Natural resources and bioeconomy studies 70/2024

Finnish Feed Tables and Nutrient Requirements

Ruminants, pigs, poultry, horses

Kaisa Kuoppala, Jenni Vattulainen, Sini Perttilä, Markku Saastamoinen and Marketta Rinne

Luke

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Abstract

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The Finnish Feed Tables and Nutrient Requirements 2024 publication contains the feed values used in Finland, the basis for their calculation and the nutrient requirements of cattle, sheep, goats, pigs, poultry and horses. The main objective of the Feed Tables is to present as reliable feed values as possible that describe the relative differences in the production responses of feeds when used in animal nutrition. The composition and feed values for reference feeds are based on extensive Finnish and international research data and long-term work. According to the Feed Act in Finland, the energy and protein values of feed materials in Finland must be based on the calculation criteria published by the Natural Resources Institute Finland. Feed values and nutrient requirements are an entity that provides the basis for ration formulation for animals to optimize diets based on animal requirements and feed prices.

Up-to-date information on feed values and nutrient requirements is available on the Feed Tables web service (www.luke.fi/feedtables), which also has a Finnish (www.luke.fi/rehutaulukot) and a Swedish (www.luke.fi/fodertabeller) version. Feed values and nutrient requirements are an important basis for ration formulation of different livestock groups, and we hope that they will contribute to the health and welfare of animals and the economic sustainability of livestock production, reduce the environmental burden of livestock production and ensure quality animal products in the food chain.

Keywords: amino acid, energy value, cattle, chicken, composition, concentrate feed, feed, feed value, feed material, feeding, forage, goat, horse, mineral, pig, poultry, protein value, reference feed, ruminant, sheep, vitamin

Tiivistelmä

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Rehutaulukot ja ruokintasuositukset 2024 -julkaisu sisältää Suomessa käytettävät rehuarvot, niiden laskentaperusteet sekä ruokintasuositukset naudoille, lampaille, vuohille, sioille, siipikarjalle ja hevosille. Rehutaulukoiden keskeinen tavoite on esittää mahdollisimman luotettavat ravintoarvot, jotka kuvaavat rehujen suhteellisia eroja niiden tuotantovaikutuksessa, kun niitä käytetään eläinten ruokinnassa. Viiterehujen koostumus- ja rehuarvotiedot pohjautuvat laajaan koti- ja ulkomaiseen tutkimusaineistoon ja pitkäaikaiseen työhön. Rehulain mukaan rehuaineista ja rehuseoksista ilmoitettavien energia- ja valkuaisarvojen tulee perustua Luonnonvarakeskuksen julkaisemiin laskentaperusteisiin. Rehuarvot ja ruokintasuositukset muodostavat kokonaisuuden, jonka perusteella eläinten rehuannos voidaan optimoida eläinten tarpeet ja rehujen hinnat huomioiden.

Ajantasainen tieto rehuarvoista ja ruokintasuosituksista on saatavilla Rehutaulukot -verkkopalvelussa (www.luke.fi/rehutaulukot), jossa käytettävissä on myös ruotsinkielinen (www.luke.fi/fodertabeller) ja englanninkielinen (www.luke.fi/feedtables) versio. Suomenkielinen julkaisu ”Rehutaulukot ja ruokintasuositukset” on myös saatavilla (Luonnonvara- ja biotalouden tutkimus 17/2024). Rehutaulukot on yksi apuväline ruokinnan suunnittelussa ja toivomme sen osaltaan edistävän kotieläinten terveyttä ja hyvinvointia sekä kotieläintuotannon taloudellista kestävyyttä, pienentävän kotieläintuotannon ympäristökuormitusta ja varmistavan laadukkaat kotieläintuotteet elintarvikeketjuun.

Asiasanat: aminohappo, energia-arvo, hevonen, hivenaine, kana, karkearehu, kivennäisaine, koostumus, lammas, märehtijä, nauta, rehu, rehuarvo, rehuaine, ruokinta, siipikarja, sika, valkuaisarvo, viiterehu, vitamiini, vuohi, väkirehu

Sammanfattning

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Publikationen Fodertabeller och näringsbehov 2024 innehåller de fodervärden som används i Finland, beräkningsgrunderna för dem samt utfodringsrekommendationer för nötkreatur, får, getter, svin, fjäderfä och hästar. Huvudsyftet med Fodertabellerna är att presentera så tillförlitliga fodervärden som möjligt som beskriver de relativa skillnaderna i fodermedlens produktionsrespons när de används i djurfoder. Referensfodrens sammansättning och fodervärden baserar sig på omfattande inhemska och internationella forskningsdata och långvarigt arbete. Enligt foderlagen ska foderråvarornas energi- och proteinvärden basera sig på de beräkningsgrunder som Naturresursinstitutet har publicerat. Fodervärdena och utfodringsrekommendationerna är en helhet som utgör grunden för optimal formulering av utfodringen för djur, baserat på djurens behov och foderpriser.

Aktuell information om fodervärden och näringsbehov finns på webbtjänsten Fodertabeller (www.luke.fi/fodertabeller), som också har en finsk (www.luke.fi/rehutaulukot) och engelsk (www.luke.fi/feedtables) version. Fodervärden och näringsbehov är en viktig grund för utformning av dieter för olika djurgrupper och vi hoppas att de kommer att bidra till djurens hälsa och välbefinnande och den ekonomiska hållbarheten i animalieproduktionen, minska miljöbelastningen från animalieproduktionen och säkerställa animaliska produkter av hög kvalitet i livsmedelskedjan.

Nyckelord: aminosyra, energivärde, fjäderfä, foder, fodervärde, foderråvara, får, get, gris, häst, idisslare, kraftfoder, mineral, nötkreatur, kyckling, proteinvärde, referensfoder, sammansättning, utfodring, vitamin

Abbreviations

Abbreviation	Explanation	Unit
AA_MiP	Proportion of amino acids in microbial protein	proportion, g/g
Ash	Ash	g/kg DM
BPD	By-pass protein digestibility	proportion, g/g
CC	Crude carbohydrates	g/kg DM
CCD	Crude carbohydrate digestibility	proportion, g/g
CF	Crude fibre	g/kg DM
CFat	Crude fat	g/kg DM
CFatD	Crude fat digestibility	proportion, g/g
CFD	Crude fibre digestibility	proportion, g/g
CP	Crude protein	g/kg DM
CPD	Crude protein digestibility	proportion, g/g
D	Digestible organic matter,	g/kg DM
dCCH	Digestible crude carbohydrates	g/kg DM
dCF	Digestible crude fibre	g/kg DM
dCFat	Digestible crude fat	g/kg DM
dCP	Digestible crude protein	g/kg DM
dCPa	Digestible crude protein for adult pigs	g/kg DM
dCPg	Digestible crude protein for growing pigs	g/kg DM
DE	Digestible energy	MJ/kg DM
DEa	Digestible energy for adult pigs	MJ/kg DM
DEg	Digestible energy for growing pigs	MJ/kg DM
dLys	Ileal digestible lysine	g/kg DM
DM	Dry matter	g/kg
dMet+dCys	Ileal digestible methionine and cysteine	g/kg DM
dNFE	Digestible nitrogen free extracts	g/kg DM
dOM	Digestible organic matter	g/kg DM
dThr	Ileal digestible threonine	g/kg DM
ECM	Energy corrected milk yield	kg/day
Eda	Energy digestibility for adult pigs	%
Edg	Energy digestibility for growing pigs	%
EPD	Effective protein degradability	proportion
GE	Gross energy	g/kg DM
hl	Hectolitre	
iNDF	Indigestible neutral detergent fibre	g/kg DM
ME	Metabolizable energy	MJ/kg DM
MEa	Metabolizable energy for adult pigs	MJ/kg DM
MEg	Metabolizable energy for growing pigs	MJ/kg DM
MiP	Microbial protein	g/kg DM
MiPD	Microbial protein digestibility	proportion, g/g
MP	Metabolizable protein	g/kg DM
MP_BP	By-pass protein absorbed from small intestine	g/kg DM
MP_MiP	Microbial protein absorbed from small intestine	g/kg DM
Nda	Nitrogen digestibility for adult pigs	%, g/g
Ndg	Nitrogen digestibility for growing pigs	%, g/g
NDF	Neutral detergent fibre	g/kg DM
NE	Net energy	MJ/kg DM

Abbreviation	Explanation	Unit
NEa	Net energy for adult pigs	MJ/kg DM
NEg	Net energy for growing pigs	MJ/kg DM
NFE	Nitrogen free extracts	g/kg DM
NFED	Nitrogen free extract digestibility	proportion, g/g
OMD	Organic matter digestibility	proportion, g/g
PB	Protein balance in the rumen	g/kg DM
Pd	Phosphorus digestibility	proportion, g/g
RDP	Rumen degradable protein	g/kg DM
Sta	Starch	g/kg DM
Sug	Sugar	g/kg DM
Amino acids		
Ala	Alanine	g/100 g CP
Arg	Arginine	g/100 g CP
Asp	Aspartic acid	g/100 g CP
Phe	Phenylalanine	g/100 g CP
Glu	Glutamic acid	g/100 g CP
Gly	Glycine	g/100 g CP
His	Histidine	g/100 g CP
Ile	Isoleucine	g/100 g CP
Cys	Cysteine	g/100 g CP
Leu	Leucine	g/100 g CP
Lys	Lysine	g/100 g CP
Met	Methionine	g/100 g CP
Pro	Proline	g/100 g CP
Ser	Serine	g/100 g CP
Thr	Threonine	g/100 g CP
Try	Tryptophan	g/100 g CP
Tyr	Tyrosine	g/100 g CP
Val	Valine	g/100 g CP
Minerals		
Ca	Calcium	g/kg DM
Cl	Chloride	g/kg DM
Co	Cobalt	mg/kg DM
Cu	Copper	mg/kg DM
Fe	Iron	mg/kg DM
K	Potassium	g/kg DM
Mg	Magnesium	g/kg DM
Mn	Manganese	mg/kg DM
Na	Sodium	g/kg DM
P	Phosphorus	g/kg DM
S	Sulphur	g/kg DM
Se	Selenium	mg/kg DM
Zn	Zinc	mg/kg DM

Contents

1. The Finnish feed evaluation system

This publication "Finnish Feed Tables and Nutrient Requirements 2024" contains official feed Tables used in Finland, the calculation equations of the feed values and the nutrient requirements of cattle, sheep, goats, pigs, poultry and horses. Feed evaluation systems have arisen from the need to plan balanced and economic diets for different animal species at different stages of production. Feed values allow comparisons between different feedstuffs. Systematic work on feed evaluation dates back to the 19th century, and the systems are constantly evolving as more research is conducted (Weisbjerg et al. 2010).

Feed composition and feed value data are based on extensive domestic and international research and long-term work. Typical reference feed data presented in the Feed Tables may vary from one year to another and from one batch to another. Therefore, it is justified to use analysed compositional data for concentrate feeds and in particular for forages, when available, for the calculation of feed values.

The content of the Feed Tables is updated according to the resources available as new information becomes available and the feeds available in the market changes. Up-to-date information on feed values and nutrient requirements is available on the Finnish Feed Tables website. The production of an edited publication is justified to help perceive the different aspect of feed evaluation and to document the values used over time. Previous publications are available in electronic form in the archive of the Finnish Feed Tables website.

The Feed Tables and Nutrient Requirements 2024 publication is based on the feed value data valid on 1 January 2024. Compared to the previous publication in 2015 (Luke 2015), there are no changes in the equations for calculating feed values, but several compositional values and coefficients have been harmonized, the nomenclature has been refined and individual feeds have been removed or added to reflect current practices. The publication now also includes the nutrient requirements of suckler cows published in 2017. In addition, the mineral and vitamin requirements of horses have been updated. The Finnish edition of this publication, "Rehutaulukot ja ruokintasuositukset" has recently been published (Kuoppala et al. 2024).

Energy values of feeds in Finnish Feed Tables are expressed as megajoules (MJ) metabolizable energy (ME) or net energy (NE). Only a part of gross energy is digested, and the rest remains undigested, i.e. is excreted in faeces. Of the digestible energy, some is lost in the form of urine and fermentation gases, and the remainder is recovered as metabolizable energy. A significant part of ME is consumed as conversion losses resulting in heat increment, resulting finally in net energy, which is available for maintenance, production (milk production, growth) and reproduction.

Protein values in the Finnish feed evaluation system are expressed as metabolizable protein (MP) and the balance of rumen degradable protein (PB) for ruminants, as ileal digestible amino acids in pigs, as crude protein in poultry and as digestible crude protein in horses.

Feed values and Nutrient Requirements within a system are linked with each other. There are several different feed evaluation systems in use globally, and the values produced by different systems are not directly comparable. For example, some systems report feed energy as digestible energy or net energy instead of metabolizable energy. The criteria for determining

even the same type of energy also vary from one system to another. Thus, it must be noted that feed values are always related to nutrient requirements within each system.

Nutritionally balanced and economic ration formulation requires not only feed tables but also a wealth of information on animal digestion, metabolism and other feed characteristics, in particular voluntary intake, which cannot be represented in feed tables. Feed tables is one tool in assisting in rational feeding, and we hope that they will contribute to the health and welfare of farm animals, the economic sustainability of livestock production, reduce the negative environmental impacts of livestock production and ensure quality animal products in the food chain.

Feed Tables website freely available:

- *In English: https://www.luke.fi/feedtables*
- *In Finnish: https://www.luke.fi/rehutaulukot*
- *In Swedish: https://www.luke.fi/fodertabeller*

1.1. Ruminants and horses

Energy value

The energy values for ruminants are based on metabolizable energy (ME) (MAFF 1975, Kaustell et al. 1997). For forages, the ME value is calculated from D-value (the concentration of digestible organic matter in DM), and for concentrates from the digestible nutrient content of feeds using energy coefficients.

Protein value

When calculating protein values, it is necessary to take into account the degradation of feed protein in the rumen and correspondingly, the microbial protein formed in the rumen. The metabolizable protein (MP) indicates the amount of amino acids absorbed from the small intestine and the rumen protein balance (PB) indicates whether nitrogen is sufficient for the needs of the rumen microbes. This metabolizable protein system takes into account separately the microbial protein formed in the rumen and the transit protein in the feed which is not degraded in the rumen. The system has been refined over the years and national amendments have been made, most recently in 2010. At that time, the changes for calculating MP and PB values were based on research data and tested using extensive research data. Based on comparative studies (Schwab et al. 2006), the Finnish protein value system is able to predict the production effect of feeds in dairy cows well compared to other protein value systems.

Metabolizable protein (MP)
Rumen microbes modify the nutrients so that an array of nutrients available to the cow differs from what was originally present in the feed. Approximately 70% of the amino acids available to the ruminant are derived from microbes in the rumen, so the protein evaluation system must take into account the amount of microbial protein formed in the rumen and the amount of rumen undegradable protein of the feed. They both flow from the rumen to the omasum, which is the equivalent of the stomach of monogastric animals, and where the protein digestion actually begins. From this point on, the protein in the microbial cells and the

protein in the feed are no longer different, but the digestion and metabolism of the amino acids they contain are similar.

The ruminant protein evaluation system does not take into account the amino acid composition of the protein, but MP only indicates the total amount of amino acids. Most of the protein available to the ruminant animal originates from microbes produced in the rumen. The amino acid composition of the microbial protein is quite stable and balanced, which means that ruminants are much less dependent on the amino acid composition of the feeds than monogastric livestock.

The determination of protein degradability in the rumen (EPD) is challenging, but it is needed to calculate the protein values. Originally, the determination of EPD was based on the so-called nylon bag method, where feed sample is incubated in the rumen for different periods of time and degradability is calculated from the amount of protein lost from the bag over time. However, this method has several problems. Degradability can also be determined by laboratory analyses (CNPCS method, Sniffen et al. 1992, Higgs et al. 2015), *in vitro* laboratory methods or *in vivo* animal experiments. The degradability values presented in the Finnish Feed Tables are a synthesis of results obtained from different methods, both in the laboratory and in animal experiments, but the final protein value is determined by the production response of the feed. If no EPD value has been determined for a particular feed, the default EPD value of 0.75 can be used for the calculation of the protein value for concentrates and 0.85 for forages.

