87*	*86*	*88*	*89*	*87*	*87*	*89*	*88*	*83*	*89*	*91*	*76*	*84*	*85*
SIDC pig (according to the CVB Feed Table)		*80.6*	*85.0*	*78.0*	*83.0*	*85.9*	*87.9*	*93.8*	*91.8*	*82.7*	*87.1*	*90.9*	*87.4*	*83.9*	*86.9*	*88.9*	*75.9*	*91.8*	*85.9*
Peanut expeller, non-decorticated		*LYS*	*MET*	*CYS*	*THR*	*TRY*	*ILE*	*ARG*	*PHE*	*HIS*	*LEU*	*TYR*	*VAL*	*ALA*	*ASP*	*GLU*	*GLY*	*PRO*	*SER*
AFDC-roosters (obtained from the CVB Feed Table)		78	84	74	79	85	85	89	90	85	86	89	85	82	89	90	78	82	84
SIDC-pigs (according to the CVB Feed Table)	No table values																		
	Conclusion: The same SIDC-pigs is used for expeller and extracted. Also, the same AFDC-poultry is used for expeller and extracted. **Proposal: Apply the same SIDC-broilers for coconut expeller and extracted**																		
Proposed SIDC-poultry for peanuts, decorticated (CVB code: 2013.000/1/0; peanut expeller CVB code: 2013.401) and peanut extracted (CVB code: 2013.407); decorticated, partly decorticated and non-corticated	Option 1: based on general ratio SIDC-broilers / AFDC-roosters	82.9	90.5	73.5	80	87.3	86	87.1	89.9	83.5	86.1	89.9	89.8	83.8	89.9	91.9	76.8	84.8	85.8
	Option 2: based on SIDC-pigs, with a corection based on oil-containing seeds	79	87	72	80	86	88	93	92	79	87	91	87	85	84	86	74	90	82
	Final proposal: Mean of options 1 and 2	**81**	**89**	**72**	**80**	**87**	**87**	**90**	**91**	**81**	**87**	**91**	**88**	**84**	**87**	**89**	**75**	**87**	**84**

Product	Remarks	Digestibility of the AA (% units)																	
Potato protein, CASH<10 and CASH>10 (CVB code: 4001.203)		LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
AFDC-roosters (obtained from the CVB Feed Table)	1 batch has been investigated by Terpstra et al. (CASH=16 g/kg DM) as pellet and meal; there were marginal differences between the two observations	88	92	73	90	90	91	94	92	92	92	93	91	89	88	91	85	90	90
SIDC-pigs (according to the CVB Feed Table)		**89**	**91**	**75**	**88**	**85**	**90**	**93**	**91**	**90**	**92**	**92**	**90**	**88**	**86**	**90**	**83**	**89**	**88**

Product	Remarks	Digestibility of the AA (% units)																	
Related products	*None*	**92**	**97**	**72**	**91**	**90**	**93**	**93**	**92**	**92**	**92**	**94**	**92**	**93**	**88**	**92**	**88**	**91**	**90**
Proposed SIDC-poultry	Option 1: AFDC-roosters is reasonably similar to – but often higher than - SIDC-pigs. Therefore, we propose a rather conservative estimation for potato protein: SIDC-broilers = Mean of AFDC-roosters and SIDC-pigs	**90**	**94**	**73**	**89**	**88**	**92**	**93**	**92**	**91**	**92**	**93**	**91**	**91**	**87**	**91**	**86**	**90**	**89**
	Option 2: AFDC-roosters as starting-point, multiply by general ratio SIDC-broilers / AFDC-roosters	**89**	**91**	**75**	**88**	**85**	**90**	**93**	**91**	**90**	**92**	**92**	**90**	**88**	**86**	**90**	**83**	**89**	**88**
	Option 3: Mean of options 1 and 2	**89**	**91**	**75**	**88**	**85**	**90**	**93**	**91**	**90**	**92**	**92**	**90**	**88**	**86**	**90**	**83**	**89**	**88**
	Final proposal: Option 1	**92**	**97**	**72**	**91**	**90**	**93**	**93**	**92**	**92**	**92**	**94**	**92**	**93**	**88**	**92**	**88**	**91**	**90**

Product	Remarks	Digestibility of the AA (% units)																	
Rice, without hulls, polished (CVB code: 1003.000)		LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
	One observation for SIDC AA of Rice, broken in Database	98.7	83.6	86.2	93.6		92.8	95.4	89.9	91.1	90.5		91.6	90.0	92.8	88.4	92.1		91.8
AFDC-roosters (obtained from the CVB Feed Table)	Two batches investigated by Terpstra et al.; Table values differ from the average value of these two observations (see below)	67	86	79	71	86	81	94	89	89	90	87	81	74	84	90	75	75	83
	Values of the observations of Terpstra et al.	80 74	81 79	76 73	73 73	- -	81 80	89 88	85 85	85 80	85 82	84 86	84 79	81 77	82 80	84 83	75 76	75 72	80 77
	Mean of the 2 observations of Terpstra et al.	77	80	75	73		81	89	85	83	84	85	82	79	81	84	76	74	79
SIDC-pigs (according to the CVB Feed Table)		93.7	95	90	93.4	93	95.7	95.9	91.5	94.6	95.7	96.7	94.8	94.8	93.5	96.2	94.6	93	96.3
Proposed SIDC-poultry	Option 1: Take values of the one observation for broilers, with an estimation of SIDC's for TRP, TYR and PRO (for these AA take SIDC pigs and correct for general difference in digestibility in grains between pigs and broilers according to 1.a.)	99	84	86	94	89	93	95	90	91	90	92	92	90	93	88	92	80	92
	Option 2: Take the mean of the AFDC's reported by Terpstra et al and multiply with the general ratio SIDC broiler/AFDC adult cockerels	81	85	74	74		83	88	85	83	84	86	83	83	81	85	79	75	79
	Option 3: SIDC-pig as starting-point; apply a correction with the difference (Mean SIDC-broiler – Mean SIDC-pig for 'cereal grains and by-products')	97	97	82	93	89	98	90	93	90	96	92	95	98	94	94	93	80	92

Product	Remarks	Digestibility of the AA (% units)																	
	Final proposal: Mean of options 1 and 3	**98 -> 91***	**90**	**84**	**93**	**89**	**95**	**93**	**91**	**90**	**93**	**92**	**93**	**94**	**93**	**91**	**93**	**80**	**92**

*:A SIDC-LYS of 98% is very unlikely as the SIDC of this amino acid in grains (with the exception of Rye) mostly is close the mean SIDC-AA. Therefore we have adjusted the SIDC-LYS to 91 (being the mean SIDC-AA for this ingredient).

Product	Remarks	Digestibility of the AA (% units)																	
Sesame seed expeller (CVB code: 3005.401)		LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
AFDC-roosters (obtained from the CVB Feed Table)	Terpstra et al. investigated one batch	68	93	83	82	88	88	94	92	91	90	92	90	84	87	92	81	82	86
SIDC-pigs (according to the CVB Feed Table)		81.9	84	84	78.8	84	86.8	84	90.1	83.9	87.1	83.9	88	84	83.9	83.9	83.9	83.8	83.9
	One observation for SIDC of Sesame seed meal, solvent extracted	78.0	88.2	56.1	76.5	83.6	87.0	87.4	88.9	69.4	86.8	89.7	83.9	82.2	76.8	83.5	59.6	86.0	75.3
Option 3:Proposed SIDC-poultry	Option 1: AFDC-rooster as starting-point, multiply by general ratio SIDC-broiler / AFDC-rooster	71	98	81	83	88	90	93	92	91	90	93	91	88	87	93	84	83	86
	Option 2: SIDC-pig as starting-point, apply a correction with the difference between mean SIDC-broiler and SIDC-pig for 'oil-containing seeds'	83	87	81	78	87	89	83	92	83	89	85	90	86	83	83	84	79	82
	Option 3: Take the values of the one observation on SIDC in broilers	78	88	56	77	84	87	87	89	69	87	90	84	82	77	84	60	86	75
	Final proposal: Mean of options 2 and 3	**80**	**88**	**69**	**77**	**85**	**88**	**85**	**91**	**76**	**88**	**88**	**87**	**84**	**80**	**83**	**72**	**82**	**79**

Maize by-products: Maize gluten feed (CVB code: 1002.205), Maize feed meal (CVB code: 1002.105), Maize germ meal, solvent extracted (CVB code: 1002.420)

For the maize by-products, mentioned above, only one observation per product is available in the Database on SIDC AA of broilers. These observations were all coming from the publication of Scheele et al. (1992a). For other feed ingredients examined by Scheele et al. (1992a) often a number of observations from other investigators were available. When doing the outlier test it appeared that the observations of Scheele et al. (1992a) were often outliers, with much lower digestibility. For the three maize by-products mentioned, Scheele et al. (1992a) also reported a remarkable low digestibility, with large differences in digestibility within one ingredient. Therefore, the following comparisons were done:

- Comparison of SIDC values reported by Scheele et al. (1992a) with the AFDC values in the CVB Feed Table (based on research in adult cockerels).
- Comparison of these values with the AFDC values reported by Terpstra et al. (1977)

- Comparison of the SIDC values of these products with those of maize, also considering the difference in digestibility to the SIDC pigs, AFDC adult cockerels and the SIDC in broilers.

Maize feed meal (MFM) (CVB code: 1002.105)

In the table below a number of data on the digestibility of amino acids in maize feed meal is given.
This table shows a number of remarkable things.

- The AFDC values in the CVB Feed Table cannot easily be traced back to the values reported for maize fed meal by Terpstra et al (1977). In this context it is mentioned that Terpstra et al. (1977) tested the three batches with adult and young cockerels. However, the values reported for young cockerels were much lower than those observed for adult cockerels, which implies that incorporating the values for young cockerels in the calculation of the mean AFDC values will not contribute to the explanation of the differences between the table values and the values found experimentally.
- It is remarkable that the AFDC values for LYS in maize feed meal are much lower than the AFDC values of other amino acids. Terpstra et al. (1977) found the same for all maize batches they studied.
- For most amino acids the SIDC values for maize feed meal in pigs are lower than those for maize (LYS and MET are exceptions). Calculations of the mean SIDC AA (omitting CYS, TRP and PRO) for maize and maize feed meal in pigs showed that the mean SIDC for maize is 7.5% higher than for maize feed meal. Also the AFDC values for maize are higher than those for maize feed meal: the mean value for all amino acids (without TRP, TYR and PRO) in maize is 2.4% higher than that or maize feed meal. Only for LYS and VAL the AFDC values in maize feed meal are higher than those in maize.

Amino acid	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**	**Mean DC-AA**	**STDEV**
												In % units								
AFDC (in adult cockerels)																				
CVB Feed Table (since 1987) [1)]	65	84	73	70	78	79	85	85	81	87	81	81	85	76	86	71	84	80	79.7	6.55
Research of Terpstra et al (1977)																				
Mean of all (= 3) observations	58	80	65	66		78	86	81	77	87	78	80	82	74	86	68	81	76	77.3	7.88
STDEV	17.5	7.09	8.74	3.21		6.43	3.61	3.51	4.73	3.61	4.04	3.51	3.51	4.16	2.52	4.16	2.65	4.16		
Mean of two observations [2)]	68	83	67	68		81	88	83	80	89	80	82	84	76	87	70	83	77	79.6	6.79
STDEV	7.1	6.4	12.0	3.5		7.1	1.4	2.1	1.4	3.5	5.0	2.1	2.8	1.4	1.4	4.2	0.7	5.7		
Mean of Maize feed meal and Maize bran (n=5) [3)]	63	81	69	68		79	86	80	79	87	79	79	82	75	86	69	82	77	77.9	6.88
STDEV	15.0	6.0	8.0	5.0		5.2	2.9	4.2	4.1	2.6	2.9	2.8	2.6	3.7	2.1	4.4	2.5	3.5		
Mean of two samples maize feed meal and two samples maize bran (n=4) [4)]	69	83	71	69		80	87	81	81	88	80	80	83	77	87	70	83	77		
STDEV	8.1	5.3	8.3	5.2		5.2	2.2	4.5	1.9	2.4	2.9	2.4	2.4	1.9	1.5	4.4	1.4	3.9		

Amino acid	LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER	Mean DC-AA	STDEV
	In % units																			
SIDC broilers																				
Maize feed meal in Database (n=1) [6)]	66.1	66.1	72.9	57.3	60.1	51	72.2	84.3	73.8	63.4	76.2	68.6	71.6	74.1	60.9	74.1	62.4	66.1	68.4	8.26
Differences in AA digestibility																			**Mean difference**	**STDEV**
Pigs: SIDC maize – SIDC MFM	-2	-5	0	3	2	10	11	11	10	12	10	9	10	6	13	3	9	12	7.5	5.42
Cockerels: AFDC Maize – AFDC MFM [6)]	-4	4	2	5	2	5	3	3	2	3	2	-1	1	3	1	6	0	3	2.4	2.5
Broilers.: SIDC Maize – SIDC MFM [7)]	24	28	13	26		42	20	8	16	31	12	22	22	15	34	12	28	25	22.3	9.13

[1)]: These values refer to maize feed meal with a CP content of 9.8% CP (according to the CVB Feed Table 1989). In this edition of the CVB Feed Table second quality of maize feed meal is mentioned (maize feed meal, USA) with 14.2% CP and deviating digestibility values for certain amino acids (e.g., AFDC-LYS: 70.6%; AFDC-MET: 81.5%; AFDC-THR: 72.4%; AFDC-ILE: 82.0%; AFDC-ARG: 85.3%). All values have been recalculated from the table values for the AFD content and the gross content of the amino acids (both expressed in g/kg product). The table values in the CVB Feed Table 1989 have the Category specification 'A', which means that the values are based on research executed by the former COVP 'Het Spelderholt' in Beekbergen (NL).

[2)]: Of the three observations of Terpstra et al. (1977) one batch had an overall lower digestibility and for some amino acids and a remarkable low value for some amino acids. Therefore the mean was calculated also without this observation.

[3)]: To the examined batches maisvoermeel (maize feed meal) the English term 'Hominy feed' is added. Terpstra et al. (1977) also examined two batches maiszemelgrint (maize bran); also in these cases the term 'Hominy feed' is added. In this row the mean AFDC (and STDEV) of the amino acid is given for the five batches maize feed meal plus maize bran is mentioned.

[4)]: Mean of four observations maize feed meal and maize bran of Terpstra et al. (1977) after skipping the observation of maize feed meal with remarkable low digestibility.

[5)]: For Maize the database contains a substantial number of observations; for maize feed meal only one, published by Scheele et al (1992a)

[6)]: For maize feed meal the AFDC values as published in the CVB Feed Table are used.

[7)]: For Maize the database contains a substantial number of observations; for maize feed meal only one, published by Scheele et al (1992a)

Maize gluten feed (CVB code: 1002.205)

For maize gluten feed a similar table was made as for maize feed meal.

Regarding the amino acid digestibility as mentioned in the table below, the following is remarkable:

- The AFDC values in the CVB Feed Table on the one hand are not identical to the mean value of the two observations of Terpstra et al. (1977) but, on the other hand, closely resembles these values. The largest difference found is for ARG (namely 3 % units).
- It is remarkable that the AFDC value for LYS is so much lower than the value for most other amino acids (with the exception of CYS and THR, which may be explained by the large proportion of these amino acids in endogenous protein).Also the SIDC LYS in pigs is much lower than the SIDC for most other amino acids. For this product (too intensive) drying might be an explanation.

- For all amino acids the SIDC of maize gluten feed in pigs is lower than for maize. The mean SIDC AA (omitting CYS, TRP and PRO) of maize is 7.3% higher than the mean SIDC AA of maize gluten feed. The AFDC values for maize and maize gluten feed do not differ very much. An exception is LYS, which is 13% higher in maize gluten feed compared to maize.
- As was also the case for the observation of Scheele et al. (1992a) with maize feed meal, the SIDC AA for maize gluten feed were much lower than those for maize.