Protein balance in the rumen (PB)
The PB value describes whether the microbial synthesis calculated from the available energy of the microbes is being achieved or if it is becoming limited by nitrogen uptake. The PB should be close to zero or positive for dairy cows. For growing cattle, -10 g PB per one kg of ration dry matter is acceptable.

In the 2010 update, the PB value was adjusted to be zero when the amount of rumen degradable protein in the rumen is sufficient to meet the nitrogen requirements of the rumen microbes. The correction was made by reducing the efficiency coefficient of rumen microbial protein synthesis based on the experimental results, which changes the PB values to a more realistic (positive) value than before.

The main part of the nitrogen demand of the rumen microbes is satisfied by ammonia produced by the degradation of feed protein. In addition, the microbes can use amino acids and peptides, which, in addition to ammonia, are the breakdown products of feed protein degraded in the rumen. Also, non-protein-N such as urea can be used as a supplement to elevate PB, if it is negative.

For horses, the energy values of ruminants are used, but the protein value is expressed as digestible crude protein (dCP). It is calculated by multiplying the feed CP concentration with its digestibility coefficient, which is presented in the Feed Tables.

1.2. Pigs and poultry

The energy value of pig feeds is based on net energy (NE), which is calculated based on the protein, fat, fibre, starch and sugar content of the feed. The energy values are expressed in megajoules in dry matter separately for growing pigs (NEg, MJ/kg DM (from pre-weaning to

150 kg live weight)) and adult pigs (NEa, MJ/kg ka (pregnant and lactating sows, boars)). The reason for reporting two different energy values is that adult pigs digest fibre better than young pigs, and therefore get more energy from the same feed (Noble & van Milgen 2004). The feed evaluation system for pigs is based on the French INRA-AFZ development (Sauvant et al. 2004). It is based on digestibility experiments carried out at the French research institute INRAE and energy metabolism experiments of pigs and sows kept in respiratory chambers. These experiments have led to the development of feed-specific equations for the calculation of energy values for the most common feed materials and general equations for the less common feed materials and feed mixtures. Feed values for pigs are calculated using the EvaPig® software, which can be downloaded free of charge from the internet.

According to the protein evaluation system for pigs, the digestibility of amino acids in feed is expressed as standardized ileal digestible amino acids. Endogenous amino acids (enzymes, cells, etc.) secreted from the small intestine were not taken into account when calculating the apparent digestibility under the previous system. The digestibility of amino acids in feed is corrected, i.e. standardized, for the basic endogenous loss of amino acids. The baseline endogenous loss is independent of the amount of protein in the feed but is influenced by the size of the animal and its dry matter intake. Standardized digestibilities of amino acids are assumed to be similar at different growth and production stages of pigs. There is insufficient data available to take into account the effect of feed processing on amino acid digestibility. The feed-specific amino acid digestibilities are based on the AFZ publication of 2000 (AFZ 2000).

Feed values for poultry are calculated based on a common European system (WPSA 1986). Energy values are expressed as metabolizable energy in MJ. Protein values of feeds and compound feed mixtures are expressed as crude protein.

Links:

EvaPig® -programme: https://evapig.com

EvaPig® -programme's Manual Equations and coefficients: https://en.evapig.com/resources/media/EvaPig_ManualEquations.pdf

Finnish Feed Tables and Nutrient Requirements website: https://luke.fi/feedtables

AFZ, Ajinomoto Eurolysine, Aventis Animal Nutrition, INRA, ITCF, 2000. AmiPig, Ileal standardized digestibility of amino acids in feedstuffs for pigs. www.feedbase.com/downloads/-amipeng.pdf

1.3. Legislation and control on feed values

According to the Feed Act (1263/2020), feeds must comply with the requirements of this Act and European Union (EU) legislation, be genuine, of good quality and safe and suitable for animal nutrition. Furthermore, the Feed Act requires that the packaging, labels, accompanying documents, brochures, advertisements or any other marketing and presentation of feed must provide truthful and adequate information about the feed. The energy and protein values of feed materials and compound feeds must be based on the calculation criteria published by the Natural Resources Institute of Finland (Luke), unless otherwise stated in the European Union (EU) legislation. The calculation criteria for poultry feeds are laid down at EU level.

Feed legislation is largely harmonized at EU level. Information on feed materials and compound feeds is laid down in the Regulation on the placing on the market and use of feed ((EC) 767/2009), which also contains the definitions of feed material, compound feed, complete feed, and complementary feed. Based on this regulation, an EU Catalogue of feed materials has been adopted. In this Feed Tables publication, the term feed is used as a synonym for feed material. The labelling of compound feed for food producing animals and fur animals must indicate the feed materials used in descending order by weight, but it is not compulsory to indicate their proportions. However, the purchaser may request this information from the person responsible for the labelling of the feed.

Traceability is an essential part of feed and food safety, and it must always be known where the feed was purchased. Feed for farmed animals may only be purchased from registered feed business operators. Animal caretaker who produces feed for his own animals and feeds them is a primary feed business operator. All feed business operators are registered with the Finnish Food Authority, which has a list of registered and approved feed business operators on its website. The notification, information, accounting and approval of feed business operators are laid down in the Regulation of the Ministry of Agriculture and Forestry on the organisation of feed business (MMMa 1266/2020). The obligations are based on the EU Feed Hygiene Regulation ((EC) 183/2005).

Vitamins and trace elements used in feed are feed additives. The authorisation and use of additives is regulated by the EU Regulation on feed additives ((EC) 1831/2003). The European Commission maintains a register of authorised additives. The Register of Feed Additives provides a link to the Regulation authorising each additive, with a description of the additive and conditions of use, such as animal species and categories, period of use, and possible minimum and maximum contents of the additive in feed. For all trace elements and vitamins A and D, maximum levels in complete feed are provided.

Feed must not contain harmful substances, products or organisms in such a way that its use may endanger human or animal health, the environment or adversely affect the quality of animal products. The maximum permitted levels of undesirable substances in feed, such as heavy metals, dioxins and aflatoxins, are laid down in Commission Regulations amending the Annexes to the EU Undesirable Substances Directive (2002/32/EC). In addition, national Feed Act prohibits the presence of salmonella in feed.

Under the Feed Act, the Finnish Food Authority is the competent authority for the official control of feed in Finland. The control covers the entire feed chain from primary production to trade. The purpose of official controls is to ensure that feeds are safe, fit for purpose and meet the requirements of the legislation as well as that feed business operators fulfil the requirements of feed legislation.

Links:

Feed Act 1263/2020 [in Finnish]: https://www.finlex.fi/fi/laki/alkup/2020/20201263

EU Regulation on additives for use in animal nutrition: http://data.europa.eu/eli/reg/-2003/1831/oj

Register for feed additives: https://ec.europa.eu/food/food-feed-portal/screen/feed-additives/search

Decree of the Ministry of Agriculture and Forestry on the Pursuit of Activities in the Feed Sector [in Finnish]: https://www.finlex.fi/fi/laki/alkup/2022/20220071

EU Regulation for feed hygiene: http://data.europa.eu/eli/reg/2005/183/2022-01-28

EU directive on undesirable substances in animal feed http://data.europa.eu/eli/dir/-2002/32/2019-11-28

More info about feed business operators, feeds and control: Feeds and feed business operators - Finnish Food Authority (ruokavirasto.fi)

1.4. Standing committee in Feed evaluation

The Natural Resources Institute Finland (Luke) maintains the rationale for calculating feed values based on the Feed Act and the Feed Tables and Nutrient Requirements web service (www.luke.fi/feedtables). Feed evaluation work is one of the Statutory and Expert Services of Luke.

The feed evaluation work is supported by the Standing committee in Feed evaluation, whose members in 2024 are Research Professor Marketta Rinne, chair (Luke), Senior Scientist Kaisa Kuoppala, secretary (Luke), Lecturer Anni Halmemies-Beauchet-Filleau (University of Helsinki), Senior Scientist Sini Perttilä (Luke), Chief Specialist Tarja Root (Finnish Food Authority), Senior Specialist Eeva Saarisalo (Ministry of Agriculture and Forestry), Principal Scientist Markku Saastamoinen (Luke), Professor Aila Vanhatalo (University of Helsinki) and Researcher Jenni Vattulainen (Luke).

Link:

Finnish Feed Tables and Nutrient Requirements: http://www.luke.fi/feedtables

2. Feed value calculations

2.1. Ruminants

2.1.1. Energy value

The energy value of ruminant feeds and, accordingly, nutrient requirements are based on metabolizable energy (ME) and are expressed in megajoules (MJ) (Kaustell et al. 1997). Metabolizable energy is calculated using the British method (MAFF 1975, 1981, 1984).

Concentrate feeds

The concentration of metabolizable energy in concentrate feeds is calculated based on the amount of digestible nutrients in the feed using the following equation (Schiemann et al. 1972, MAFF 1975, 1984):

ME (MJ/kg DM) = (15.2 × dCP + 34.2 × dCFat + 12.8 × dCF + 15.9 × dNFE) / 1000,

where

dCP = digestible crude protein, g/kg DM
dCFat = digestible crude fat, g/kg DM
dCF = digestible crude fibre, g/kg DM
dNFE = digestible nitrogen free extracts, g/kg DM.

The concentration of a digestible nutrient (e.g. dCP) is calculated by multiplying the concentration of a nutrient (e.g. CP) by its own digestibility coefficient (e.g. CPd). The digestibility coefficients for the different nutrients are given in the Feed Tables.

Forages

The concentration of metabolizable energy in forages is calculated based on the digestible organic matter concentration in DM, i.e. D-value, using the following equations. D-value is expressed as g/kg DM.

Silage, grass:	ME, MJ/kg DM = 0.0160 MJ/g × D-value (g/kg DM)
Hay, haylage[1)]:	ME, MJ/kg DM = 0.0169 MJ/g × D-value (g/kg DM) – 1.05
Straw:	ME, MJ/kg DM = 0.0140 MJ/g × D-value (g/kg DM)
Whole-crop cereal silage:	ME, MJ/kg DM = 0.0155 MJ/g × D-value (g/kg DM)

[1)] Haylage: DM over 500 g/kg.

2.1.2. Protein value

The protein value of ruminant feeds is expressed by using two values, which are MP (metabolizable protein) and PB (protein balance in the rumen) (Tuori et al. 1998). Previously abbreviations AAT and PBV were used for these values based on the Nordic protein evaluation cooperation.

MP presents the amount of amino acid absorbed from the small intestine, which originates from two sources: rumen undegradable feed protein and microbial protein synthesized in the rumen. The amount of microbial protein is calculated based on the amount of digestible organic matter minus undegradable feed protein. The effective protein degradability value in the rumen (EPD) is used to calculate the feed protein degradability. The PB value for feeds describes the sufficiency of the degradable protein in the feed to meet the nitrogen demand of the microbes in the rumen, which is defined by the energy supply to them. If the PB value of the feed is negative, the calculated MP content will not be met due to the nitrogen deficiency limiting microbial growth.

If ruminal protein degradability of a feed is manipulated by feed processing, the beneficial effects of improved amino acid supply to the animal must be demonstrated in feeding trials before the altered EPD-values can be included in the Feed Tables.

The feed protein values for ruminants are calculated as follows:

MP = MP_MiP + MP_BP
PB = RDP - MiP
MP_MiP = AA_MiP × MiPD × MiP
MP_BP = BPD × BP
MiP = 152 × (D-value - BP)/1000
RPP = EPD × CP,
BP = CP - RDP = (1 - EPD) × CP,

where:

MP = metabolizable protein (g/kg feed DM)
PB = protein balance in the rumen (g/kg feed DM)
MiP = Microbial protein (g/kg feed DM)
RDP = Rumen degradable protein (g/kg feed DM)
BP = By-pass protein (g/kg feed DM)
MP_MiP = Microbial protein absorbed from small intestine (g/kg feed DM)
MP_BP = By-pass protein absorbed from small intestine (g/kg DM)
D-value = Digestible organic matter, dOM (g/kg feed DM)
EPD = Effective protein degradability
CP = crude protein concentration (g/kg feed DM)
AA_MiP = Proportion of amino acids in microbial protein (constant value 0.75)
MiPD = Microbial protein digestibility (constant value 0.85)
BPD = By-pass protein digestibility (constant value 0.82)

In the Feed Tables, the MP values of dairy by-products have been calculated separately for calves that do not yet ruminate. The proportion of amino-N in total N has been estimated to be 0.9. The digestibility of CP of dry dairy products is 0.95 and that of liquid ones 1.0.

2.1.3. Examples of feed value calculations

Examples of feed value calculations are presented for barley (Table 1) and grass silage (Table 2).

Table 1. Barley, 60–64 kg/hl (Feed code 1002).

	Concentration, g/kg DM	Digestibility	Digestible nutrients, g/kg DM	ME, MJ/kg digestible nutrient	ME, MJ/kg DM
Ash	29				
Crude protein	119	0.68	80.9	15.2	1.23
Crude fat	22	0.64	14.1	34.2	0.48
Crude fibre	54	0.30	16.2	12.8	0.21
Nitrogen free extracts	776	0.91	706.2	15.9	11.23
Total	1 000		817.4		13.15

Energy value:
ME, MJ/kg DM**=**
(119 × 0.68 × 15.2 + 22 × 0.64 × 34.2 + 54 × 0.30 × 12.8 + 776 × 0.91 ×15.9) / 1000 = 13.1 MJ/kg DM

Crude protein concentration = 119 g/kg DM
Effective protein degradability (EPD) = 0.80
Digestible organic matter (D-value) = 817 g/kg DM

Protein values:

RDP = EPD × CP = 0.80 × 119 g/kg DM= 95.2 g/kg DM
BP = CP - RDP = 119 g/kg DM – 95.2 g/kg DM= 23.8 g/kg DM
D-value= (CPD × CP + CFatD × CFat + CFD × CF + NFED × NFE) = 817.4 g/kg DM
MiP = 152 × (D-value - BP) / 1000 = 152 × (817.4 - 23.8 g/kg DM) / 1000 = 120.6 g/kg DM
MP_MiP= 0.75 × 0.85 × MiP = 0.75 × 0.85 × 120.1 g/kg DM = 76.9 g/kg DM
MP_BP = 0.82 × BP = 0.82 ×23.8 g/kg DM = 19.5 g/kg DM

MP = MP_MiP + MP_BP = 96.4 g/kg DM
PB = RPD - MiP = -24.9 g/kg DM

Table 2. Grass silage, average/early 1st cut (Feed code 7002).

	Value
Crude protein concentration	160 g/kg DM
Effective protein degradability (EPD)	0.85
D-value	690 g/kg DM

Energy values:
D-value × 0.016 = 690 g/kg DM × 0.016 = 11.04 MJ ME/kg DM

Protein values:
RDP = EPD × CP = 0.85 × 160 g/kg DM = 136.0 g/kg DM
BP = CP - RDP = 160 - 136 g/kg DM = 24.0 g/kg DM
D-value = 690 g/kg DM
MiP= 152 × (D-value - BP) / 1000 = 152 × (690 g/kg DM - 24 g/kg DM) / 1000 = 101.2 g/kg DM

MP_MiP = 0.75 × 0.85 × MiP = 64.5 g/kg DM
MP_BP = 0.82 × BP = 19.7 g/kg DM

MP = MP_MiP + MP_BP = 84.2 g/kg DM
PB = RDP - MiP = 34.8 g/kg DM

2.2. Horses

For horses, the energy values (ME, MJ/kg ka) of ruminants are used, but digestible crude protein (dCP, g/kg DM) is used as the protein value. The energy value for feeds is expressed in megajoules (MJ) of metabolizable energy (ME) and is calculated using the same criteria as presented above for ruminants. In reality, feed digestibility is somewhat lower in horses than in ruminants (Särkijärvi et al. 2012), but this difference has been taken into account by increasing the energy requirements accordingly. The digestible crude protein content is obtained by multiplying the crude protein content (CP) of the feed by its digestibility coefficient (CPD).

2.3. Pigs

2.3.1. Energy value

The energy value of pig feeds is based on net energy (NE) and it is expressed as megajoules per kg dry matter (MJ/kg DM). The equations are based on INRA-AFZ feed evaluation system (EvaPig 2020). The NE values have been calculated using equations of EvaPig® program. The NE values are presented separately for growing pigs (NEg, from weaning to live weight of 150 kg) and adult pigs (NEa, pregnant and lactating sows, boars).

The NE values have mainly been calculated based on the reference ingredients of EvaPig® program. Calculation based on reference ingredients is the recommended way as in that case, feed material specific equations and coefficients are used. If suitable reference ingredient cannot be found in EvaPig® Feed Table, the NE value of a feed material has been calculated based on the analysed chemical composition. Calculation based on chemical composition is based on general equations.

For calculating the NE value of a feed material, the following information of the chemical composition is required. If the information is not available, values of the reference ingredient are used. If calculations are based on the chemical composition of the feed material, analysed values for composition are compulsory except for sugars.

- Dry matter
- Ash
- Crude protein
- Fibre: crude fibre (Weende method), NDF or ADF
- Fat: ether extracts
- Starch
- Sugars: increases the accuracy of calculations
- Gross energy: if fat concentration is not available when calculating based on chemical composition.

Calculation of NE value based on a reference ingredient

The reference ingredient is chosen so that it resembles the new feed material as well as possible based on its botanical or other source and chemical composition. The calculation combines the feed value of the reference ingredient and the difference in chemical composition between the reference ingredient and the new feed material using coefficients. The general form of the equation is:

$$Y_{New} = Y_{Ref} + a \times (X_{New} - X_{Ref}) + b \times (Z_{New} - Z_{Ref}) + \ldots$$

where Y is the calculated value, X, Z etc. are the chemical components and a, b etc. the feed material specific or general coefficients. "New" refers to the new feed material and "Ref" to the reference ingredient in the Feed Table of the Evapig® program. The equations, coefficients and ratios of energy values are presented in the Evapig® program Handbook of Equations and Coefficients.

The following steps are included in the calculation of NE values based on reference ingredient (f = function, g = growing pigs, a = adult pigs)

- Gross energy, GE = f(protein, fat, ash)
- Energy digestibility for growing pigs, Ed_g = f(fibre)
- Digestible energy for growing pigs, $DE_g = GE \times Ed_g$
- Digestible energy for adult pigs, DE_a = f(DE_g, Ed_g, ash)
- Ratio of metabolizable energy and digestible energy, ME / DE = f(protein, DE)
- Metabolizable energy, ME = DE × ME / DE
- Ratio of net energy and metabolizable energy, NE / ME = f(protein, fat, starch, ME)
- Net energy, NE = ME × NE / ME.

Calculation of NE value based on chemical composition

If a suitable reference ingredient cannot be found from Evapig® program, the NE values for growing and adult pigs are calculated based on the chemical composition of the feed material using the general equations of the program. This method is not as accurate as the one based on the reference ingredient as it does not take into account feed material specific factors.

The following steps are included in the calculation of NE values based on chemical composition:

- GE = f(protein, fat, ash, fibre, sugar, starch); Analysed GE value can be used instead of a GE value calculated based on the chemical composition
- Feed material Ed_g = f(fibre); equations including ash concentration should not be used
- $DE_g = GE \times Ed_g$
- DE_a=f(DE_g, Ed_g, ash, protein)
- Energy loss in urine = f(protein)
- Energy loss in methane = f(ash, protein, fat, starch, sugars)
- ME = f(DE, urine energy, methane energy)
- NE = f(DE, protein, fat, starch, fibre)

2.3.2. Protein value

The following information of pig feeds are included in the Feed Table:

Standardized ileal digestible lysine	g/kg DM
Standardized ileal digestible methionine + cysteine	g/kg DM
Standardized ileal digestible threonine	g/kg DM
Standardized ileal digestible tryptophan	g/kg DM
Standardized ileal digestible valine	g/kg DM
Digestible crude protein for growing pigs	g/kg DM
Digestible crude protein for adult pigs	g/kg DM

Standardized ileal digestible amino acids in feeds are calculated based on Evapig® Feed Table standardized ileal digestibility of amino acids for reference ingredients multiplied by the amino acid composition presented in Finnish Feed Tables.

Calculation of standardized ileal digestibility of amino acids in Evapig® program

For most common feed materials used in EvaPig® programme, the ileal amino acid digestibility has been determined using animal experiments for each feed material (62 items). For those feed materials of the EvaPig® programme (35 items) for which these results were not available, the digestibility is calculated using the general amino acid digestibility coefficients. The amino acid digestibilities per feed are available in: Ileal Standardized digestibility of amino acids in feedstuffs for pigs (2000, AFZ, Ajinomoto Eurolysine, Aventis Animal Nutrition, INRA - UMRVP, ITCF).

Equations

Abbreviations used in equations:

- AADiet: Amino acid or protein content of feed mixture, % kg DM (AADietKA) or % kg (AADietKG)
- AARM: Amino acid or protein content of feed material, % kg DM (AARMKA) or % kg (AARMKG)
- DApp: Apparent ileal digestibility, %
- DAppCorr: Corrected apparent ileal digestibility, %
- DStd: Standardized ileal digestibility, %
- Digesta: Amino acid or protein content of digesta, % kg DM
- DMI: Dry matter intake, g/day
- DME: Dry matter excretion, g/day
- Endo: Endogenous amino acid or protein secretion (dependent on dry matter intake and animal, but not on feed material characteristics). The value is expressed in g/kg dry matter eaten (EndoKAI) or g/kg (EndokgI). The values are reported separately for the three laboratories A, B and C that performed the tests (Sauvant et al. 2004).
- FMI: Feed intake, g/day
- A, B and C: Codes for laboratories

Apparent ileal digestibility

[A, B]
DApp = [(AADietKA × DMI) - (Digesta × DME × 100)] × 100 / (AADietKA × DMI)
[C]
DApp = [(AADietKG × FMI) - (Digesta × DME × 100)] × 100 / (AADietKG × FMI)

Corrected apparent ileal digestibility

Corrected apparent ileal digestibility can be calculated both from apparent or standardized ileal digestibility.

[A, B]
DAppCorr = DApp + EndoKAI × 10 × (1/AADietKA – 1 / AARMKA)
DAppCorr = DStd - EndoKAI × 10 / AARMKA
[C]
DAppCorr = DApp + EndoKGI × 10 × (1/AADietKG – 1 / AARMKG)
DAppCorr = DStd – EndoKGI × 10 / AARMKG

Standardized ileal digestibility

[A, B]
DStd = DApp + (EndoKAI × 10 / AADietKA)
[C]
DStd = DApp + (EndoKAI × 10 / AADietKA)

For feed materials presented in Table 3, the standardized ileal digestibility coefficients of amino acids have been calculated based on *in vitro* digestibility of nitrogen and dry matter (Boisen & Fernandez 1995) using equations (Boisen 2007).

Table 3. Feed materials for which the standardized ileal digestibility coefficients of amino acids have been calculated based on equations of Boisen (2007).

Feed code	Feed material	Standardized ileal digestibility of amino acids, %					
		Lysine	Threonine	Methionine	Cysteine	Tryptophan	Valine
3037	Barley fibre, moist	76.3	69.2	78.4	76.9	71.2	76.6
3041	Barley starch distillers' grain, moist	90.8	90.0	90.8	90.9	90.2	90.8
3042	Barley distillers' solubles	92.2	91.9	92.2	92.3	91.8	92.2
3043	Barley distillers' solids	89.4	88.3	89.7	89.5	88.9	89.6
3047	Barley fibre, dried	32.2	22.2	44.9	38.8	25.8	
3049	Barley protein	92.0	91.8	92.1	92.1	91.9	92.1

The digestible crude protein for growing and adult pigs is calculated based on the Evapig® digestibility coefficient for crude protein and the crude protein concentration presented in Finnish Feed Tables.

2.3.3. Digestible phosphorus

In Finnish Feed Tables, the total tract digestibility of phosphorus is presented according to Evapig® program. Table 4 presents the feed materials for which the digestibility of phosphorus is based on Finnish experiments.

Table 4. Feed materials for which the total tract digestibility of phosphorus is based on Finnish experiments.

Feed code	Feed material
1072	Faba bean, seed
2027	Faba bean meal, decorticated, heat treated
3037	Barley fibre, moist
3041	Barley starch distillers' grains, moist
3042	Barley distillers' solubles
3043	Barley distillers' solids
3047	Barley fibre, dried
3049	Barley protein
3053	Barley protein feed, A-Rehu OVR

2.3.4. Examples of feed value calculations

Example 1. Calculation of the net energy value (NE, MJ/kg ka) of barley (60–64 kg/hl) feed for growing and adult pigs using reference feed from EvaPig® (Tables 5–7).

For the calculation of feed values, the EvaPig® program is available, which calculates the NE values for feed materials when the chemical composition of a new feed material is entered into the program. The NE values are calculated for growing pigs (from weaning to 150 kg liveweight) and adult pigs (sows, boars).

It is recommended to create a new feed material based on the reference feed material of the EvaPig® programme. The feed material chosen as the reference feed should be as close as possible to the feed material itself in terms of botanical or other origin and/or chemical composition.

Following units are used in calculation:

- Chemical composition: % DM
- Energy values: MJ/kg DM
- Proportions and digestibilities: %

Table 5. Chemical composition of barley as the reference feed of EvaPig® programme and barley (60–64 kg/hl) from Feed Tables.

	Barley EvaPig® Reference feed (Ref)	Barley 60–64 kg/hl (New)
	% of DM	
Ash	2.20	2.90
Crude protein	9.87	11.9
Crude fat	1.65	2.20
Crude fibre	4.68	5.40
NDF	18.7	21.0
ADF	5.63	5.40
Starch	52.3	60.0
Sugars	2.18	2.00

Table 6. Energy values of barley in EvaPig®, their ratios and fibre coefficients of feed material used in the calculation of NE for growing pigs.

	Barley EvaPig®
Gross energy (GE_{ref}), MJ/kg DM	15.98
Energy digestibility for growing pigs (Es_{ref}), %	80.3
Coefficients of fibre (a)	
aNDF	-0.9
aCrude fibre	-2.53
ME/DE_{ref} for growing pigs, %	96.8
NE/ME_{ref} for growing pigs, %	76.6

DE=digestible energy, ME=metabolizable energy, NE=net energy

Table 7. Energy values of barley in EvaPig®, their ratios and fibre coefficients of feed material used in the calculation of NE for adult pigs.

	Barley EvaPig®
Gross energy (GE_{ref}), MJ/kg DM	15.98
Coefficients of digestible energy	
a, kJ/g	2.5
b	1.036
ME/DE_{ref} for adult pigs, %	96.1
NE/ME_{ref} for adult pigs, %	76.7

DE=digestible energy, ME=metabolizable energy, NE=net energy
a (kJ/g): DEa – DEg (MJ/kg) = (a / 1000) × undigested organic matter (g)
b (no unit): OMDg = b × Edg
DEa = Digestible energy for adult pigs
DEg = Digestible energy for growing pigs
OMDg= Organic matter digestibility for growing pigs
Edg = Energy digestibility for growing pigs

1. Gross energy (GE) for growing and adult pigs is calculated from reference feed material using general coefficients

$GE_{New} = GE_{Ref} + 0.0616 \times (Protein_{New} - Protein_{Ref}) + 0.2192 \times (Fat_{New} - Fat_{Ref}) - 0.1866 \times (Ash_{New} - Ash_{Ref})$
$GE_{New} = 15.98 + 0.0616 \times (11.9 – 9.87) + 0.2192 \times (2.2 – 1.65) – 0.1866 \times (2.9 – 2.2) = 16.09$ MJ/kg DM

2. Energy digestibility for growing pigs (Edg) is calculated from the reference feed material using feed material specific equations with fibre content as the explanatory factor. The fibre can be expressed as crude fibre, NDF or ADF, each with its own coefficients (Table 6). In the example barley, the NDF and crude fibre content is known.

$Ed_{NewNDF} = Ed_{Ref} + a_{NDF} \times (NDF_{New} - NDF_{Ref})$
$Ed_{NewNDF} = 80.3 – 0.9 \times (21.0 – 18.7) = 82.37\%$

$Ed_{NewCrudefibre} = Ed_{Ref} + a_{Crudefibre} \times (ADF_{New} - ADF_{Ref})$
$Ed_{NewCrudefibre} = 80.3 – 2.53 \times (5.4 – 5.63) = 80.88\%$

Digestibility of energy for growing pigs is expressed as average of the digestibilities calculated with equations.

$Edg_{New} = (Ed_{NewNDF} + Ed_{NewCrudefibre}) / 2$
$Edg_{New} = (82.4 + 80.9) / 2 = 81.6\%$

3. Digestible energy for growing pigs (DEg, MJ/kg DM), is calculated as follows:

$DEg_{New} = Ed_{New} / 100 \times GE_{New}$
$DEg_{New} = 81.6 / 100 \times 16.09 = 13.1$ MJ/kg DM

4. Digestible energy for adult pigs (DEa, MJ/kg DM) is calculated from the digestible energy content for growing pigs (DEg) using coefficients per feed material (Table 6). The digestible energy content for growing pigs (DEg_{New}) required for the equation is calculated in section 3 of the example and the energy digestibility for growing pigs (Edg_{New}) in section 2.

$DEa_{New} = DEg_{New} + a_{Ref} \times (1 – Ash_{New} / 100) \times (1 - b_{Ref} \times Edg_{New} / 100)$
$Dea_{New} = 13.1 + 2.5 \times (1 – 2.9/100) \times (1 – 1.036 \times 81.6 / 100) = 13.5$ MJ/kg DM

5. The ratio of metabolizable and digestible energy for growing and adult pigs is calculated using general coefficient for protein.

$ME/DE_{New} = ME/DE_{Ref} -1.98 \times (Protein_{New} – Protein_{New}) / DE_{New}$
Growing pigs: $ME/DEg_{New} = 96.8 – 1.98 \times (11.9 – 9.87) / 13.1 = 96.5\%$
Adult pigs: $ME/DEa_{New} = 96.1 – 1.98 \times (11.9 – 9.87) / 13.5 = 95.8\%$

6. Metabolizable energy for growing and adult pigs (ME, MJ/kg DM), is calculated as follows

$ME_{New} = DE_{New} \times (ME/DE_{New}) / 100$
Growing pigs: $MEg_{Uusi} = 13.1 \times 96.5 / 100 = 12.7$ MJ/kg DM
Adult pigs: $MEa_{Uusi} = 13.5 \times 95.8 / 100 = 12.9$ MJ/kg DM

7. The ratio of net energy and metabolizable energy is calculated using general coefficients.

$NE/ME_{New} = NE/ME_{Ref} + ((5.5 \times (Fat_{New} - Fat_{Ref}) + 1.5 \times (Starch_{New} - Starch_{Ref}) - 2.8 \times (Protein_{New} - Protein_{Ref}))/ME_{New}$

Growing pigs:

$NE/MEg_{New} = 76.6 + ((5.5 \times (2.2 - 1.65) + 1.5 \times (60.0 - 52.3) - 2.8 \times (11.9 - 9.87)) / 12.7 = 77.3\%$

Adult pigs:

$NE/MEa_{New} = 76.7 + ((5.5 \times (2.2 - 1.65) + 1.5 \times (60.0 - 52.3) - 2.8 \times (11.9 - 9.87)) / 12.9 = 77.4\%$

8. Net energy (NE, MJ/kg DM), is calculated as follows

$NE_{New} = ME_{New} \times (NE/ME_{New}) / 100$

Growing pigs: $NEg_{New} = 12.68 \times 77.3 / 100 = 9.80$ *MJ/kg DM*

Adult pigs: $NEa_{New} = 12.95 \times 77.39 / 100 = 10.0$ *MJ/kg DM*

Example 2. Calculation of total nitrogen digestibility of barley (hlp 60-64 kg) for growing and adult pigs using EvaPig® reference feed.