Feed ingredient: Maize feed meal (MGF)																			
											In % units								
Amino acid	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**	**Mean DC-AA**	**STDEV**
AFDC (in adult cockerels)																				
CVB Feed Table (since 1987) [1)]	74	83	69	75	85	81	85	85	83	90	85	83	86	76	87	72	84	82	81.80	5.24
Research of Terpstra et al (1977)																				
Mean of all (= 2) observations	73	82	70	76		83	88	86	83	90	83	85	86	76	87	71	84	80	81.53	5.53
STDEV	7.07	2.12	4.24	6.36		3.54	3.54	0.71	1.41	0.71	0.71	3.54	3.54	4.95	3.54	4.24	2.12	3.54		
SIDC broilers																				
Maize gluten feed in database (n=1) [2)]	63	79	62	64	90	77	78	79	68	83	79	74	79	58	77	60	78	70		
Differences in AA digestibility																			**Mean dfference**	**STDEV**
Pigs: SIDC maize – SIDC MGF	10	6	22	7	10	6	3	3	10	4	2	9	3	10	7	17	7	12	7.3	4.13
Cockerels: AFDC Maize – AFDC MGF	-13	5	6	0		3	3	3	0	0	-2	-3	0	3	0	5	0	1	0.3	4.37
Broilers.: SIDC Maize – SIDC MGF	27	15	24	19		15	15	14	22	11	9	16	14	31	18	26	13	21	18.2	6.22

[1)]: The CVB Feed Table, edition 1989 does not present AFD coefficients; instead he apparent fecal digestible and the gross content of amino acids is mentioned. Using these data the AFDC values given in this table have been recalculated. The origin between the coefficients in the CV Feed table and the mean of the observations of Terpstra et al. (1977) is not obvious. In the CVB Feed table two qualities for maize gluten feed are included, with identical AFDC values.

[2)]: This observation is from Scheele et al. (1992a).

Maize germ feed meal, solvent extracted (CVB code: 1002.420)

In the table below the following data is presented: The AFDC AA coefficients as published in the CVB Feed Table (since 1979), as found by Terpstra et al. (1977) and, subsequently the differences in amino acids between pigs, adult cockerels and broilers between maize and maize germ feed meal, solvent extracted. From this table the following can be seen:

- The AFDC AA values for maize germ feed meal, solvent extracted strongly deviate from the mean of the two observations of Terpstra et al. (1977).
- The difference in AFDC AA values of the two observations of Terpstra et al. (1977) was relatively small (as can be concluded from the STDEV). It is not clear why in the CVB Feed table identical AFDC values are maintained or all AA.

- When using the mean AFDC values of the two observations of Terpstra et al. (1977) the amino acid digestibility of maize germ feed meal, solvent extracted, does not deviate very much from that in maize.
  The difference in SIDC AA between maize and maize germ feed meal, solvent extracted, in pigs is much larger and of the same order of magnitude as the SIDC AA of both feed ingredients in broilers.

Feed ingredient: Maize germ feed meal, solvent extracted (MGM)																				
Amino acid	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**	**Mean DC-AA**	**STDEV**
AFDC in adult cockerels																				
CVB Feed Table (since 1987) [1)]	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58.0	0.00
Research of Terpstra et al (1977)																				
Mean of all (= 2) observations [2)]	62	85	64	67		78	85	83	78	86	81	78	82	75	84	67	80	77	77.7	7.34
STDEV	2.83	4.24	2.83	0.71		1.41	0.00	0.71	.00	1.41	2.12	2.12	0.71	2.83	0.00	0.00	4.95	1.41		
SIDC broilers																				
Maize germ feed meal, solvent extracted in database (n=1) [3)]	75	84	63	70	63	82	88	83	74	85	78	81	83	73	84	72	79	77		
Differences in AA digestibility																			**Mean difference**	**STDEV**
Pigs: SIDC Maize – SIDC MGM	13	5	17	15	18	13	6	7	17	12	1	15	19	14	21	11	17	20	12.6	5.79
Cockerels: AFDC Maize – AFDC MGM:																				
With MGM values for AFDC from CVB table	3	30	17	17	22	26	30	30	25	32	25	22	28	21	29	19	26	25	24.1	7.31
With mean MGM values from Terpstra et al.	-1	3	11	8.5		6	3	5.5	5	4	2.5	2.5	4.5	4	3	10	4.5	6	4.4	2.64
Broilers: SIDC Maize – SIDC MGM	15.2	10.6	22.9	12.8	22.6	10.5	4.9	10.1	15.6	9	10.1	9.4	9.9	15.9	11.5	13.6	12.1	13.6	11.51	2.96

[1)]: In the CVB Feed Table identical AFDC coefficients are given for all amino acids.

[2)]: This is the mean of one batch that has been examined in adult cockerels both as meal feed and after pelleting.

[3)]: This observation has been published by Scheele et al. (1992a).

Table values for maize feed meal, maize gluten feed and maize germ feed meal, solvent extracted.

Although these products are not the most relevant to poultry, a realistic estimation of the SIDC AA is desired. From a general overall comparison of the SIDC values in broilers with the AFDC values in adult cockerels it appeared that for ingredients that for feed ingredients that are (rather) good digestible the differences between both systems are relatively small.

Although other decisions are possible, it is proposed (with the exception of LYS) to adopt the AFDC values as the SIDC values for the three ingredients mentioned, but then directly based on the means of the observations of Terpstra et al. (1977). To formulate a table value for SIDC LYS a comparison as made of the LYS digestibility to the mean AA digestibility (not including LYS, TRP, TRP and PRO). The amino acids CYS, TRP and PRO were excluded because the number of observations in the databases generally is much less than for other amino acids. LYS was excluded as this is the amino acid to be compared to the mean amino acid digestibility.

Below the LYS digestibility is compared with the mean amino acid digestibility for pigs (according to the CVB Table on standardized ileal level) and poultry (cockerels according to Terpstra et al. (1977) at fecal level).

Feed ingredient	Pigs		Adult cockerels	
	SIDC LYS (%)	Mean SIDC AA (%)	AFDC LYS (%)	Mean AFDC AA (%)
Maize	75	84.9	61	83.6
Maize feed meal	77	77.4	69	79.2
Maize gluten feed	65	77.7	73	82.1
Maize germ feed meal, solvent extracted	62	72.3	62	78.8

With the exception of maize feed meal, the SIDC LYS values in pigs are approximately 10% units lower than the mean SIDC AA values. In adult cockerels the AFDC LYS of maize feed meal and maize gluten feed are about 10% units lower than the mean AFDC AA values, whereas for maize germ meal and maize the difference is larger (17 and 23% units, respectively). Based on this data the pragmatic choice is made to use a SIDC LYS for maize feed meal, maize gluten feed and maize germ feed meal (solvent extracted) in poultry that is 10% units lower than the mean SIDC AA.
In the table below the SIDC AA table values to be used for these three maize by-products are given in bold. For TRP (hatched cell) the mean SIDC AA is used.

	SIDC AA (% units) to be used																		
Ingredient	**LYS**	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**	**Mean [1)]**	**STDEV**
Maize feed meal (CVB code: 1002.105)																				
Mean of 2 Maize feed meal and 2 Maize bran of Terpstra et al. [2)]	69	**83**	**71**	**69**	**79**	**80**	**87**	**81**	**81**	**88**	**80**	**80**	**83**	**77**	**87**	**70**	**83**	**77**	79.2	6.16
Adapted value for SIDC LYS	**69**																			
Mais gluten feed (CVB code: 1002.205)																				
Mean of 2 observations of Terpstra et al.	73	**82**	**70**	**76**	**82**	**83**	**88**	**86**	**83**	**90**	**83**	**85**	**86**	**76**	**87**	**71**	**84**	**80**	82.1	5.53
Adapted value for SIDC LYS	**72**																			
Maize germ feed meal, solvent extracted (CVB Code: 1002.420)																				
Mean of 2 observations of Terpstra et al.	62	**85**	**64**	**67**	**79**	**78**	**85**	**83**	**78**	**86**	**81**	**78**	**82**	**75**	**84**	**67**	**80**	**77**	78.8	7.34
Adapted value for SIDC LYS	**79**																			

[1)]: Mean and STDEV are calculated using the values of all amino acids with the exception of the AFDC's for LYS, CYS, TRP en PRO.

[2)]: The observation of maize feed meal Terpstra et al. (1977) with much lower AFDC values is not included.

4.2 Feedstuffs for which the fecal amino acid digestibility has ***not*** been studied in adult roosters by Terpstra et al. (1977).

In the column 'Remark', the cells 'Starting-point' refer to the starting-points applied in that row for the estimated values for standardized ileal digestibility (SIDC) for poultry.