Nitrogen digestibility (reported separately for growing and adult pigs in the Luke Feed Tables) is used to calculate the amount of digestible crude protein. The EvaPig® program is the preferred tool for calculating total nitrogen digestibility, with information on the chemical composition of the new feed.

The total nitrogen digestibility (Ns) of the new feed material is calculated from the reference feed material using the common coefficients for protein and fibre (Tables 9 and 10). The coefficients are different for growing and adult pigs. For the example barley, the crude fibre and NDF contents are known (Table 8).

Table 8. Chemical composition of barley used as reference feed in EvaPig® programme and barley (60–64 kg/hl) from Feed Tables.

	Barley EvaPig® Reference feed (Ref)	1002 Barley (60–64 kg/hl) (New)
	% of DM	
Crude protein	9.87	11.9
Crude fibre	4.68	5.4
NDF	18.73	21.0

Table 9. Nitrogen digestibility of barley used as reference feed in EvaPig® programme.

	Nitrogen digestibility (Nd_{ref})
Growing pig	74.7
Adult pig	79.8

Table 10. The coefficients of fibre and protein used in calculation of nitrogen digestibility.

		a (protein)	b (fibre)
Growing pig	Crude fibre	0,69	-1,21
	NDF	0,79	-0,69
Adult pig	Crude fibre	0,77	-0,87
	NDF	0,86	-0,44

1. Nitrogen digestibility for growing pigs (Ndg) is calculated as followed

$Ndg_{NewCrudefibre} = Ndg_{Ref} + a \times (Protein_{New} - Protein_{Ref}) + b \times (Fibre_{New} - Fibre_{Ref})$
$Ndg_{NewNDF} = 74.7 + 0.79 \times (11.9 – 9.87) – 0.69 \times (21.0 – 18.73) = 74.7\%$
$Ndg_{NewCrudefibre} = 74.7 + 0.9 \times (11.9 – 9.87) – 1.21 \times (5.4 – 4.68) = 75.2\%$

The nitrogen digestibility is presented as the mean of the values calculated using the equations.

$Ndg_{New} = (Ndg_{NewNDF} + Ndg_{NewCrudefibre}) / 2$
$Ndg_{New} = (74.7 + 75.2) / 2 = 74.9\%$

2. Nitrogen digestibility for adult pigs (Nda) is calculated with same equations as for growing pigs, except using coefficients of adult pigs.

$Nda_{NewNDF} = 79.8 + 0.86 \times (11.9 – 9.87) - 0,.4 \times (21.0 – 18.7) = 80.5\%$
$Nda_{NewCrudefibre} = 79.8 + 0.77 \times (11.9 – 9.87) – 0.87 \times (5.4 – 4.68) = 80.7\%$
$Nda_{New} = (80.5 + 80.7) / 2 = 80.6\%$

3. Digestible crude protein (dCP, g/kg DM) is calculated separately for growing and adult pigs.

$dCP = Nd_{New} / 100 \times Protein_{New} \times 10$
Growing pigs: $dCPg_{New} = 74.9 / 100 \times 11.9 \times 10 = 89.2$ g/kg DM
Adult pigs: $dCPa_{New} = 80.6 / 100 \times 11.9 \times 10 = 95.9$ g/kg DM

Links:
EvaPig® handbook:
https://en.evapig.com/resources/media/EvaPig_ManualEquations.pdf

2.4. Poultry

2.4.1. Energy value

The energy value of the feeds for poultry is expressed as megajoules (MJ) of metabolizable energy (ME). The energy values in Table 11 below are apparent metabolizable energy values corrected to zero nitrogen balance (AME_N, **A**pparent **M**etabolizable **E**nergy, N-corrected, poultry). They are calculated based on a method presented by WPSA in 1986, which for many feed groups is based on the regression equations presented in Table 11.

If it was not possible to form a regression equation, the energy value should be calculated from digestible nutrients according to the following formula (D).

(D) ME (MJ) = (18.03 × dCP + 38.83 × dCFat + 17.32 × dNFE) / 1000,

where dCP = digestible crude protein, g/kg DM
dCFat = digestible crude fat, g/kg DM
dNFE = digestible nitrogen free extract, g/kg DM.

The concentration of a digestible nutrient (e.g. dCP) is calculated by multiplying the concentration of a nutrient (e.g. CP) by its own digestibility coefficient (e.g. CPd). The digestibility

coefficients for the different nutrients are given in the Feed Tables. The digestibility coefficients for crude protein, crude fat and nitrogen-free extracts given in the feed tables are average values obtained from different European sources.

The code in the formula column of the Feed Table indicates the regression equation used for the calculation of the ME value (Table 11) or, if the code is D, the calculation is based on the formula (D). The energy coefficient for sugar (S) is taken from the Dutch feed tables (CVB 1991).

Examples of calculations using the different equations can be found in section 2.4.2.

Table 11. The coefficients presented by WPSA to calculate the energy value of feeds for poultry.

No		Regression coefficients						
		DM	Ash	CP	CFat	CF	Sta	Sug
R1	Barley, multirows	9.258	-9.258				6.810	
R2	Barley, tworows	9.258	-9.258				7.516	
R3	Oats	12.98	-12.98		48.82	-25.50		
R4	Barley by-products	13.74	-13.74			-35.58	2.913	
R5	Maize by-products	17.72	-17.72	-9.931	11.73	-69.34		
R6	Rice by-products	19.54	-19.54	-29.10	17.97	-34.29		
R7	Wheat by-products	16.78	-16.78			-69.20		
R8	Tapioca	16.38	-16.38			-34.64		
R9	By-products from ethanol production	16.38	-16.38	-4.066		-26.70		
R10	Sunflower by-products (shelled)	2.626	-2.626	10.62	26.20			
R11	Meat and meat-and-bone meals	14.20	-19.15		25.10			
R12	Fish meals	15.01	-14.26		17.61			
E1	Groundnut by-products	12.42			25.50	-25.47		
E2	Cotton seed by-products	8.898			19.72	-12.97		
E3	Sunflower by-products (not shelled)	11.17			32.30	-21.43		
S	By-products from sugar industry							17.32

DM=dry matter, Ash=Ash, CP=crude protein, CFat=crude fat, CF=crude fibre, Sta=starch and Sug=sugars, kg/kg DM. Sources: Equations D, R1 - E3: European Federation of Branches of the World's Poultry Association (1986); equation S: CVB (1991, 1992)

Energy value of a feed mixture

The energy value of feed mixtures for poultry is presented as nitrogen corrected apparent metabolizable energy. It is calculated based on the EU Regulation (EC 152/2009 annex VII) from the chemical composition of the feed mixture:

ME (MJ/kg) = (15.51 × CP + 34.31 × CFat + 13.01 × sugar + 16.69 × starch) / 1000,

where feed composition is expressed as g/kg with a default DM concentration of 880 g/kg. The acceptable energy value deviation calculated with this equation is ± 0.4 ME MJ/kg.

2.4.2. Examples of feed value calculations

Table 12. Calculating the energy value of a batch of barley (feed code 1002). The regression equation R1 is used for the calculation, which is intended for multirow barley. If the batch of barley is two-row barley, equation R2 gives a slightly higher energy value.

	Concentration, g/kg DM	Coefficient, kJ/g	ME, MJ/kg DM
DM	1 000	9.258	9.26
Ash	29	-9.258	-0.27
Starch	600	6.810	4.09
Total			13.1

ME, MJ/kg DM = (9.258 × 1000 – 9.258 × 29 + 6.810 × 600) / 1000 =13.1 MJ/kg DM

Table 13. Calculating the ME value for soya bean meal (feed code 2012). The calculation is based on the energy values of digestible nutrients using equation D.

	Concentration, g/kg DM	Digesti-bility	ME, MJ/kg digestible nutrients	ME, MJ/kg DM
Crude protein	520	0.87	18.03	8.15
Crude fat	34	0.50	38.83	0.66
Nitrogen free extract	321	0.36	17.32	2.01
Total				10.8

ME, MJ/kg DM=(520 × 0.87 × 18.03 + 34 × 0.50 × 38.83 + 321 × 0.36 × 17.32) / 1000 = 10.8 MJ/kg DM

3. Using the Feed Tables

The main objective of the Feed Tables is to present the nutritional values of feeds that are as reliable as possible and that reflect well the relative differences between feeds in terms of their production impact. Both the calculation methods and the feed values should be based on the results of scientific studies.

When using Feed Tables, it should be borne in mind that the nutritional value of a feed is influenced not only by the chemical composition and calculated feed values but also by other factors. A feed may influence the digestibility and voluntary intake of the whole ration in ruminants, may improve or disturb the balance of nutrients in the diet, or may have positive or negative associative effects on both digestibility and metabolism within the animal.

When calculating feed values, the equations and coefficients for the corresponding animal species presented in the Feed Tables should be used. For horses, the coefficients for ruminants are used. If compositional data have been analysed for a batch of feed, feed values may be calculated using the equations and digestibility coefficients for the reference feeds given in previous chapters, but with the analytical data for the batch of feed in question inserted in the equation. Feed Table values for cereals and other concentrate feeds can be used with reasonable accuracy in planning of ruminant diets. However, the composition of forages varies widely between batches due to variations in cultivation, harvesting and preservation techniques and weather conditions. Given the high proportion of forages in the diet of ruminants, analysis of the feed batches used in the diet is of paramount importance.

3.1. The format of Feed Tables

The Feed Tables show the composition and feed values for ruminant, pig, and poultry feeds in separate Tables for each species. Each feed has its own number, and its basic chemical composition remains the same in the Tables for the different animal groups, whereas the feed values are specific to the animal groups.

The feeds are grouped into specific categories. The feed number starts with the category number and the last three digits identify the feed within the category. The feed categories are:

1 Grains and seeds
2 Cakes and meals
3 Plant by-products
4 Feeds of animal origin
5 Roots, tubers, fruits and cabbages
6 Fresh forages and pasture
7 Grass silages
8 Other silages
9 Hay and artificially dried grasses
10 Straw
11 Minerals
90 Other feeds

The presentation of the numerical data in the Feed Tables follows the SI system (Système international d'unités). The composition of feeds is expressed in g/kg DM and digestibility coefficients are expressed as fractions. Expression as a fraction indicates the amount of digestible matter (g) in relation to the total amount of matter (g), but since the same unit appears in the numerator and denominator, they are reduced, and the unit is not shown at all. The use of SI units simplifies feed calculations, since, for example, the amount of digestible ingredient can be calculated directly by multiplying the concentration by the digestibility without any modification. Percentages (%) are also used in calculating feed values for pigs. The ways of representing the units are illustrated by the example in Table 14.

If no representative data are available in the Tables, they are replaced by two dots (..), while a numerical value of 0 means that the value is 0.

Table 14. Example of presentation of feed data in SI units (g/kg DM and proportions) and percentages.

Feed code	Feed	Crude protein concentration		Crude protein digestibility	
		g/kg DM	%	proportion (g/g)	%
1002	Barley, 60–64 kg/hl	119	11.9	0.68	68

3.2. Feed values are expressed on dry matter basis

The dry matter content is a very important information for animal feeding, as only the dry matter in the feed provides nutrients to the animals. Feed Tables give indicative dry matter contents for feed materials. In some contexts, especially for cereals, the moisture content may also be used instead of the dry matter content. It is therefore important to check which one is being used.

The dry matter content of feed can vary considerably, especially in the case of moist feeds that can be dried to varying degrees, such as grass silage and moist by-products. Feed composition and feed values are expressed on dry matter basis and are therefore not affected by the dry matter content of an individual feed batch. However, in practical feeding of animals it is important to know the dry matter content of feeds, as this is the only way to estimate the amount of nutrients that animals receive.

The dry matter content of grass silage in the Tables is 350 g/kg, which corresponds to a typical wilted feed under Finnish conditions. Depending on the degree of wilting, the dry matter content can vary considerably and, especially for horses, highly dried grass feeds are used, which can have a dry matter content of 500-700 g/kg. The average dry matter content of grass silage is around 350 g/kg (Salo et al. 2014), but there is a large variation between batches. The average dry matter content of air-dried concentrates is about 860 g/kg, i.e. they contain about 140 g/kg moisture. In EU regulations, a moisture content of 120 g/kg is used for concentrate feeds.

3.3. Updates since the 2015 publication

Main updates made since the previous publication of Feed tables and Nutrient Requirements (Luke 2015):

- Nutrient requirements of suckler cows have been added
- Individual new feeds have been added to the feed tables
    - Hemp feeds (seed, meal and bran)
    - Faba bean meal
    - Pea and faba bean stands and silages
    - Lucerne containing silages
    - Maize silages
- Individual feed compositions have been updated
- The names of the feeds have been clarified
- The indigestible fibre (iNDF) values have been added for ruminants
- The DM content of all silage has been changed to 350 g/kg
- Mineral and vitamin requirements of horses have been updated
- Feed Tables and formulas have been updated for improved clarity

4. Energy and nutrient requirements

The animal needs energy, protein, fatty acids, minerals, vitamins and water for maintenance and production. An animal obtains all of these from feeds, in addition of drinking water. Maintenance refers to the basic functions of the body such as heartbeat, blood circulation, breathing, endocrine function and maintaining muscle tension. Production means absorbing of nutrients to tissues, as well as the removal of nutrients in products, the growth of muscle and fat tissues (change in body weight), foetal growth (pregnancy), milk production, egg production, wool/fur growth and muscle work.

Nutrient requirements refer to the average amount of energy, protein, minerals, and vitamins used by animals for maintenance and production. Nutrient requirements are the counterpart of feed values in ration formulation. The requirements are based on research materials where the consumption of nutrients in a given situation have been measured. A safety margin is generally added to the requirements. Animals today are not thought to have a certain standardized need for energy and nutrients, but rather the milk yield or growth achieved is a response to the energy and nutrient supply from feeds within the animal's genetic potential (Huhtanen & Nousiainen 2012). However, nutrient requirements give an estimate of the average energy and protein consumption in a given situation.

4.1. Energy and nutrient requirements of ruminants

4.1.1. Energy requirements of dairy cows

The energy and protein requirements of dairy cows (Tables 15 and 16) are based on research results in animal groups where the energy balance has been close to zero. They may not be suitable as such for a single cow, especially in the early part of the lactation, when the use of tissue stores can match the need for up to nearly 20 kilograms of milk.

The maintenance requirements of energy and protein for a dairy cow are determined by the weight of the cow, which is expressed as metabolic live weight (live weight (kg) to the power of 0.75). The live weight can be determined either by weighing the animal or by estimating the circumference of the chest and the length of the body. The production requirements of energy and protein for a dairy cow comprise milk production, increased live weight (growth) and pregnancy (foetus). Energy-corrected milk (ECM) yield is used to calculate the production requirements.

It is recommended to distribute protein feeds evenly over the different stages of the lactation. Such a protein feed distribution strategy also supports the sustainability of cows, as the energy deficit decreases at the beginning of the lactation, but on the other hand, during the end of lactation, the protein promotes milk production and may reduce fat deposition of cows. The practice has also been shown to work in feeding experiments (Mäntysaari et al. 2005).

Table 15. Energy requirements of dairy cows (MJ/day).