- Starting-points 1.a to 1.e refer to the differences in 'Mean SIDC-broilers – Mean SIDC-pigs', as mentioned in Table A of part I of this Appendix for various product categories. These differences have been used to estimate values for the standardized ileal digestibility (SIDC) for poultry, departing from the given 'Apparent fecal digestibility for adult roosters (AFDC-roosters, %) in the current CVB Feed Table for the product under consideration.
- Starting-point 2 refers to ratios (SIDC-broilers / AFDC-roosters) as given in Table B of part I of this Appendix. These ratios have been used to estimate values for the standardized ileal digestibility (SIDC) for poultry, departing from the 'SIDC-pigs' as given in the current CVB Feed Table for the product under consideration.

Based on the results obtained from these starting-points, a final proposal is given for the SIDC-poultry for the feedstuff under consideration (the row in question is given in grey). In a number of cases, a footnote at the end of the Table provides an explanation for the choice made. The proposed SIDC's for poultry have been rounded-off to whole numbers.

The starting-point 'Check whether related feedstuffs can be identified for which the standardized ileal amino acid digestibility is well-studied and for which the SIDC's may be applied as reference values' has not been used for these feedstuffs, because this starting-point resulted in limited contribution to the final result when estimating the SIDC's for poultry in the previous section of this Appendix.

Approach 1	**Number of ingredients**	**(Mean SIDC Broiler) – (Mean SIDC Pigs)**																	
		LYS	**MET**	**CYS**	**THR**	**TRP**	**ILE**	**ARG**	**PHE**	**HIS**	**LEU**	**TYR**	**VAL**	**ALA**	**ASP**	**GLU**	**GLY**	**PRO**	**SER**
1.a Cereals and cereal by-products	**6**	**3.4**	**2.0**	**-7.8**	**-0.4**	**-3.9**	**2.1**	**-5.7**	**1.3**	**-5.0**	**0.4**	**-5.1**	**-0.1**	**3.6**	**0.6**	**-1.8**	**-1.1**	**-12.7**	**-3.8**
1.b Legume seeds	**4**	**1.8**	**4.9**	**-0.5**	**-0.7**	**-1.9**	**0.2**	**-1.5**	**2.4**	**-1.8**	**1.2**	**1.0**	**0.6**	**5.2**	**0.1**	**1.3**	**1.3**	**-5.6**	**0.2**
1.c Oil seeds and oil sead by-products	**8**	**1.0**	**3.3**	**-2.8**	**-1.1**	**2.7**	**1.9**	**-1.4**	**2.3**	**-0.9**	**2.1**	**1.6**	**2.3**	**2.2**	**-0.9**	**-1.2**	**0.3**	**-4.9**	**-1.5**
1.d Feed ingredients from animal origin	**4**	**2.4**	**6.2**	**-8.6**	**-5.4**	**1.8**	**-2.9**	**-1.4**	**1.1**	**-0.9**	**-0.1**	**-0.3**	**-1.0**	**1.4**	**-2.6**	**-4.1**	**-1.6**	**-9.4**	**-4.1**
1.e All feed ingredients	**15**	**2.3**	**3.3**	**-3.2**	**-1.1**	**0.3**	**1.1**	**-3.3**	**1.9**	**-2.9**	**1.1**	**-1.3**	**0.7**	**3.1**	**0.0**	**-0.8**	**-0.4**	**-7.5**	**-2.6**
Approach 2		LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
Ratio (SIDC broiler/AFDC adult cockerel) *		**1.05**	**1.06**	**0.98**	**1.01**	**1.00**	**1.02**	**0.99**	**1.00**	**0.99**	**1.00**	**1.01**	**1.01**	**1.05**	**1.00**	**1.01**	**1.03**	**1.01**	**1.00**
STDEV		**0.089**	**0.077**	**0.107**	**0.068**	**0.076**	**0.060**	**0.042**	**0.039**	**0.086**	**0.049**	**0.035**	**0.061**	**0.035**	**0.072**	**0.042**	**0.085**	**0.051**	**0.053**

*: Based on the ratio's for barley, peas, maize (except LYS), rapeseed meal, soybeans, heat treated, soybean meal, solvent extracted, wheat, wheat middling's and sunflower seed meal, solvent extracted.

Table D. Estimation of the SIDC-AA of feedstuffs for which no observations with broilers at the ileal level are listed in the database, and for which no AFDC-AA has been reported by Terpstra et al. (1977). The proposed estimation of the SIDC-AA is presented in bold in the line where the cell in the second column is highlighted in grey.

Explanation 'Proposal Table' (see second column): a= based on SIDC Pigs; b= based on AFDC adult cockerels; c = based on both approaches.

Feed Ingredient		LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
Sweet potatoes, dehydrated [a] (CVB code: 4007.611/0/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		54.5	55	55	53.6	55	54.3	54.5	53.9	53.6	54.2	54.2	54.4	54.5	54.2	53.3	53.8	52.8	53.1
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table (category C in CVB Feed Table 1986)																	
		30	40	-25	31	33	38	30	43	25	39	30	38	30	51	33	25	20	27
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%) (notwithstanding to the reference point, the values for tapioca were used)																	
	Approach 1.e	57	58	52	53	55	55	51	56	51	55	53	55	58	54	53	53	45	51
	Approach 2	31.4	42.3	-24.5	31.3	33.1	38.9	29.6	43.0	24.9	39.0	30.2	38.5	31.5	51.1	33.4	25.8	20.2	26.9
	Proposal Table: a	57	58	51	53	52	55	51	56	51	55	53	55	58	54	53	53	54	51
Tapioca, STARCH 575-625 g/kg [a] (CVB code: 4008.611/1/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		54	55	55	52.7	55	53.8	54.2	52.7	53.4	53.6	53.2	54.1	54.3	53	52.2	52.9	51.1	51.8
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table (category C in CVB Feed Table 1986)																	
		20	25	-67		33	22	36	25	25	33	14	23	36	33	39	20	10	23
	Approach 1.e	56.3	58.3	51.8	51.6	55.3	54.9	50.9	54.6	50.5	54.7	51.9	54.8	57.4	53.0	51.4	52.5	43.6	49.2
	Approach 2	21.0	26.4	-65.7	0.0	33.1	22.5	35.5	25.0	24.9	33.0	14.1	23.3	37.8	33.1	39.5	20.7	10.1	22.9
	Proposal Table: a	56	58	50	52	51	55	51	55	50	55	52	55	57	53	51	52	53	49
Tapioca, STARCH 625-675 g/kg [a] (CVB code: 4008.611/2/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		54	55	55	52.7	55	53.8	54.2	52.7	53.4	53.6	53.2	54.1	54.3	53	52.2	52.9	51.1	51.8
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table (category C in CVB Feed Table 1986)																	
		3		-100			25	33	14		25		18	33	28	34	11		25
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.e	56.3	58.3	51.8	51.6	55.3	54.9	50.9	54.6	50.5	54.7	51.9	54.8	57.4	53.0	51.4	52.5	43.6	49.2
	Approach 2	3.1	0.0	-98.1	0.0	0.0	25.6	32.6	14.0	0.0	25.0	0.0	18.2	34.7	28.1	34.4	11.4	0.0	24.9
	Proposal Table: a	56	58	50	52	51	55	51	55	50	55	52	55	57	53	51	52	53	49
Tapioca, STARCH 675-725 g/kg [a] (CVB code: 4008.611/3/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		54	55	55	52.7	55	53.8	54.2	52.7	53.4	53.6	53.2	54.1	54.3	53	52.2	52.9	51.1	51.8
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table (category C in CVB Feed Table 1986)																	
				-150	-14		14	27			9			20	25	29	13	-14	10
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.e	56.3	58.3	51.8	51.6	55.3	54.9	50.9	54.6	50.5	54.7	51.9	54.8	57.4	53.0	51.4	52.5	43.6	49.2

Feed Ingredient		LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
	Approach 2	0.0	0.0	-147.1	-14.1	0.0	14.3	26.7	0.0	0.0	9.0	0.0	0.0	21.0	25.1	29.3	13.4	-14.2	10.0
	Proposal Table: a	56	58	50	52	51	55	51	55	50	55	52	55	57	53	51	52	53	49
Brewers' yeast, dehydrated (CVB code: 9001.315)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		88.4	81.8	69.4	83	85.4	84.1	91.6	86.1	84.4	85.4	88.6	84.6	85.6	86.1	89.1	85.4	90.2	84.8
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table (category C in CVB Feed Table 1986)																	
		86	79	61	80	83	82	89	84	82	83	86	82	83	84	87	83	87	82
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.e	90.7	85.1	66.2	81.9	85.7	85.2	88.3	88.0	81.5	86.5	87.3	85.3	88.7	86.1	88.3	85.0	82.7	82.2
	Approach 2	90.1	83.5	59.8	80.8	83.3	84.0	87.8	84.1	81.6	82.9	86.7	83.0	87.2	84.2	88.0	85.8	88.0	81.7
	Proposal Table: c	90	84	80	81	86	85	88	86	82	85	87	84	88	85	88	85	85	82
Beans, heat treated (Phaseolus vulg.) (CVB code: 2001.616/0/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		67.5	55.3	44.9	54.9	54.8	53.5	71.5	43.4	57.7	54.6	55.5	52.8	54.4	47.3	55.9	49.6	59.6	56.8
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		83	67	61	79	80	78	87	82	81	83	76	77	76	83	86	74	81	81
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.b	69.3	60.2	44.4	54.2	52.9	53.7	70.0	45.8	55.9	55.8	56.5	53.4	59.6	47.4	57.2	50.9	54.0	57.0
	Approach 2	87.0	70.9	59.8	79.8	80.2	79.9	85.9	82.1	80.6	82.9	76.6	77.9	79.8	83.2	87.0	76.5	81.9	80.7
	Proposal Table: c	78	66	59	67	67	67	78	64	68	69	67	66	70	65	72	64	68	69
Bread meal (CVB code: 1010.612/0/0)		**In the database on the ileal digestibility of amino acids in broilers some observations for 'bakery by-product are incorporated. Considering the chemical compositions these most likely were ground biscuits. The same values were used for biscuits and bread meal.**																	
	As ground biscuits	**70**	**81**	**77**	**72**	**75**	**79**	**79**	**78**	**74**	**81**	**77**	**76**	**75**	**72**	**88**	**71**	**81**	**78**
Grassmeal, dehydrated, CP 45 - 140 g/kg [b)] (CVB code: 5010.610/1/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		47.8	63	33	47.7	48	47.8	47.8	47.7	47.7	47.8	47.8	47.9	47.9	47.7	47.3	47.7	47.4	47.5
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table (Category C in CVB Feed Table 1986)																	
		45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.e	50.1	66.3	29.8	46.6	48.3	48.9	44.5	49.6	44.8	48.9	46.5	48.6	51.0	47.7	46.5	47.3	39.9	44.9
	Approach 2	47.1	47.6	44.1	45.4	45.1	46.1	44.4	45.1	44.8	45.0	45.4	45.5	47.3	45.1	45.5	46.5	45.5	44.8
	Proposal Table: b	47	48	43	45	44	46	44	45	45	45	45	46	47	45	46	47	46	45
Grassmeal, dehydrated, CP 140-160 g/kg [b)] (CVB code: 5010.610/2/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		47.8	63	33	47.7	48	47.8	47.8	47.7	47.7	47.8	47.8	47.9	47.9	47.7	47.3	47.7	47.4	47.5
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45

Feed Ingredient		LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.e	50.1	66.3	29.8	46.6	48.3	48.9	44.5	49.6	44.8	48.9	46.5	48.6	51.0	47.7	46.5	47.3	39.9	44.9
	Approach 2	47.1	47.6	44.1	45.4	45.1	46.1	44.4	45.1	44.8	45.0	45.4	45.5	47.3	45.1	45.5	46.5	45.5	44.8
	Proposal Table: b	47	48	43	45	44	46	44	45	45	45	45	46	47	45	46	47	46	45
Grassmeal, dehydrated, CP 160-200 g/kg [b)] (CVB code: 5010.610/3/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		47.8	63	33	47.7	48	47.8	47.8	47.7	47.7	47.8	47.8	47.9	47.9	47.7	47.3	47.7	47.4	47.5
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.e	50.1	66.3	29.8	46.6	48.3	48.9	44.5	49.6	44.8	48.9	46.5	48.6	51.0	47.7	46.5	47.3	39.9	44.9
	Approach 2	61.8	62.4	57.9	59.6	59.2	60.4	58.2	59.1	58.7	58.9	59.5	59.7	62.0	59.2	59.7	61.0	59.7	58.8
	Proposal Table: b	62	62	57	60	58	60	58	59	59	59	59	60	62	59	60	61	60	59
Grassmeal, dehydrated CP > 200 g/kg [b)] (CVB code: 5010.610/4/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		47.8	63	33	47.7	48	47.8	47.8	47.7	47.7	47.8	47.8	47.9	47.9	47.7	47.3	47.7	47.4	47.5
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.e	50.1	66.3	29.8	46.6	48.3	48.9	44.5	49.6	44.8	48.9	46.5	48.6	51.0	47.7	46.5	47.3	39.9	44.9
	Approach 2	71.2	71.9	66.7	68.7	68.2	69.6	67.1	68.1	67.6	67.9	68.6	68.8	71.4	68.2	68.8	70.3	68.8	67.7
	Proposal Table: b	71	72	66	69	67	70	67	68	68	68	69	69	71	68	69	70	69	68
Oats grain (CVB code: 1004.000/0/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		80.4	84.3	74.9	74.5	77	82.1	90	85.9	87.6	84	84.6	81.6	75.8	75.6	83.6	76.7	85.4	80.2
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		60	76	64	63	73	70	79	72	71	74	75	68	60	67	82	58	71	64
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.a	83.8	86.3	67.1	74.1	73.1	84.2	84.3	87.2	82.6	84.4	79.5	81.5	79.4	76.2	81.8	75.6	72.7	76.4
	Approach 2	62.9	80.4	62.8	63.6	73.2	71.7	78.0	72.1	70.6	73.9	75.6	68.8	63.0	67.2	83.0	59.9	71.8	63.7
	Proposal Table: a	84	86	67	74	73	84	84	87	83	84	80	82	79	76	82	76	73	76
Oats grain, peeled (CVB code: 1004.116/0/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		86.4	90.3	80.9	80.6	83	88.1	96	92	93.7	90	90.7	87.7	81.9	81.7	89.6	82.7	91.5	86.3
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		83	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	

Feed Ingredient		LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
	Approach 1.a	89.8	92.3	73.1	80.2	79.1	90.2	90.3	93.3	88.7	90.4	85.6	87.6	85.5	82.3	87.8	81.6	78.8	82.5
	Approach 2	87.0	87.8	81.4	83.8	83.3	85.0	81.9	83.1	82.5	82.9	83.7	84.0	87.2	83.2	84.0	85.8	83.9	82.7
	Proposal Table: c	90	92	73	80	79	90	90	93	89	90	86	88	85	82	88	82	79	82
Cottonseed, decorticated (CVB code: 3018.000/1/0)		**There is a remarkable large number of observations for cotton seed expeller and cotton seed meal, solvent extracted; these values are also used for cotton seed, decorticated**																	
		58	77	71	66	77	69	86	80	75	71	77	71	70	75	83	70	74	73
Linseed expeller (CVB code: 3006.401/0/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		82	84.7	85.4	79.7	84.5	75.3	75.4	75.3	75.3	75.3	75.3	75.3	75.3	75.3	75.2	75.3	75.1	75.2
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.c	83.0	88.0	82.6	78.6	87.2	77.2	74.0	77.6	74.4	77.4	76.9	77.6	77.5	74.4	74.0	75.6	70.2	73.7
	Approach 2	58.7	59.2	54.9	56.5	56.2	57.4	55.3	56.1	55.7	55.9	56.5	56.7	58.8	56.2	56.7	57.9	56.6	55.8
	Proposal Table: a	83	88	67	79	80	77	74	78	74	77	77	78	77	74	74	76	77	74
Linseed meal, solvent extracted (CVB code: 3006.401/0/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		81.8	84.6	85.1	79.3	84.4	75	75.1	75	75	75	75	75	75	75	75	75	74.8	74.9
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.c	82.8	87.9	82.3	78.2	87.1	76.9	73.7	77.3	74.1	77.1	76.6	77.3	77.2	74.1	73.8	75.3	69.9	73.4
	Approach 2	58.7	59.2	54.9	56.5	56.2	57.4	55.3	56.1	55.7	55.9	56.5	56.7	58.8	56.2	56.7	57.9	56.6	55.8
	Proposal Table: a	83	88	67	78	80	77	74	77	74	77	77	77	77	74	74	75	77	73
Alfalfa meal, dehydr. CP 140-160 g/kg b) (CVB code: 4005.610/2/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		45.8	71.8	8.9	54.5	54	61.9	72.6	64.5	53.8	61.6	57.7	58.4	58.6	67.9	57.3	51.1	73.1	58.1
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.e	48	75	6	53	54	63	69	66	51	63	56	59	62	68	57	51	66	56
	Approach 2	54.5	55.0	51.0	52.5	52.2	53.3	51.3	52.1	51.7	52.0	52.4	52.6	54.6	52.1	52.6	53.7	52.6	51.8
	Proposal Table: b	54	55	50	53	51	53	51	52	52	52	52	53	55	52	53	54	53	52
Alfalfa meal, dehydr. CP 160-180 g/kg b) (CVB code: 4005.610/3/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		45.8	71.8	8.9	54.5	54	61.9	72.6	64.5	53.8	61.6	57.7	58.4	58.6	67.9	57.3	51.1	73.1	58.1
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	