Maintenance (MJ/day)	Live weight$^{0.75}$ kg × 0.515 MJ/kg
Milk production (MJ/day)	5.15 MJ/kg ECM × ECM, kg/day
Live weight change (MJ/day)	34 MJ × kg live weight gain 28 MJ × kg live weight loss
Pregnancy (MJ/day)	7th month: 11 MJ/day 8th month: 19 MJ/day 9th month: 34 MJ/day

ECM=energy corrected milk

An example of the energy requirement of a cow that weighs 650 kg and produces 40 kg energy corrected milk (ECM) per day:

Energy requirement (MJ ME/day) = 650$^{0.75}$ kg × 0.515 MJ/kg + 5.15 MJ/kg ECM × 40 kg ECM/day = 272 MJ ME/day

An example of the energy requirement of a cow that weighs 550 kg and produces 20 kg energy corrected milk (ECM) per day:

Energy requirement (MJ ME/day) = 550$^{0.75}$ kg × 0.515 MJ/kg + 5.15 MJ/kg ECM × 20 kg ECM/day = 161 MJ ME/day

The effects of housing type, grazing or temperature are not taken into account in energy requirements of dairy cows.

Correction equation for energy intake

The feed evaluation system uses constant feed values irrespective of the feeding situation. The feeds do however have important associative effects, which can be taken into account by using correction equations. The following correction equation is based on a large data set of production experiments (Huhtanen et al. 2009):

Corrected ME-intake (MJ/day)
=Uncorrected ME-intake (MJ/day) - (-56.7+6.99×MEm+1.621×DMI-0.44595×CP+0.00112×CP^2),

where:

DMI = dry matter intake, kg/day
MEm = Uncorrected ME concentration of the diet, MJ/kg DM
CP = Crude protein concentration of the diet, g/kg DM

The correction equation indicates that ME intake is reduced, when:

- Dry matter intake increases
- Diet has a high energy value
- Diet has a low crude protein concentration (the effect is curvilinear so that the benefits from increased crude protein concentration become smaller at higher concentrations)

In some cases (particularly for dry cows with low feed intake and energy concentration in the diet), the correction term produces negative values. In that case, the energy intake will increase compared to the calculate D-values. The increase will be taken into account up to 2 MJ/day.

The energy corrected milk (ECM) yield can be calculated according to Sjaunja et al. (1990) based on milk yield and milk fat, protein and lactose concentrations (g/kg):

$$ECM\ (kg) = Milk\ production\ (kg) \times (38.3 \times fat + 24.2 \times protein + 16.54 \times lactose + 20.7)/3140$$

If lactose concentration has not been determined, the following equation can be used:

$$ECM\ (kg) = Milk\ production\ (kg) \times (38.3 \times fat + 24.2 \times protein + 783.2)/3140$$

4.1.2. Protein requirements of dairy cows

Metabolizable protein (MP)

The average daily consumption of MP is calculated on the basis of live weight, dry matter intake, ECM and protein output. Live weight change and the extra requirement for pregnancy during three last months of it are also taken into account (Table 16).

Table 16. Average consumption of metabolizable protein (MP) of dairy cows, g/day.

Maintenance (g/day)	1.8 g × live weight$^{0.75}$ kg + 14 g × DMI, kg/day
Milk production (g/day)	(1.47 – 0.0017 × ECM, kg/day) × protein yield, g/day
Live weight change (g/day)	233 g × kg live weight gain 138 g × kg live weight loss
Pregnancy (g/day)	7th month: 75 g/day 8th month: 135 g/day 9th month: 205 g/day

ECM=energy corrected milk

An example of MP requirements of a dairy cow, that weighs 650 kg, consumes 25.3 kg DM/day, produces 40 kg energy corrected milk (ECM) and 1240 g milk protein per day:

$$MP\ (g/day) = 1.8 \times 650^{0.75} + 14 \times 25.3 + (1.47 - 0.0017 \times 40) \times 1240 = 2324$$

An example of MP requirements of a dairy cow, that weighs 550 kg, consumes 14.9 kg DM/day, produces 20 kg energy corrected milk (ECM) and 620 g milk protein per day:

$$MP\ (g/day) = 1.8 \times 550^{0.75} + 14 \times 14.9 + (1.47 - 0.0017 \times 20) \times 620 = 1303$$

If the dry matter intake of the cow is not known, it can roughly be estimated using the energy requirement and an average diet energy concentration (i.e. 11.5 MJ ME/kg DM). This method assumes that the cow is in energy balance (not using or building body energy reserves).

Example: A cow weighs 650 kg and produces 30 kg ECM/day, so that her energy requirement is 221 MJ ME/day.

$$Dry\ matter\ intake\ (kg/day) = 221\ MJ\ ME/day\ /\ 11.5\ MJ\ ME/kg\ DM = 19.2\ kg\ DM/day$$

Protein balance in the rumen (PB)

Ruminal protein degradation and consumption are in balance when the average diet PB value is close to zero. In ration formulation, negative diet PB values should not be accepted for dairy cows.

If the PB of the diet is negative, the rumen microbes suffer from nitrogen deficiency. In this case, the production of microbial protein is reduced, and the calculated MP intake is not realized. If the PB of the diet is negative, feeds with a positive PB values should be added. Feeds that contain a lot of non-protein nitrogen, such as grass silage and, theoretically, urea, are also suitable for this purpose. However, in the practical feeding of dairy cows, negative PVT is rarely encountered.

If the PB of the diet is very positive, the microbes have an excess of rumen degradable protein relative to their need, which decreases nitrogen use efficiency and wastes feed protein. Excess feed protein broken down in the rumen is absorbed into the bloodstream as ammonia. Ammonia is converted into urea in the liver and most of it is excreted with urine, and milk urea level is also elevated. Abundant PB overload puts a strain on the cow's metabolism and the formation of urea increases energy consumption. In addition, the environmental load increases.

The adequacy of nitrogen for rumen microbes can be estimated from milk urea concentration, which should be over 17–18 mg/dl.

4.1.3. Energy requirements of suckler cows

The energy and protein requirements of suckler cows are based on maintenance of body functions, milk production, pregnancy and changes in live weight (condition score). Nutrient requirements of suckler cows (Tables 17 and 21) are mainly based on those for dairy cows.

The energy and protein requirements of dairy cows are calculated using energy corrected milk yields. For suckler cows, the calculation of energy corrected milk yields is unnecessary due to many uncertainties. It is most practical to use the estimated milk yield as the basis for the calculation. The average milk protein content of 31 g/kg milk from Finnish suckler cow studies can be used to calculate the milk protein yields of suckler cows (Manninen 2007).

Table 17. Metabolizable energy requirements of suckler cows, MJ/day.

Maintenance (MJ/day)	Live weight$^{0.75}$ kg × 0.515 MJ/kg
Milk production (MJ/day)	5.15 MJ/kg milk × kg milk/day
Pregnancy (MJ/day)	7th month: 11 MJ/day 8th month: 19 MJ/day 9th month: 34 MJ/day
Live weight change (MJ/day)	34 MJ × kg live weight gain 28 MJ × kg live weight loss

An example of maintenance energy requirement for a suckler cow that weighs 700 kg and is in a body condition score 3.0. No conditioning requirement:

$$\textit{Energy requirement (MJ ME/day)} = 700^{0.75}\ \textit{kg} \times 0.515\ \textit{MJ/day} = 70\ \textit{MJ/day}$$

Table 18. Maintenance energy requirements (MJ/day) for suckler cows at different live weights (body condition score 3.0, no conditioning requirement).

Live weight, kg	550	600	650	700	750	800	850	900
Energy requirement, MJ/d	59	62	66	70	74	78	81	85

Effect of body condition score on energy requirements

One condition score unit corresponds to 45-60 kg of cow live weight. The weight of one condition score unit and the amount of energy it contains varies by the animal breed type and size. Body condition score change can be calculated by using live weight change, if it is known how many kilograms an increase or decrease of one condition score corresponds to.

Table 19. The target body condition score (BCS) is 3.0. Increasing the condition score increases the energy requirement (+). Decreasing the condition score decreases the energy requirement (-).

BCS, scale 1–5	Target BCS	Energy requirement change, proportion of maintenance energy requirement	
		%	Coefficient
1.0	1.5	+37	+0.37
1.5	2.0	+28	+0.28
2.0	2.5	+19	+0.19
2.5	3.0	+9	+0.09
3.0	3.0	0	0
3.5	3.0	-9	-0.09
4.0	3.5	-16	-0.16
4.5	4.0	-22	-0.22
5.0	4.5	-27	-0.27

Example: A suckler cow weighs 700 kg and is in a body condition score 2.0. The conditioning requirement is one condition score unit (2.0 ->3.0).

Increasing the condition score 2.0 →2.5:

$$\textit{Energy requirement (ME MJ/day)} = 700^{0.75}\ \textit{kg} \times 0.515\ \textit{MJ/kg} \times 1.19 = 83\ \textit{MJ/day}$$

Increasing the condition score 2.5 →3.0:

$$\textit{Energy requirement (ME MJ/day)} = 700^{0.75}\ \textit{kg} \times 0.515\ \textit{MJ/kg} \times 1.09 = 76\ \textit{MJ/day}$$

Increasing the condition score should be done before the last two months of pregnancy.

Example: A suckler cow weighs 700 kg and is in a body condition score 4.0.
Decreasing the condition score 4.0 → 3.5:

$$\textit{Energy requirement (MJ ME/day)} = 700^{0.75}\ \textit{kg} \times 0.515\ \textit{MJ/kg} \times 0.84 = 59\ \textit{MJ/day}$$

Effect of pregnancy on energy requirements

Example: An example of energy requirement during the last two months of pregnancy for a suckler cow that weighs 700 kg and is in a body condition score 3.0.

8th pregnancy month:

$$\textit{Energy requirement (MJ ME/day)} = 700^{0.75}\ \textit{kg} \times 0.515\ \textit{MJ/kg} + 19 = 89\ \textit{MJ/day}$$

9th pregnancy month:

$$\textit{Energy requirement (MJ ME/day)} = 700^{0.75}\ \textit{kg} \times 0.515\ \textit{MJ/kg} + 34 = 104\ \textit{MJ/day}$$

The effect of lactation on energy requirement

Table 20. Average milk production of different beef breeds, kg/day.

Milk production/yield, kg/day	Low	Moderate	High	Very high
	Less than 7 kg/day	8 kg/day	10 kg /day	More than 14 kg/day
Breed type	Blonde d'Aquitaine, Limousin, Highland Cattle	Charolais, Hereford	Angus	Simmental – Simmental-crossings
Production age	First lactation (ab, ba, ch, hf, li, hc)	First lactation (si)		

ab= Aberdeen Angus, ba= Blonde d'Aquitaine, ch= Charolais, hf= Hereford, li= Limousin, hc= Highland Cattle, si = Simmental

Example: An example of energy requirement during the lactation for a suckler cow of Hereford breed that weighs 700 kg and is in a body condition score 3.0. Moderate milk production. No conditioning requirement:

$$\textit{Energy requirement (MJ ME/day)} = (700^{0.75}\ \textit{kg} \times 0.515\ \textit{MJ/kg}) + (5.15\ \textit{MJ/kg} \times 8\ \textit{kg/day})\ 111\ \textit{MJ ME/day}$$

Example: An example of energy requirement during the lactation for a suckler cow of Simmental breed that weighs 850 kg and is in a body condition score 3.0. Very high milk production. No conditioning requirement:

$$\textit{Energy requirement (MJ ME/day)} = (850^{0.75}\ \textit{kg} \times 0.515\ \textit{MJ/kg}) + (5.15\ \textit{MJ/kg} \times 14\ \textit{kg/day}) = 153\ \textit{MJ ME/day}$$

Example: An example of energy requirement during the lactation for a suckler cow of Hereford breed that weighs 700 kg and is in a body condition score 2.5. Moderate milk production. Conditioning requirement: 0.5 condition score:

Energy requirement (MJ ME/day) = ($700^{0.75}$ kg × 0.515 MJ/kg × 1.09) + (5.15 MJ/kg × 8 kg/day) = 118 MJ ME/day

Example: An example of energy requirement during the lactation for a suckler cow of Simmental breed that weighs 850 kg and is in a body condition score 2.0. Very high milk production. Conditioning requirement: one condition score:

Increasing the condition score 2.0 → 2.5:

Energy requirement (MJ ME/day) = ($850^{0.75}$ kg × 0.515 MJ/kg × 1.19) + (5.15 MJ × 14 kg/day) = 169 MJ ME/day

Increasing the condition score 2.5 → 3.0:

Energy requirement (MJ ME/day) = ($850^{0.75}$ kg × 0.515 MJ/day × 1.09) + (5.15 MJ × 14 kg/day) = 161 MJ ME/day

4.1.4. Protein requirements of suckler cows

Table 21. Metabolizable protein (MP) requirement of suckler cows (g/day).

Maintenance (g/day)	1.8 g × live weight$^{0.75}$ + 14 × DMI[1)], kg/day
Milk production (g/day)	(1.47 – 0.0017 × kg milk, kg/day) × protein yield[2)], g/day
Live weight change (g/day)	233 g × kg live weight gain 138 g × kg live weight loss
Pregnancy (g/day)	7th month: 75 g/day 8th month: 135 g/day 9th month: 205 g/day

1) DMI=dry matter intake
2) Protein yield (g/day) = milk yield (kg/day) × milk protein content (g/kg).
The protein content of milk can be taken as 31 g/kg.

Dry matter intake of suckler cows

If the dry matter intake of the suckler cow is not known, it can be roughly estimated using the body weight and forage digestibility (D-value) when the suckler cows are fed *ad libitum* (Table 22).

Table 22 Estimating the dry matter intake of suckler cows during different stages of production.

Forage quality	D-value	Maximum DM intake, kg DM/d, as proportion of body weight					
		Maintenance		Pregnancy, last month		Lactation	
	g/kg DM	%	kg/kg	%	kg/kg	%	kg/kg
Low	Below 600	1.8	0.018	1.2	0.012	2.2	0.022
Moderate	600–670	2.2	0.022	2.0	0.020	2.5	0.025
High	Over 670	2.5	0.025	2.3	0.023	2.7	0.027

Example: Maintenance period, body weight 700 kg, forage D-value 630 g/kg DM.

Dry matter intake (kg DM/day) = 700 kg × 0.022 kg/kg = 15.4 kg DM/day

Example: Lactation, body weight 700 kg, forage D-value 650 g/kg DM.

Dry matter intake (kg DM/day) = 700 kg × 0.025 kg/kg = 17.5 kg DM/day

Effect of pregnancy on intake

During the last month of pregnancy, dry matter intake decreases 0.2% (0.002) of body weight when forage D-value is over 600 g/kg DM.

Example: Dry matter intake during the last month of pregnancy. Live weight 700 kg. Forage D-value 630 g/kg DM.

Dry matter intake (kg DM/day) = 700 kg × (0.022-0.002) = 14.0 kg DM/day

During the last month of pregnancy, dry matter intake decreases 1.2% (0.012) of live weight when forage D-value is below 600 g/kg DM.

Example: Dry matter intake during the last month of pregnancy. Live weight 700 kg. Forage D-value less than 600 g/kg DM.

Dry matter intake (kg DM/day) = 700 kg × 0.012 = 8.4 kg DM/day

Effect of breed type

Dry matter intake of Limousin and Blonde d'Aquitaine suckler cows is 2.0 kg DM/day less during the maintenance period and 1.7 kg DM/day less during the lactation period compared to other breeds.

Example: Dry matter intake of a Limousin suckler cow during the maintenance period. Body weight 800 kg. Forage D-value 630 g/kg DM.

Dry matter intake (kg DM/day) = 800 kg × 0.022 – 2 = 15.6 kg DM/day

Effect of body condition score

If body condition score is below 3.0, dry matter intake increases 10%.

Example 4: Dry matter intake during the maintenance period. Body weight 700 kg. Body condition score 2.0. Forage D-value 630 g/kg DM.

Dry matter intake (kg DM/day) = 700 kg × 0.022 × 1.1 = 16.9 kg DM/day

If body condition score is over 4.0, dry matter intake decreases 10%.

Example 5: Dry matter intake during the maintenance period. Body weight 700 kg. Body condition score 4.0. Forage D-value 630 g/kg DM.

Dry matter intake (kg DM/day) = 700 kg × 0.022 x 0.9 = 13.9 kg DM/day

Model calculations for MP requirements during different stages of production

Maintenance period

Body weight 700 kg. Body condition score 3.0. Forage D-value 600 g/kg DM. *Ad libitum* feeding.

$$MP\ requirement\ (g/day) = 1.8 \times 700^{0.75} + 14 \times (700\ kg \times 0.018) = 421\ g/day$$

Pregnancy

Body weight 700 kg. Body condition score 3.0. Forage D-value 630 g/kg DM. 9th pregnancy month. *Ad libitum* feeding.

$$MP\ requirement\ (g/day) = 1.8 \times 700^{0.75} + 14 \times (700\ kg \times ((0.022-0.02)) + 205 = 646\ g/day$$

Lactation

Body weight 700 kg. Body condition score 3.0. Moderate milk production, 8 kg/day. Forage D-value 650 g/kg DM. *Ad libitum* feeding.

$$MP\ requirement\ (g/day) = 1.8 \times 700^{0.75} + 14 \times (700\ kg \times 0.025) + (1.47 - 0.0017 \times 8) \times (8 \times 31) = 851\ g/day$$

Protein balance in the rumen (PB) requirement

Ruminal protein degradation and consumption are in balance when the average diet PB value is close to zero. During the maintenance period, the PB value can be -20 g per each kg of dry matter intake. During the lactation, the PB value should not be negative.

4.1.5. Energy and nutrient requirements of growing cattle

The growth rate affects the nutritional requirements of animals, and, on the other hand, feeding intensity influences growth. The breed, sex, and purpose of growing cattle influence the feeding choices, as for example dairy replacement heifers are fed differently from bulls of beef breed. Further, nutritional requirements vary at different stages of growth.

Nutrient requirements of growing animals are calculated based on live weight and daily growth rate. The recommendations are given for animals in a loose-house environment. The energy requirements of growing beef breed cattle are about 10% lower than those of dairy breed cattle. All energy recommendations are expressed in MJ of metabolizable energy.

Calves

Table 23. Energy and protein requirements of calves.

Age, months	Live weight, kg	Growth, g/d	MJ ME/d	g MP/d
0–1	50	400–600	15	180
1–2	70	800–1000	25	260
2–3	90	800–1000	30	300

Growing bulls

The energy requirements (Table 24) are based on the equation of AFRC (1990). The coefficients have been modified according to Finnish research results. The requirements are presented for dairy breed animals. For beef breeds and crossings, the energy requirement is approximately 10% lower. The requirements are presented for animals in a loose-house environment. The growth rate (g/d) indicates the growth at the period between the denoted live weight range, not averaged over the whole growing period.

Table 24. Metabolizable energy requirements of growing bulls (MJ ME/day).

Live weight, kg	Growth, g/d													
	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
	Metabolizable energy requirement, MJ/d													
100–150	35	37	40	42	44	47	50	54	57	61	66			
150–200	44	46	49	51	54	58	61	65	69	73	78	84		
200–250	51	54	57	60	64	67	71	75	80	85	91	97	104	
250–300	59	62	65	69	73	77	81	86	91	97	103	110	118	121
300–350	66	69	73	77	81	85	90	96	101	108	115	122	131	141
350–400	73	76	80	85	89	94	99	105	111	118	126	134	144	154
400–450	79	83	87	92	97	102	108	114	121	129	137	146	156	167
450–500	85	90	94	99	105	110	116	123	130	138	147	157	168	180
500–550	91	96	101	106	112	118	125	132	140	148	157	168	179	192
550–600	97	102	107	113	119	126	132	140	148	157	167	178	190	204
600–650	103	108	114	120	126	133	140	148	157	166	176	188	201	215
650–700	108	114	120	126	133	140	147	156	165	175	186	198	211	
700–750	114	120	126	132	139	147	155	163	173	183	194	207		
750–800	119	125	131	138	145	153	161	171	180	191	203			

Growing heifers

Energy requirements of growing heifers are calculated based on live weight and daily growth rate (Table 25). The pregnancy addition is calculated similarly as for lactating cows (Table 15).

Table 25. Energy requirements of growing heifers (MJ ME/day).

Live weight, kg	Growth, g/d										
	500	600	700	800	900	1000	1100	1200	1300	1400	1500
	Metabolizable energy requirement, MJ/d										
100–150	32	34	37	40	44	48	52	57	63		
150–200	39	42	46	49	53	58	63	68	75	82	
200–250	46	50	54	58	62	67	73	79	86	94	104
250–300	53	57	61	66	71	77	83	90	97	106	117
300–350	59	63	68	73	79	85	92	100	108	118	129
350–400	65	70	75	81	87	94	101	110	119	130	142
400–450	71	76	82	88	95	102	110	119	129	141	154
450–500	77	82	88	95	102	110	119	128	139	151	165
500–550	75	80	86	92	99	107	115	125	135	147	161
550–600	79	85	91	98	106	114	123	132	144	156	170
600–650	84	90	97	104	112	120	130	140	152	165	180

Protein requirements of growing cattle

The metabolizable protein (MP) requirements are presented only for cattle under 200 kg live weight (Table 26). For animals over 200 kg, the protein intake is adequate if the protein balance in the rumen (PB) of the total diet is not lower than -10 g per kg DM intake. If an animal eats 8 kg DM per day, the daily dietary PB value may thus be -80 g/day. In that case, the microbial protein synthesized in the rumen and the by-pass protein of the feeds provide enough amino acids for the needs of growing cattle. If PB is more negative, ration should be modified to include more rumen degradable protein.

Table 26. The metabolizable protein (MP) requirements (g/day) for growing cattle (bulls and heifers) at live weight from 100 to 200 kg.

Live weight, kg	Growth, g/d											
	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600
	MP, g/d											
100–150	204	227	251	275	299	323	347	370	394	418	442	466
150–200	239	264	290	315	341	366	391	417	442	467	493	518

4.1.6. Macro and micro mineral and vitamin requirements of cattle

The mineral recommendations for cows and growing cattle are generally based on a Nordic collaborative review (NJF 1975). Feeding recommendations for phosphorus in dairy cows have been reduced in the 2000s.

Table 27. Mineral requirements of dairy cows (g/day). The requirements are presented for a cow of 650 kg live weight.

Milk production, kg/d	g/d					
	Ca	P	Mg (inside)	Mg (grazing)[3)]	Na	K
0	43 [1)]	21 [2)]	15	20	14	80
10	52	29	18	24	19	92
20	80	48	24	33	26	107
30	108	68	31	41	33	121
40	137	87	37	50	40	135
50	165	107	44	59	47	150
60	194	126	50	67	54	164

1) For pregnant heifers, add 10 % during gestation months 8 and 9

2) Corresponds to the requirement at the gestation month 9

3) To prevent grass tetany, additional Mg (20-30 g/day) can be given during the 3-4 first weeks of grazing.

Table 28. Mineral requirements of growing cattle (g/day).

Growth	Live weight, kg	g/d			
		Ca	P	Mg	Na
0.5 kg/d	100	15	9	3	3
	200	18	10	5	5
	300	21	12	7	6
	400	27	13	8	8
	500	33	14	10	10
	600	38	16	12	12
	700	42	17	14	14
1.0 kg/d	100	27	16	5	3
	200	30	17	6	5
	300	33	19	8	7
	400	37	20	10	9
	500	40	22	12	11
	600	44	24	13	13
	700	47	25	15	15
1.5 kg/d	100	40	23	6	4
	200	44	25	8	6
	300	46	26	9	8
	400	51	28	11	10
	500	54	30	13	12
	600	57	32	15	14
	700	61	34	17	16

Table 29. Micro mineral requirements of cattle. The concentrations are presented as mg/kg DM unless otherwise stated.

	mg/kg DM							
	Fe	Cu	Zn	Mn	I	Co	Se	Mo
Calves	100[1)]	10	50[2)]	40	0.1[4)]	[5)]	0.1	0.3
Young cattle	100	10	50	40	0.2[4)]	0.1	0.1	0.3
Dairy cows	100	10	50	40[3)]	0.9[4)]	0.1	0.1	0.3

1) mg per animal per day
2) For grazing calves 80 mg/kg DM
3) During the first 3 months of lactation 80 mg/kg DM
4) When feeds contain goitrogen, 1.3, 1.2 and 2.0 mg/kg DM
5) During milk feeding, 40 micrograms B_{12}-vitamin/kg feed DM

Table 30. Vitamin requirements of cattle, international units (IU/kg DM).

		IU/kg DM		
		Vitamin A	Vitamin D	Vitamin E
Dairy cows	0–3 weeks after calving	4 000	1 000	15
	In milk	3 200	1 000	15
	Dry	4 000	1 200	15
Calves	Liquid feed	3 800	600	40
	Starter concentrate	2 200	300	25
Growing cattle		2 200	300	25

4.1.7. Energy and nutrient requirements of sheep and lactating goats

Table 31. Energy and protein requirements of sheep.

Phase of production	Live weight, kg	ME, MJ/d	MP, g/d
Maintenance	40	6.3	42
	50	7.4	50
	60	8.5	57
	70	9.6	64
	80	10.6	70
	90	11.5	77
	100	12.5	83
Additional requirement for pregnancy			
< 2 lambs	6 weeks before lambing	4.0	20
	Last 2 weeks	8.0	60
> 2 lambs	6 weeks before lambing	5.0	30
	Last 2 weeks	11.0	105
Additional requirement for suckling			
1 lamb		12.0	120
2–3 lambs		19.0	170
3–4 lambs		22.0	210
Additional requirement for ram		6.3	120
Additional requirement for ewes at flushing		3.5	25

ME= metabolizable energy; MP = metabolizable protein

Table 32. Mineral requirements of ewes (80 kg) and growing lambs (20-40 kg) (g/day).

	Calcium (Ca) g/d	Phosphorus (P) g/d	Salt (NaCl) g/d
Ewes at maintenance[1)]	3.2	3.2	10
Ewes at flushing[1)]	4.0	3.2	10
Pregnant ewes[1)]			
Months 1-3 of pregnancy	3.6	3.6	11
Month 4 of pregnancy	4.5	4.2	11
Month 5 of pregnancy	7.0	5.5	12
Lactating ewes[1)], 0–60 days			
Suckling 1 lamb	9.5	7.4	13
Suckling 2 lambs*	11.0	8.5	14
Suckling 3 lambs**	13.6	11.0	15
Suckling twins[2)], 60–120 days	6.0	4.5	10
Lambs (kg), growth 250 g/day			
20–30	5.0	3.0	9
30–40	6.0	3.7	9
Replacement ewe lamb, 40 kg	5.0	2.6	9
Replacement ram lamb, 40 kg	5.0	3.7	9

1) The Ca and P requirements are decreased/increased by 10 % for each 10 kg change in body weight for adult ewes. The average live weight of young ewes lambing for the first time is approximately 50-60 kg. Their requirement is 20 % smaller than presented in the Table and additional 5 g of feed chalk (calcium carbonate, $CaCO_3$) is daily given to them.

*5 g feed chalk (calcium carbonate) per animal per day

**10 g feed chalk (calcium carbonate) per animal per day

2) If ewes are still suckling after 8 weeks of lactation, the requirement of Ca and P is approximately half of that during the first 8 weeks of lactation.

Copper (Cu). Pregnant ewes require approximately 5 mg of copper in kg feed (DM 880 g/kg). Toxicity level is 25 mg/kg. Copper toxicity can occur even at levels of 10–20 mg/kg if simultaneously the feed molybdenum (Mo) concentration is low. The Cu : Mo ratio should be between 4 : 1 and 10 : 1. Meat breeds (e.g. Texel) are more susceptible to copper poisoning than Finnsheep breed.

Selenium (Se). The Se requirement of sheep is approximately 0.1–0.2 mg/kg feed (DM 880 g/kg). If the Se concentration is below 0.1 mg/kg, the sheep will suffer from muscle dystrophy. The toxicity level of Se is 2 mg/kg.

Magnesium (Mg). A sufficient amount of Mg for sheep is 1.5 g/day. In the beginning of grazing season, additional Mg is given to prevent grass tetany. The toxicity level of Mg is 8 g/day.

Table 33. Nutrient requirements of growing lambs.

Live weight, kg	Growth, g/d	ME, MJ/d	MP, g/d
15	200	6.8	86
	300	8.7	115
	400	10.6	141
25	200	10.0	85
	300	12.7	112
	400	15.4	137
	500	18.2	161
35	200	13.0	86
	300	16.6	111
	400	20.2	135
	500	23.7	157
45	200	15.9	87
	300	20.4	112
	400	24.8	135

Table 34. Nutrient requirements of dairy goats.

Live weight, kg	ME, MJ/d	g/d			
		MP	Ca	P	Mg
20	3.7	24	0.78	1.03	0.41
30	5.0	32	1.18	1.55	0.62
40	6.3	40	1.57	2.07	0.82
50	7.4	47	1.96	2.59	1.03
60	8.5	53	2.35	3.10	1.24
Gestation (Additional need):					
Month 4 (/50 kg LW)	1.9–2.5				
Month 5 (/50 kg LW)	2.6–4.6	38			
Milk production:					
MJ ME/kg ECM	5.1	45	2.55	1.90	1.18

4.2. Energy and nutrient requirements of horses

Nutrient requirements of horses are expressed in terms of metabolizable energy and digestible crude protein (Table 35). The mineral and vitamin requirements of horses have been revised for this publication for calcium and phosphorus, copper, zinc and iron (Tables 36 and 37). Vitamin requirements have been revised for fat-soluble vitamins A, D and E (Table 38) (NRC 2007, GfE 2014). Breeding mares are divided into two categories: pregnant mares (last 3 months of pregnancy) and lactating mares (Vervuert 2023).

The energy and protein requirements of horses are based on their live weight and the work intensity. If horse is thinner than this, energy and protein intake should be higher than the presented requirements, and likewise if the horse is fatter, energy and protein intake should be reduced compared to the requirements presented. The live weights correspond to the average weights of different horse breeds: Finnhorse 540–550 kg, warm-blood trotter 440–550 kg, and warm-blood riding horse 560–600 kg in a condition score "good".

The work intensity of horses is classified as light, medium and heavy work. *Light work* means light exercise, such as walking or jogging for about an hour during riding or driving, and the horse is not sweating. This type of exercise is typical for leisure horses (riding or driving) and trotting horses at the beginning of their training. *Moderate work* means exercise with light sweating. This kind of exercise includes jogging with moderate speed, dressage or show jumping training. The work of riding school horses is mostly moderate or heavier than this. The work of racing trotters, driving and eventing horses during their competition season is *heavy work*, which causes clear sweating. This includes speed and power training, and also regular and frequent competing. The amount of exercise is around 6-10 hours per week and exercising can be daily, or the week can include training days with 1–2 days off.

Heartbeat can be used as an aid when determining the intensity and amount of work a horse is doing. During light work, the heartbeat is on average 80 times/min. In moderate work, the heartbeat during the exercise is on average 90–100 times/min and 110–150 times/min during heavy work. During a competition or speed training, the heartbeat can rise significantly above this.

When evaluating the energy requirement, the differences between individuals and breeds should be considered. In practise, regular (between 3–4 weeks) evaluation of the body condition score is enough to evaluate the energy intake and its requirement. This is important not only for horses that are used in riding or driving, but also for pregnant and lactating mares and for young, growing horses.

Table 35. Metabolizable energy (ME) and digestible crude protein requirements (dCP) of horses.