Feed Ingredient		LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
		60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.e	48.1	75.1	5.7	53.4	54.3	63.0	69.3	66.4	50.9	62.7	56.4	59.1	61.7	67.9	56.5	50.7	65.6	55.5
	Approach 2	62.9	63.5	58.8	60.6	60.2	61.4	59.2	60.1	59.7	59.9	60.5	60.7	63.0	60.2	60.7	62.0	60.7	59.8
	Proposal Table: b	63	63	58	61	59	61	59	60	60	60	60	61	63	60	61	62	61	60
Alfalfa meal, dehydr. CP > 180 g/kg [b)] (CVB code: 4005.610/4/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		45.8	71.8	8.9	54.5	54	61.9	72.6	64.5	53.8	61.6	57.7	58.4	58.6	67.9	57.3	51.1	73.1	58.1
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.e	48.1	75.1	5.7	53.4	54.3	63.0	69.3	66.4	50.9	62.7	56.4	59.1	61.7	67.9	56.5	50.7	65.6	55.5
	Approach 2	70.2	70.9	65.7	67.6	67.2	68.6	66.1	67.1	66.6	66.9	67.6	67.8	70.4	67.2	67.8	69.2	67.8	66.7
	Proposal Table: b	70	71	65	68	66	69	66	67	67	67	68	68	70	67	68	69	68	67
Maize, chemical/heat treated [c)] (CVB code: 1002.629/0/0)		**Net als bij andere waarderingssystemen, dezelfde waarden aanhouden als voor Maïs.**																	
		90	94	86	83	85	93	93	93	90	94	88	90	93	89	95	86	91	91
Maize germ meal, solvent extracted (CVB code: 1002.418/0/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		58.9	79	63	65.7	62	70.9	79.9	77.8	73.8	73.9	78.9	68.9	64.9	64.7	64.7	64.8	64.8	64.7
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.a	62.3	81.0	55.2	65.3	58.1	73.0	74.2	79.1	68.8	74.3	73.8	68.8	68.5	65.3	62.9	63.7	52.1	60.9
	Approach 2	60.8	61.3	56.9	58.6	58.2	59.4	57.2	58.1	57.7	57.9	58.5	58.7	60.9	58.2	58.7	59.9	58.7	57.8
	Proposal Table: c	62	71	54	62	67	66	66	69	63	66	66	64	65	62	61	62	64	59
Maize germ feed expeller (CVB code: 1002.419/0/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		61.8	82	64	63.6	58	72.8	81.9	79.7	68.8	76.9	84.8	70.9	67.9	67.6	67.6	67.7	67.7	67.6
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.a	65.2	84.0	56.2	63.2	54.1	74.9	76.2	81.0	63.8	77.3	79.7	70.8	71.5	68.2	65.8	66.6	55.0	63.8
	Approach 2	56.6	57.1	53.0	54.5	54.2	55.3	53.3	54.1	53.7	54.0	54.4	54.7	56.7	54.1	54.6	55.8	54.6	53.8
	Proposal Table: c	61	71	53	59	66	65	65	68	59	66	67	63	64	61	60	61	63	59

Feed Ingredient		LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
Maize bran (CVB code: 1002.108/0/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		69.9	86.4	72.6	70.1	72.5	80.1	88.5	80.3	80.3	83.5	83.2	78.5	79.9	72.5	79.5	69.9	76.9	80.5
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		66	82	70	68	75	81	85	85	81	87	79	80	84	76	86	72	83	79
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.a	73.3	88.4	64.8	69.7	68.6	82.2	82.8	81.6	75.3	83.9	78.1	78.4	83.5	73.1	77.7	68.8	64.2	76.7
	Approach 2	69.1	86.7	68.6	68.7	75.2	83.0	83.9	85.1	80.6	86.9	79.7	81.0	88.2	76.2	87.0	74.4	83.9	78.7
	Proposal Table: c	71	88	76	69	79	83	83	83	78	85	79	80	86	75	82	72	79	78
Molasses, sugar beet [b] (CVB code: 4004.210/0/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		93.6	95	95	92.9	95	94.6	92.6	92.1	91.4	94.1	94.5	94.3	94.7	94.5	94.8	94.2	91.8	93.7
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		-50	25		33		36	-100	17		31	33	50	57	66	61	44	-50	33
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.e	95.9	98.3	91.8	91.8	95.3	95.7	89.3	94.0	88.5	95.2	93.2	95.0	97.8	94.5	94.0	93.8	84.3	91.1
	Approach 2	-52.4	26.4	0.0	33.3	0.0	36.9	-98.7	17.0	0.0	31.0	33.3	50.6	59.9	66.2	61.7	45.5	-50.6	32.9
	Proposal Table: a	96	98	92	92	95	96	89	94	88	95	93	95	98	95	94	94	84	91
Molasses, sugarcane, SUG <475 g/kg [d] (CVB code: 7002.210/1/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		90.8	95	95	91.7	95	93.1	86.7	88.3	86.7	92	90.8	94.1	94.5	94.6	92.8	92.6	88.3	90.8
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		-100	-100		-67		-33	-300	-100	-100	-75	-100		30	58	38	-25	-100	-50
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.e	93.1	98.3	91.8	90.6	95.3	94.2	83.4	90.2	83.8	93.1	89.5	94.8	97.6	94.6	92.0	92.2	80.8	88.2
	Approach 2	-105	-106	0.0	-67.6	0.0	-33.8	-296	-100	-99.5	-74.9	-100.8	0.0	31.5	58.2	38.4	-25.8	-101	-49.8
	Proposal Table: a	93	98	92	91	95	94	83	90	84	93	90	95	98	95	92	92	81	88
Molasses, sugarcane, SUG >475 g/kg [d] (CVB code: 7002.210/2/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		90.7	95	95	91.5	95	93.1	86.3	88	86.3	91.8	90.7	94.1	94.5	94.6	92.7	92.5	88	90.7
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		-150			-50			-300	-100	-100	-40	-100	22	54	79	62		-200	-17
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.e	93.0	98.3	91.8	90.4	95.3	94.2	83.0	89.9	83.4	92.9	89.4	94.8	97.6	94.6	91.9	92.1	80.5	88.1
	Approach 2	-157	0.0	0.0	-50.5	0.0	0.0	-296	-100	-99.5	-40.0	-101	22.3	56.7	79.2	62.7	0.0	-202	-16.9
	Proposal Table: a	93	98	92	91	95	94	83	90	84	93	89	95	98	95	92	92	81	88

Feed Ingredient		LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
Milkpowder, skimmed (CVB code: 8008.000/0/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		96.8	96.9	91.1	92.6	91	88.7	97	97.4	96.1	96.2	96.9	89.7	89	93.5	88.2	95.2	99.2	81.5
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.d	99.2	103.1	82.5	87.2	92.8	85.8	95.6	98.5	95.2	96.1	96.6	88.7	90.4	90.9	84.1	93.6	89.8	77.4
	Approach 2	99.5	100.5	93.2	95.9	95.3	97.3	93.8	95.1	94.5	94.9	95.8	96.2	99.8	95.3	96.1	98.2	96.1	94.6
	Proposal Table: c	99	100	88	92	94	92	95	97	95	96	96	92	95	93	90	96	93	86
Millet (CVB code: 1006.000/0/0)		In the database some observations for the ileal amino acid digestibility of pearl millet are incorporated. These data were used for millet																	
		87	83	75	79	86	83	89	79	80	82	86	81	81	82	82	80	76	81
Rice with hulls (CVB code: 1003.000/2/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		79.7	84	74	74.3	77	81.7	89.8	85.5	87.6	83.7	83.6	80.8	75.8	75.5	83.2	76.5	84.9	79.2
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		60	77	70	63	77	73	85	81	80	81	78	73	66	75	82	67	67	74
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.a	83.1	86.0	66.2	73.9	73.1	83.8	84.1	86.8	82.6	84.1	78.5	80.7	79.4	76.1	81.4	75.4	72.2	75.4
	Approach 2	62.9	81.4	68.6	63.6	77.2	74.8	83.9	81.1	79.6	80.9	78.6	73.9	69.3	75.2	83.0	69.2	67.8	73.7
	Proposal Table: c	73	84	67	69	75	79	84	84	81	83	79	77	74	76	82	72	70	75
Sorghum gluten meal (CVB code: 1008.204/0/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		81.9	91	88	87.9	88	89.9	87.9	90.9	84.9	91	92	89	87	86.9	94.9	83.9	94.9	92.9
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		76	87	82	83	85	86	85	88	82	89	89	85	84	83	92	79	92	89
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.a	85.3	93.0	80.2	87.5	84.1	92.0	82.2	92.2	79.9	91.4	86.9	88.9	90.6	87.5	93.1	82.8	82.2	89.1
	Approach 2	79.6	92.0	80.4	83.8	85.3	88.1	83.9	88.1	81.6	88.9	89.7	86.0	88.2	83.2	93.1	81.6	93.1	88.6
	Proposal Table: c	82	92	80	86	85	90	83	90	81	90	88	87	89	85	93	82	88	89
Sunflower seed expeller, all qualities (CVB code: 3003.401)	For Sunflower seed expeller, all qualities, the same SIDC-AA in pigs and AFDC-AA in roosters values are published in the CVB Feed Table (2016) as for Sunflower seed meal. Also for Sunflower seed meal, the same SIDC-AA in pigs and AFDC-AA in roosters values are used for all qualities. Therefore, for SIDC-poultry for Sunflower seed expeller (all qualities) the same values are taken as for Sunflower seed meal (as included in the database based on the literature study).																		
Wheat germs		For this ingredient SIDC values are used obtained by regression analyses on the data for wheat and its by-products from the milling industry																	
Wheat germ feed		For this ingredient SIDC values are used obtained by regression analyses on the data for wheat and its by-products from the milling industry																	

Feed Ingredient		LYS	MET	CYS	THR	TRP	ILE	ARG	PHE	HIS	LEU	TYR	VAL	ALA	ASP	GLU	GLY	PRO	SER
Wheat feed meal		For this ingredient SIDC values are used obtained by regression analyses on the data for wheat and its by-products from the milling industry																	
Whey powder, low lactose, ASH >210 g/kg (CVB code: 8009.626/2/0)		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		93.1	93.1	93.7	92.5	91.2	91.9	91.8	91.7	91.7	91.9	91.8	91.9	91.9	91.8	91.7	91.5	91.7	91.7
		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.d	95.5	99.3	85.1	87.1	93.0	89.0	90.4	92.8	90.8	91.8	91.5	90.9	93.3	89.2	87.6	89.9	82.3	87.6
	Approach 2	94.3	95.2	88.3	90.9	90.3	92.2	88.8	90.1	89.5	89.9	90.7	91.1	94.5	90.2	91.1	93.0	91.0	89.6
	Proposal Table: c	95	97	87	89	92	91	90	91	90	91	91	91	94	90	89	91	87	89
Whey powder (CVB code: 8009.000/0/0)		Apparent fecal digestibility adult roosters (AFDC-roosters) (%) in current CVB Feed Table																	
		90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
		Standardized ileal digestibility pigs (SIDC-pigs) (%)																	
		92	91.6	92.4	90.3	87.5	90	89.8	89.6	89.7	89.9	89.8	89.9	89.9	89.8	89.6	89.3	89.6	89.6
		Estimated values for the standardized ileal digestibility (SIDC) for poultry (%)																	
	Approach 1.d	94.4	97.8	83.8	84.9	89.3	87.1	88.4	90.7	88.8	89.8	89.5	88.9	91.3	87.2	85.5	87.7	80.2	85.5
	Approach 2	94.3	95.2	88.3	90.9	90.3	92.2	88.8	90.1	89.5	89.9	90.7	91.1	94.5	90.2	91.1	93.0	91.0	89.6
	Proposal Table: c	94	97	86	88	90	90	89	90	89	90	90	90	93	89	88	90	86	88

a): The values for AFDC-roosters for the various amino acids, as included in the current CVB Feed Table are somewhat peculiar for Sweet potatoes and for Tapioca. Therefore, the estimation of SIDC-AA for poultry has been based on the SIDC-AA for pigs in the case of Sweet potatoes and Tapioca. For safety reasons the SIDC of CYS an TRP have been diminished some %-units, whereas the SIDC of PRO has been elevated some %-units

b): A similar SIDC-AA-pigs for Grass meal and Alfalfa meal for all qualities does not make sense. Therefore, the proposal for these feedstuffs was not based on SIDC-pigs.

c): For Maize, chemical/heat treated, the same values are taken as for Maize, as is generally the case for this feedstuff in evaluation of the feeding value for simple-stomached production animals.

d): The values for AFDC-roosters for the various amino acids as given in the current CVB Feed Table are somewhat peculiar. The background thereof is unknown. Therefore, the estimation of SIDC-AA for poultry was based on the SIDC-AA values for pigs for Sugar beet molasses and Sugarcane molasses.

Appendix 5: Statistical analysis on the dataset of wheat and wheat by-products from the milling industry.

In the CVB Feed Table several wheat by-products are distinguished. By-products from the dry wheat milling-industry can be considered more or less as a continuum from high starch/low fibre to low starch/high fibre. In the database a large number of observation for wheat are present. The number of observations for wheat by-products is limited: wheat middling's 5, wheat bran 4, wheat feed flour 1. To derive SIDC values for some other by-products from the wheat milling-industry we considered if it was possible to do this by regression-analysis on the dataset for wheat and the three wheat by-products mentioned. As the number of observation differs largely, for each amino acid in a feed ingredient a weighing factor was used. As weighing factor the square root of the number of observations was calculated and subsequently conversed to an integer. This means that for many amino acids in the regression analysis wheat had a 3 – 3.5 times higher weight than wheat middling's and wheat bran and a 6 -7 times higher weight than wheat feed flour. In the regression analysis we used CFIBRE as the independent parameter and the SIDC-AA as the dependent parameter. In Figure 5.1 the relation between SIDC AA and CFIBRE in wheat and wheat by-products is illustrated for four amino acids. For the CFIBRE contents of each product the mean value from the CVB Feed Table 2016 was used.