Live weight, kg [1)]	450		550		600	
	ME, MJ/d	dCP, g/d	ME, MJ/d	dCP, g/d	ME, MJ/d	dCP, g/d
Sports (and working) horse [1)]						
Maintenance	57.3	320	70.2	400	76.0	430
Light work	57.3–66.7	405	70.2–81.9	495	76.0–88.9	540
Moderate work	66.7–81.9	480	81.9–99.5	585	88.9–108.8	640
Heavy work	81.9–95.9	640	99.5–117	780	108.8–127.5	850
Pregnant mare, last 3 months of gestation [4)]	65.5–71.3	450	80.5–87.5	550	87.4–95.0	600
Lactating mare, months 1–3 [1, 2)]	95.9	900	117.0	1 100	127.5	1 200
Weaned foal, months 6–12 [1, 3, 4)]	52.6	450	64.4	550	70.2	600
1–3 years old horse [3)]						
Not in training	57.3	410	70.2	500	76.0	545
In training, 1.5–2.5 years	68.0–74.0	450	84.0–91.0	550	91.0–99.0	600

1) The additional energy requirement caused by the outside temperature: Weaned foal +1.4%/degree below 0 °C, young horse +1.4%/degree below -11°C, adult horse +2.7%/degree below -15°C
2) After this, the energy intake is reduced by approximately 15% and protein intake by 30 % for the rest of the lactation.
3) Based on mature weight
4) Lysine 0.5-0.6% in the ration or approximately 0.55 g/MJ

Table 36. Calcium (Ca), phosphorus (P) and magnesium (Mg) requirements of horses (g/day).

Live weight, kg [1)]	450			550			600		
	Ca	P	Mg	Ca	P	Mg	Ca	P	Mg
Sports (and working) horse									
Maintenance	18	13	7	22	16	8	24	17	9
Light work	27	16	9	33	20	10	36	22	12
Moderate work	32	19	10	38	23	13	42	25	14
Hard work	36	26	13	44	32	17	48	35	18
Pregnant mare, last 3 months	32	24	10	40	29	12	43	32	13
Lactating mare, first 1–3 months	47	35	11	63	42	14	69	45	15
Weaned foal, 6–12 months [1)]	28	18	5	31	22	5	34	24	7
1–3 years old horse [1)]									
Not in training	22	14	7	26	17	9	28	19	10
In training, 1.5–2.5 years	38	25	10	46	30	12	50	33	14

1) Based on mature weight

Table 37. Iron (Fe), copper (Cu) and zinc (Zn) requirements of horses (mg/d) (live weight 500 kg).

	Fe	Cu	Zn
Maintenance/light work	500	60	500
Training or working	600	125	600
Pregnant mare, last 3 months	900	125	400
Lactating mare	900	125	500
Weaned foal, 7–12 months	490	75	315

Table 38. Requirements of vitamins A, D and E for horses (live weight 500 kg).

	Vitamin A, IU/day	Vitamin D, IU/day	Vitamin E, mg/day
Maintenance/light work	30 000–40 000	3 000–4 000	400–450
Heavy training/work	40 000–60 000	3 000–5 000	1 500–2 500
Pregnant mare, last 3 months	30 000–40 000	6 000–9 000	800–960
Lactating mare	30 000–36 000	6 000–9 000	1 000–1 200
Weaned foal, 7–12 months	17 000	5 100	400–500

Table 39. Feed dry matter intake of horses as percentage (%) of live weight.

	% of live weight
Lactating mare	
Beginning of lactation	2.0–3.0 %
End of lactation	1.5–2.5 %
Pregnant mare	1.5–2.5 %
Sports and hobby horse	1.5–2.5 %
Foal and young horse	
Weaned	2.5–3.0 %
1 year old	3.0 %
2 years old	2.5 %

Example of dry matter intake calculation for sport and hobby horse, whose live weight is 500 kg:

Dry matter intake 1.5 % of live weight, kg/day = 500 × (1.5/100) = 7.5 kg DM/day
Dry matter intake 2.5 % of live weight, kg/day = 500 × (2.5/100) = 12.5 kg DM/day

Condition scoring of horses

1. **Poor:** No or very thin fatty tissue. Ribs and spinous processes are clearly visible. Neck is very thin.
2. **Thin:** Ribs and spinous processes are still clearly visible. Slight fatty tissue covers the ribs. Neck is thin or moderately or obviously thin.
3. **Moderately thin:** Ribs are slightly visible. Backbone and spinous processes and are covered, back is level. Neck is obviously thin.
4. **Good/Moderate:** Ribs and spinous processes are covered and easily felt with hands. Back is level. Fat around tailhead is beginning to feel soft. Neck blends smoothly into body.
5. **Moderately fleshy:** Fat over ribs feel spongy. Fat on neck and withers and behind shoulders is beginning to be deposited. Fat around tailhead feels soft.
6. **Fat:** Individual ribs can be felt with pressure or are difficult to feel. Area along withers is filled with fat. Noticeable thickening of neck. Fat deposited behind shoulders. Gutter along spine. Fat around tailhead is soft or very soft.
7. **Extremely fat:** Neck, withers area and shoulder are bulging fat. Neck is very thick and broad. Crest grossly enlarged and thickened. To feel the ribs is very difficult or not possible. The backbone is in a deep gutter. Fat around tailhead is bulging.

4.3. Energy and nutrient requirements of pigs

The energy requirements of pigs are presented as megajoules (MJ) net energy (NE) per day, separately for growing pigs (weight under 150 kg, MJ NEg) and for adult pigs (MJ NEa). Protein requirements are presented as g/MJ NE. Amino acid requirements are presented as standardized ileal digestible amino acids as a proportion of energy, g/MJ NE, for growing and adult pigs.

The breeding of pigs develops rapidly, and the breed used in production has affects the nutrient requirements. The changes in the breeds used and genetic improvement of the animals would acquire faster update of nutrient requirements. The requirements shown here are indicative at the time of publication.

Table 40. Energy content per kg DM of a normal complete diet for pigs.

	MJ NE/kg DM
Weaner diets, under 15 kg	11.5–12.0
Weaner diets, 15–25 kg	11.3–11.8
Finisher diets, 25–55 kg	10.8–11.3
Finisher diets, over 55 kg	9.8–10.8
Gestation diets	8.6–10.0
Lactation diets	11.0–12.0

4.3.1. Energy requirements of sows

The aim of presenting the energy requirements is to improve the fertility, longevity and welfare of sows by adequate feeding so that great weight changes during the production cycle are avoided. This is achieved by using condition scoring and modifying feeding during gestation on individual or group basis (Table 41). The condition scoring is conducted on all sows at weaning (for gilts at first insemination). There are 3 condition score categories: thin (2), good (3) and fat / very fat (4–5). The condition score of a sow at weaning should be 3–3.5. This is possible if the sow does not lose more than 10–15 kg weight during lactation. Some sows are genetically low-fat and mobilize body reserves during lactation, and this target may not apply to them.

Table 41. Conditioning scoring of sows.

	2 - Thin	3–3.5 - Good	4–5 Fat – very fat
Backfat, mm	over 13	16–18	over 19
Tail head	cavity around tail	no cavity around tail	fat around tail
Hips Backbone Ribs	can be palpated with slight pressure and also visible	can be palpated with firm pressure, but cannot be observed visually	cannot be palpated

Feeding pregnant sows according to their condition

Sows will be fed so that the target condition score 3–3.5 is reached before the next farrowing. If condition has been lost during lactation, the best time to replace it is during the early to middle part of the following pregnancy. The greatest amounts of feed are given to sows in loose-house systems, that are moving a lot. If the sows are in individual crates, the feed allowance can be increased immediately after insemination if the sows need large amounts of muscle and fat to recover from the previous lactation. If the sows are in loose-house system after insemination, the feed allowance can be increased approximately one week after insemination. After moving to farrowing pen, 3–5 days before farrowing, lactation feed and good quality hay/straw ad libitum and/or laxatives are recommended. If they are not given, feed allowance can be greater, but at maximum 24 MJ NEa/day (Table 42).

Table 42. Energy requirements of gestating sows.

	MJ NEa/kg DM		
Condition score at insemination	2 thin	3 good	4–5 fat – very fat
0–85 pregnancy days	30–34	24–28	23
From pregnancy days 85 until moving to farrowing pen	30–34	24–28	23
3–5 days before farrowing	18–24	18–24	18–24

Feeding of lactating sows

The lactating sow is fed individually according to appetite. Lactating sows should be fed 3–4 times per day. Feed portion will be increase 5–10 MJ NEa per day in the first lactation week until the maximum level is reached. If the sow has 10 or more piglets, she is fed *ad libitum*, at least 82–85 MJ NEa/day.

From weaning to new gestation

At least 34 MJ NEa/d of feed is given from weaning to gestation according to sow's condition and appetite. Part of the feed can be piglet feed. Sows that have lost a lot of weight during lactation can be fed *ad libitum*.

Energy requirements of gilts

The energy requirements of gilts are presented for moderate growth rate. The gilts are transported to the mating department at the age of approximately 6 months to obtain boar contact, for heat control and mating. In the mating department, the gilts are fed the feed of pregnant sows. If gilts are fed restrictively, flushing is recommended two weeks before insemination. In flushing, the feed allowance is risen to the level of 30.0 MJ NE/day (Table 43). The feed for lactating sows or piglets is recommended. Flushing should start 1 week after the first heat and gilts are inseminated at the second heat.

Table 43. Energy requirements of gilts.

Week	Weight, kg	MJ NEg/d
1	30	13.6
2	36	15.5
3	42	17.5
4	48	19.4
5	54	21.3
6	60	23.3
7	66	25.2
8	72	26.2
9	78	27.2
10	83	27.2
11	89	27.2
12	95	27.2
13	101	27.2
14	106	27.2
15	112	27.2
16	118	27.2
17	124	27.2
18	130	27.2
19	136	27.2
20	142	27.2
		MJ NEa/d
2 weeks before insemination		30.0

Energy requirements of growing pigs

The energy requirements of growing pigs start at 25 kg live weight when the pigs are approximately 10 weeks old. The high/low (Table 44) and the high/high (Table 45) energy requirements are the same until 8 to 10 weeks, after which the high/high energy recommendation continues at a higher level.

Live weight in the columns is the estimated weight at the beginning of the week. Estimated weight development is based on a daily gain of 900–970 g and an average feed utilization of 25–26 MJ per kg of growth throughout the rearing period. For purebred Landrace and Yorkshire pigs, the requirements of MY crossbred pigs are used.

Table 44. Energy requirements of growing pigs, high/low.

Week	Landrace, Yorkshire and crosses				DLY-crosses			
	Females		Castrates+mixed growing		Females		Castrates+mixed growing	
	MJ NEg/d	Live weight, kg	MJ NEg/d	Live weight, kg	MJ NEg/d	Live weight, kg	MJ NEg/d	Live weight, kg
1	12.6	25.0	13.6	25.0	13.6	25.0	13.6	25.0
2	13.6	30.0	14.6	30.0	15.5	30.5	15.5	30.5
3	15.5	36.0	16.5	36.0	17.5	37.0	17.5	37.0
4	17.5	42.0	18.9	42.5	19.4	43.5	19.9	43.5
5	19.4	48.5	21.3	49.5	21.3	50.0	22.3	50.5
6	21.3	55.0	23.8	56.5	23.3	57.0	24.7	58.0
7	23.3	62.0	25.7	63.5	25.2	64.0	27.2	65.5
8	25.2	69.0	27.2	70.5	27.2	71.0	28.6	73.0
9	27.2	76.0	28.1	77.5	28.6	77.5	29.1	80.0
10	28.6	82.5	29.1	84.0	29.1	84.0	29.1	86.5
11	29.1	89.0	29.6	91.0	29.1	90.5	29.1	93.0
12	29.1	95.5	30.1	97.5	29.1	97.0	29.1	99.5
13	29.1	102.0	30.1	104.0	29.1	103.0	29.1	106.0
14	29.1	108.0	30.1	110.5	29.1	109.0	29.1	112.0
15	29.1	114.0	30.1	117.0	29.1	115.0	29.1	118.0

L= landrace; Y = yorkshire; D = duroc

Table 45. Energy requirements of growing pigs, high/high.

Week	Landrace, Yorkshire and crosses				DLY-crosses			
	Females		Castrates+mixed growing		Females		Castrates+mixed growing	
	MJ NEg/d	Live weight, kg	MJ NEg/d	Live weight, kg	MJ NEg/d	Live weight, kg	MJ NEg/d	Live weight, kg
1	12.6	25.0	13.6	25.0	13.6	25.0	13.6	25.0
2	13.6	30.0	14.6	30.0	15.5	30.5	15.5	30.5
3	15.5	36.0	16.5	36.0	17.5	37.0	17.5	37.0
4	17.5	42.0	18.9	42.5	19.4	43.5	19.9	43.5
5	19.4	48.5	21.3	49.5	21.3	50.0	22.3	50.5
6	21.3	55.0	23.8	56.5	23.3	57.0	24.7	58.0
7	23.3	62.0	25.7	63.5	25.2	64.0	27.2	65.5
8	25.2	69.0	27.6	70.5	27.2	71.0	29.1	73.0
9	27.2	76.0	29.1	77.5	28.6	78.0	30.1	80.0
10	28.6	83.0	30.1	84.5	30.1	85.0	30.1	87.0
11	29.6	89.5	30.6	91.5	30.1	92.0	30.1	94.0
12	30.1	96.0	31.0	98.5	30.1	98.5	30.1	101.0
13	30.1	102.5	31.0	105.5	30.1	105.0	30.1	107.5
14	30.1	109.0	31.0	112.5	30.1	111.0	30.1	114.0
15	30.1	115.0	31.0	119.0	30.1	117.0	30.1	120.0

L= landrace; Y = yorkshire; D = duroc

4.3.2. Protein and amino acid requirements of pigs

Table 46. Protein and amino acids requirements of piglets and growing pigs.

	Piglets		Growing pigs		
	under 15 kg	15–25 kg	25–55 kg	55–80 kg	over 80 kg
Standardized ileal digestible amino acids, g/MJ NEg					
Lysine	1.12–1.14	1.10–1.12	0.98–1.01	0.79–0.84	0.69–0.74
Methionine + Cysteine	0.67–0.68	0.66–0.67	0.59–0.61	0.47–0.50	0.41–0.44
Threonine	0.69–0.71	0.66–0.69	0.62–0.64	0.51–0.55	0.45–0.48
Tryptophan	0.21–0.22	0.21	0.19	0.15–0.16	0.13–0.14
Valine	0.75–0.76	0.74–0.75	0.66–0.68	0.53–0.56	0.46–0.50
% of lysine					
Methionine + Cysteine	60	60	60	60	60
Threonine	62	62	63	65	65
Tryptophan	19	19	19	19	19
Valine	67	67	67	67	67
Digestible crude protein, g/MJ NEg	15.5–16.5	15.2–16.2	14.4–15.2	12.3–13.5	11.8–12.8

Table 47. Protein and amino acid requirements of growing gilts.

	25–55 kg	55–100 kg*	over 100 kg
Standardized ileal digestible amino acids, g/MJ NE			
Lysine	0.86–0.91	0.64–0.74	0.54–0.64
Methionine + Cysteine	0.52–0.55	0.38–0.44	0.36–0.43
Threonine	0.54–0.57	0.42–0.48	0.41–0.48
Tryptophan	0.16–0.17	0.12–0.14	0.11–0.13
Valine	0.58–0.61	0.43–0.50	0.40–0.47
% of lysine			
Methionine + Cysteine	60	60	67
Threonine	63	65	75
Tryptophan	19	19	21
Valine	67	67	74
Digestible crude protein, g/MJ NEg	12.7–13.9	11.7–12.8	11.2–12.3

*If gilts are too thin in insemination, protein requirements of over 100 kg gilts should be used in this stage of growing.

Table 48. Protein and amino acid requirements of sows and boars.

	Pregnant sows, boars	Lactating sows*
Standardized ideal digestible amino acids, g/MJ NE		
Lysine	0.48–0.52	0.64–0.70
Methionine + Cysteine	0.32–0.35	0.38–0.42
Threonine	0.36–0.39	0.42–0.46
Tryptophan	0.10–0.11	0.13–0.14
Valine	0.36–0.38	0.52–0.57
% of lysine		
Methionine + Cysteine	67	60
Threonine	75	65
Tryptophan	21	20
Valine	74	81
Digestible crude protein, g/MJ NEg	11.2–12.5	13.5–14.4

* Requirements of lactating sows calculated for average feed intake (gilts 6.3 kg, 2nd litter sows 6.9 kg and older sows 7.2 kg).