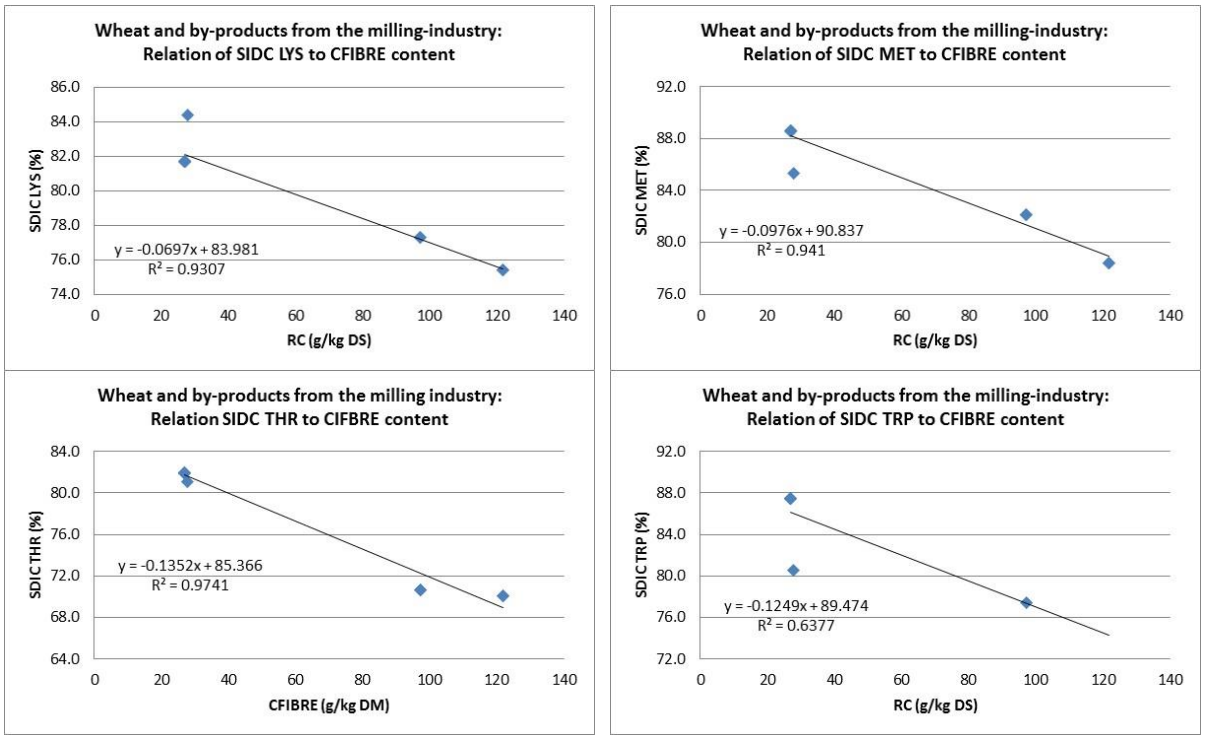

Figure 5.1. Relation between SIDC of LYS (left, above), MET (right, above), THR (left, below) and TRP (right, below) and the CFIBRE content of wheat and wheat by-products from the milling industry. For detailed information see text.

In table 5.1 the formula obtained by regression analysis for all amino acids are presented, together with the R^2, standard error of the prediction and the variation coefficient.

Table 5.1. Estimation formulas for the prediction of the SIDC values of amino acids of wheat by-products from the dry milling industry. The following regression model was used: SIDC AA = c + a*RC_{DM}. For further explanation see text.

SIDC of AA	c	a	R^2	s.e. prediction	Variation coefficient (%)
SIDC-LYS	84.0	-0.0697	0.93	0.85	1.1
SIDC-MET	90.8	-0.0976	0.94	1.09	1.3
SIDC-CYS	87.0	-0.1180	*0.58*	4.94	6.2
SIDC-THR	85.4	-0.1352	0.97	0.98	1.3
SIDC-TRP	89.5	-0.1249	*0.64*	4.94	5.8
SIDC-ILE	92.0	-0.1225	0.92	1.56	1.8
SIDC-ARG	85.5	-0.0652	*0.56*	2.57	3.1
SIDC-PHE	93.4	-0.1450	0.99	0.58	0.7
SIDC-HIS	86.9	-0.1190	0.96	1.12	1.4
SIDC-LEU	91.2	-0.1328	0.90	1.97	2.3
SIDC-TYR	88.9	-0.1615	0.99	0.39	0.5
SIDC-VAL	90.0	-0.1432	0.99	0.69	0.8
SIDC-ALA	83.9	-0.0888	0.93	1.11	1.4
SIDS-ASP	83.2	-0.0773	0.78	1.86	2.4
SIDC-GLU	98.0	-0.1102	0.98	0.72	0.8
SIDS-GLY	88.8	-0.1616	0.97	1.26	1.6
SIDC-PRO	100.2	-0.2162	0.99	0.92	1.0
SIDS-SER	92.3	-0.1643	0.98	1.14	1.4

Explanation for the relatively low R^2 for some amino acids:

- CYS: 10% difference between SIDC CYS in wheat middling's (65.3%; one observation) and wheat bran (75.6%; stdev:1.85%; mean of two observations)
- TRP: no database information for wheat bran, and a 2% difference between SIDC for wheat feed flour and wheat.
- ARG: value for wheat feed flour 4% units higher than that for wheat

In Table 5.2 the mean SIDC values in the database and the SIDC values predicted with the regression formulas for wheat feed flour, wheat middling's and wheat bran are compared.
This Table shows that for wheat middling's and wheat bran the difference between the database value and the predicted value is less than 2% units. For wheat feed meal (quality with lower CFIBRE content) only one observation is included in the database. For a number of amino acids the SIDC did not differ very much from the mean SIDC value for wheat (which had a much higher weighing factor in the regression analysis). For 10 amino acids the difference between the database value and the predicted value was more than 2% units. The largest difference was found for ARG and CYS, being 6.8 and 5.4% units, respectively. Based on these results we concluded that:

- For wheat middling's and wheat bran the mean SIDC values from the database will be used, except for those amino acids where this value deviated more than 2% units from the predicted value. In the latter cases the predicted value is used.
- For wheat feed flour the predicted value will be used for all amino acids.

In Table 5.3 SIDC values, predicted with the regression formulas, are given for wheat by-products from the milling industry that are listed in the CVB Feed Table with an energy evaluation for either broilers and/or adult poultry / laying hens.

Table 5.2 Comparison of the mean SIDC values from the database with experimental observation on ileal digestibility of amino acids in broilers for thee wheat by-products with values obtained by regression analysis (Regr.). For amino acids where the difference between the database value and the predicted value of the SIDC values was more than 2% units the figures are printed in bold.

Amino acid	**Wheat feed flour (1) (CVB code: 1010.103/1/0)**			**Wheat middling's**			**Wheat bran**	
	CFIBRE: 27.7 g/kg DM			**CFIBRE: 97.3 g/kg DM**			**CFIBRE: 121.8 g/kg DM**	
	Database	Regr.		Database	Regr.		Database	Regr.
	SIDC (% units)							
LYS	**84.4**	**82.0**		77.3	77.2		75.4	75.5
MET	**85.3**	**88.1**		82.1	81.3		78.4	78.9
CYS	**81.5**	**83.8**			75.6		**76.5**	**72.7**
THR	81.1	81.6		70.6	72.2		70.1	68.9
TRP	**80.6**	**86.0**			77.3			74.3
ILE	**85.3**	**88.6**		78.5	80.1		78.3	77.1
ARG	**90.5**	**83.7**		77.6	79.2		78.7	77.6
PHE	87.9	89.4		78.9	79.3		76.0	75.7
HIS	**86.3**	**83.6**		74.3	75.3		73.1	72.4
LEU	**83.6**	**88.3**		77.5	79.1		77.0	75.8
TYR	84.6	84.5		73.9	73.3		68.8	69.3
VAL	86.1	86.3		75.3	76.4		73.8	72.8
ALA	80.3	81.5		73.6	75.3		74.4	73.1
ASP	**77.3**	**81.0**		**73.6**	**75.7**		75.3	73.8
GLU	93.1	95.0		86.9	87.3		84.9	84.6
GLY	**86.4**	**84.3**		71.3	73.1		70.4	69.1
PRO	94.4	94.2		77.6	79.2		75.0	73.9
SER	85.8	87.8		74.9	76.4		73.4	72.3

Table 5.3 Predicted SIDC values for wheat by-products for which no experimental data has been incorporated in the database.

Amino acid	**Wheat germs (CVB code: 1010.102/0/0)**	**Wheat feed flour (2) (CVB code: 1010.103/1/0)**	**Wheat germ feed (CVB code: 1010.114/0/0)**	**Wheat feed meal (CVB code: 1010.105/0/0)**
	CFIBRE: 40.1 g/kg DM	**CFIBRE: 50.7 g/kg DM**	**CFIBRE: 60.0 g/kg DM**	**CFIBRE: 79.4 g/kg DM**
LYS	81.2	80.4	79.8	78.4
MET	86.9	85.9	85.0	83.1
CYS	82.3	81.1	80.0	77.7
THR	79.9	78.5	77.3	74.6
TRP	84.5	83.1	82.0	79.6
ILE	87.1	85.8	84.7	82.3
ARG	82.9	82.2	81.6	80.3
PHE	87.6	86.0	84.7	81.9
HIS	82.1	80.9	79.7	77.4
LEU	86.7	85.3	84.0	81.4
TYR	82.5	80.8	79.3	76.1
VAL	84.5	83.0	81.7	78.9
ALA	80.4	79.4	78.6	76.9
ASP	80.1	79.3	78.5	77.0
GLU	93.6	92.4	91.4	89.3
GLY	82.3	80.6	79.1	76.0
PRO	91.5	89.2	87.2	83.0
SER	85.7	84.0	82.5	79.3