4.3.3. Mineral and vitamin requirements of pigs

Table 49. Mineral requirements of pigs.

	Piglets		Growing pigs			Growing replacement gilts	Pregnant sows, Boars	Lactating sows
	under 15 kg	15–25 kg	25–55 kg	55–80 kg	80–120 kg	25 kg – until insemination		
In MJ NE								
Calcium, g*	0.88	0.88	0.84	0.76	0.67	0.84	0.77	0.86
Digestible phosphorus, g	0.31	0.31	0.31	0.28	0.22	0.31	0.28	0.34
Salt, g**	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.55
Magnesium, g	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Iron, mg***	13.3	13.3	8.5	8.5	8.5	8.5	8.5	8.5
Copper, mg	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Zinc, mg	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7
Iodine, mg	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Selenium, mg	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04

*The ratio of calcium and digestible phosphorus can vary between 2.5–3.1.
**The upper level of sodium recommendation is 0.3 g/MJ NE, which means no more than 0.79 g NaCl/MJ NE.
***For piglets, easily soluble iron 10.4 mg/MJ NE.

If phytase enzyme is added to the diet to improve phosphorus digestibility, feed calcium concentration should be decreased by 0.05 g/MJ NE. For weaned piglets (under 9 kg), the recommendation for calcium is 0.73 g/MJ NE.

Permitted maximum levels of trace elements in compound feed:
Selenium: 0.5 mg/kg
Zinc: 150 mg/kg
Copper: until weeks 12 of age 170 mg/kg 17 weeks, other pigs: 25 mg/kg

Permitted maximum levels of trace elements in compound feeds are based on EU register of feed additives.

Table 50. Vitamin requirements of pigs.

	Piglets 9–30 kg	Growing pigs over 30 kg	Gilts 30–100 kg	Gilts over 100 kg	Pregnant sows, Boars	Lactating sows
Per unit of NE*						
Vitamin A, IU	540	430	430	850	850	850
Vitamin D, IU	54	43	43	85	85	85
Vitamin E mg**	6.7	4.0	4.0	5.0	5.0	5.0
Thiamine, B_1, mg	0.21	0.21	0.21	0.21	0.21	0.21
Riboflavine, B_2, mg	0.45	0.22	0.22	0.53	0.53	0.53
Pyridoxine, B_6, mg	0.32	0.32	0.32	0.32	0.32	0.32
Niacine, mg	2.13	2.13	2.13	2.13	2.13	2.13
Pantotenic acid, mg	1.12	1.12	1.12	1.6	1.6	1.6
Biotine, mg	0.02	0.006	0.02	0.02	0.02	0.02
Vitamin B_{12}, mg	0.002	0.002	0.002	0.002	0.002	0.002
Folic acid, mg	0.05	0.05	0.05	0.16	0.16	0.16
Vitamin K, mg	0.21	0.21	0.21	0.21	0.21	0.21

*The amount added ** For weaned piglets should have higher recommendation maximum 3 – 4 weeks after weaning (11 mg/MJ NE). For vitamin E extra supplement of 0.5 mg/%-unit of oily fat added.

Link: https://ec.europa.eu/food/food-feed-portal/screen/feed-additives/search

4.4. Energy and nutrient requirements of poultry

The energy requirements of poultry are given in megajoules (MJ) of metabolizable energy (ME) per kilogram of feed (MJ ME/kg) for laying hens, chickens, pullets, broilers and turkeys. Nutrient recommendations for feed are given per kilogram of fresh feed, e.g. g/kg. As poultry breeding is progressing rapidly, the nutrient requirements should be updated more frequently. At the time of publication, the nutrient requirements presented here are indicative.

Table 51. Amino acid, mineral and linolic acid requirements of laying hens.

		Age			
		17–28 wk	29–45 wk	46–65 wk	>65 wk
Crude protein	g/kg	175	175	175	175
Metabolizable energy	MJ/kg	11.0	11.0	11.0	11.0
Amino acids:					
Lysine	g/kg	7.6	7.6	7.6	7.6
Methionine	g/kg	3.7	3.7	3.7	3.7
Methionine + Cysteine	g/kg	6.3	6.3	6.3	6.3
Threonine	g/kg	6.7	6.7	6.7	6.7
Linolic acid	%	1.2	1.2	1.2	1.2
Minerals:					
Calcium	g/kg	35.0	38.0	39.0	39.0
Available phosphorus	g/kg	3.5	2.9	2.5	2.3
Natrium	g/kg	1.6	1.6	1.6	1.6
Potassium	g/kg	2–4	2–4	2–4	2–4
Chlorine	g/kg	1.3	1.3	1.3	1.3
Magnesium	mg/kg	500–600	500–600	500–600	500–600
Manganese	mg/kg	70	70	70	70
Iron	mg/kg	50–100	50–100	50–100	50–100
Copper	mg/kg	5–10	5–10	5–10	5–10
Zinc	mg/kg	60	60	60	60
Selenium	mg/kg	0.1	0.1	0.1	0.1
Iodine	mg/kg	0.4	0.4	0.4	0.4

Table 52. Amino acid, mineral and linolic acid requirements of young chicken.

		Chicks, 0–6 weeks		Pullets, 7–20 weeks		
Crude protein	g/kg	180	200	130	150	170
Metabolizable energy	MJ/kg	11.5	12.0	11.0	11.0	11.5
Amino acids:						
Lysine	g/kg	9.5	10.0	6.5	7.0	8.0
Methionine	g/kg	4.0	4.5	2.5	3.0	3.5
Methionine + Cysteine	g/kg	7.0	8.0	4.5	5.5	6.3
Arginine	g/kg	10.0	11.0	6.6	7.8	9.0
Threonine	g/kg	6.0	6.8	4.0	4.7	5.5
Tryptophan	g/kg	1.8	2.0	1.5	1.6	1.8
Histidine	g/kg	3.3	3.6	2.1	2.5	3.0
Leucine	g/kg	11.5	12.0	8.0	9.0	10.0
Isoleucine	g/kg	6.2	6.8	4.4	5.2	5.8
Phenylalanine	g/kg	6.0	6.4	4.2	4.8	5.5
Phenylalanine + Tyrosine	g/kg	11.0	12.0	8.0	9.0	10.8
Valine	g/kg	6.8	7.4	5.0	6.0	6.6
Linolic acid	%	1.4	1.4	0.8	0.8	0.8
Minerals:						
Calcium	g/kg	9.0	9.0	7.5	7.5	8.0
Available phosphorus	g/kg	4.0	4.5	3.5	3.5	4.0
Natrium	g/kg	1.6	1.6	1.5	1.5	1.5
Potassium	g/kg	2.5–4.0		3–6		
Chlorine	g/kg	1.2–1.5		1.3		
Magnesium	mg/kg	600		500–600		
Manganese	mg/kg	70		50–70		
Iron	mg/kg	80–100		60–80		
Copper	mg/kg	10		5–10		
Zinc	mg/kg	60		35–60		
Selenium	mg/kg	0.1		0.1		
Iodine	mg/kg	0.4		0.4		

Table 53. Amino acid, mineral and linolic acid requirements of broiler chicken.

		Starter phase	Growing phase	Finishing phase
		days 1–10	days 11–22	from day 23 until slaughter
Crude protein	g/kg	220	200	200
Metabolizable energy	MJ/kg	12.4	12.4	12.4
Amino acids:				
Lysine	g/kg	12.0	11.0	10.0
Methionine	g/kg	4.8	4.5	4.0
Methionine + Cysteine	g/kg	9.0	8.0	7.0
Threonine	g/kg	7.5	7.0	6.0
Linolic acid	%	1.2	1.0	1.0
Minerals:				
Calcium	g/kg	10.0	9.5	9.0
Available phosphorus*	g/kg	4.1	3.8	3.5
Natrium	g/kg	1.6	1.6	1.5
Potassium	g/kg	3–5	3–5	3–5
Chlorine	g/kg	1.2–1.5	1.2–1.5	1.2–1.5
Magnesium	mg/kg	600	600	600
Manganese	mg/kg	60–70	60–70	60–70
Iron	mg/kg	80–100	80–100	80–100
Copper	mg/kg	8–10	8–10	8–10
Zinc	mg/kg	50–60	50–60	50–60
Selenium	mg/kg	0.15	0.15	0.15
Iodine	mg/kg	0.4	0.4	0.4

*If the feed includes phytase enzyme, the recommendation of available phosphorus can be decreased by 25%.

Table 54. Amino acid, mineral and linolic acid requirements of turkeys.

	Unit	Starting			Growing				Finishing		Breeding
Crude protein	g/kg	300	280	260	230	210	190	170	160	150	160
Metabolizable energy	MJ/kg	12.5	12	11.5	12.5	11.5	11.5	11	12.5	12.5	11
Amino acids:											
Lysine	g/kg	16	15	14	11	10	9	8	8.2	8	7
Methionine	g/kg	5.6	5.3	5	4.5	4	3.8	3.3	3.5	3.4	3
Methionine +Cysteine	g/kg	11	10	9	8	7.5	7	6	5.8	5.6	5.5
Arginine	g/kg	17	16	15	12	10.5	9.5	8.5	9.5	9	7.5
Threonine	g/kg	11	10.5	10	8	7.5	7	6.5	6.1	5.8	5.5
Tryptophan	g/kg	3.2	2.8	2.6	2.2	2	1.9	1.7	1.6	1.5	1.6
Histidine	g/kg	6.1	5.7	5.5	4.8	4.2	3.9	3.5	3.2	3	3.2
Leucine	g/kg	21	19.5	18.5	16	14	13	12	11.5	11	11.5
Isoleucine	g/kg	12	11.3	10.5	9	8	7.5	7	6.5	6	6.5
Phenylalanine	g/kg	11.5	10.3	9.5	8.2	7.5	7	6.5	6	5.5	6
Phenylalanine + Tyrosine	g/kg	19.5	18	17	15	13.5	12.5	11	10	9.5	10
Valine	g/kg	13.5	12	11.5	10	8.5	8	7	6.5	6	6.5
Linolic acid	%	1			0.8				0.6		0.6
Minerals:											
Calcium	g/kg	13	11.5	10	8.5	8	7.5	7	6	6	25
Available phosphorus	g/kg	6.5	6	5	4.5	4	3.7	3.5	3	3	4
Natrium	g/kg	1.7	1.7	1.6	1.7	1.6	1.6	1.5	1.5	1.5	1.5
Potassium	g/kg	7			5				5		6
Chlorine	g/kg	1.5			1.3				1.2		1.2
Magnesium	mg/kg	700			700				700		700
Manganese	mg/kg	80			60				60		80
Iron	mg/kg	100			80				50		80
Copper	mg/kg	10			8				5		8
Zinc	mg/kg	80			60				50		70
Selenium	mg/kg	0.2			0.2				0.2		0.2
Iodine	mg/kg	0.4			0.4				0.4		0.4

Table 55. Vitamin requirements of young chicken, laying hens and broiler chicken.

Vitamin	Unit	Chicks	Pullets	Laying hens	Broilers	
					Beginning	End
A	IU	10 000–15 000	7 000–10 000	7 500–10 000	9 000–13 000	7 500–10 000
D_3	IU	1 300–2 000	1 200–2 000	1 500–2 500	1 500	1 500
E	mg/kg	15–30	1–2	10–20	30	20
K	mg/kg	1.5–3	1–2	1.5–2	1.5–2.5	1.5
B_1, thiamine	mg/kg	1–2.5	1–2	1–2	2.2–2.5	2.0
B_2, riboflavin	mg/kg	4–5	4	4–4.5	5–5.5	4
B_6, pyridoxine	mg/kg	3–4	3–4	3	4	3.5–4
B_{12}, cobalamin	mg/kg	0.01–0.015	0.01–0.012	0.010	0.013–0.015	0.01–0.012
Pantothenic acid	mg/kg	8–5	7–12	6–10	14–15	10–12
Niacin, nicotinic acid	mg/kg	30–60	30–40	30–40	40	35–40
Choline	mg/kg	1 500–1 600	1 300–1 400	1 100–1 400	1 500–1 600	1 300
Folic acid	mg/kg	0.5–1	0.5–0.6	0.4–0.75	0.8–0.85	0.3–0.5
Biotin	mg/kg	0.15–0.25	0.12–0.25	0.12–0.15	0.15–0.2	0.1–0.12

Table 56. Vitamin requirements of turkeys.

Vitamin	Unit	Starting	Growing	Finishing	Breeding
A	IU	10 000	8 500	7 000	10 000
D_3	IU	1 700	1 500	1 300	1 500
E	mg/kg	35	30	15	30
K	mg/kg	1.5	1.0	1.0	1.0
B_1, thiamine	mg/kg	3.0	2.0	2.0	2.0
B_2, riboflavin	mg/kg	6.0	4.0	4.0	5.0
B_6, pyridoxine	mg/kg	5.0	4.0	3.0	4.0
B_{12}, cobalamin	mg/kg	0.014	0.014	0.012	0.014
Pantothenic acid	mg/kg	15	10	10	17
Niacin, nicotinic acid	mg/kg	70	50	50	50
Choline	mg/kg	1 700	1 200	1 000	1 000
Folic acid	mg/kg	1	0.8	0.5	1
Biotin	mg/kg	0.25	0.2	0.15	0.2

5. Feed tables

5.1. Feed tables – Ruminants and Horses

RUMINANTS AND HORSES

Feed code	Feed	DM, g/kg	ME, MJ/kg DM	MP, g/kg DM	PB, g/kg DM	EPD	D value, g/kg DM	Composition, g/kg DM									Digestibility, g/g					dCP, g/kg DM
								CP	EE	CF	NFE	NDF	INDF	Sta	Sug	Ash	CPd	EEd	CFd	NFEd	OMd	
01 Grains and seeds																						
1000	Barley, over 69 kg/hl	860	13.2	96	-31	0.80	822	113	22	46	790	210	37	620	20	29	0.66	0.64	0.30	0.91	0.85	75
1001	Barley, 64–69 kg/hl	860	13.2	96	-29	0.80	821	115	22	48	786	210	37	610	20	29	0.67	0.64	0.30	0.91	0.85	77
1002	Barley, 60–64 kg/hl	860	13.1	96	-25	0.80	817	119	22	54	776	210	37	600	20	29	0.68	0.64	0.30	0.91	0.84	81
1003	Barley, 57–60 kg/hl	860	12.9	95	-20	0.80	801	122	22	56	771	230	39	595	20	29	0.69	0.64	0.30	0.89	0.83	84
1004	Barley, under 57 kg/hl	860	12.5	94	-13	0.80	777	127	22	58	764	230	39	585	20	29	0.70	0.64	0.30	0.86	0.8	89
1005	Barley, naked	860	13.8	104	-5	0.80	849	150	28	36	761	123	37	700	30	25	0.74	0.71	0.30	0.93	0.87	111
1011	Oats, over 58 kg/hl	860	12.4	93	-12	0.75	729	125	60	103	674	280	110	460	18	38	0.71	0.84	0.30	0.83	0.76	89
1012	Oats, 54–58 kg/hl	860	12.1	92	-8	0.75	711	127	60	109	666	290	115	440	18	38	0.70	0.84	0.30	0.81	0.74	89
1013	Oats, 45–54 kg/hl	860	11.5	89	0	0.75	677	130	60	124	650	310	125	420	18	36	0.68	0.84	0.30	0.77	0.7	88
1014	Oats, 35–45 kg/hl	860	10.4	80	2	0.75	606	120	60	151	638	350	145	350	18	31	0.65	0.84	0.25	0.69	0.63	78
1015	Oats, hulless or dehulled	860	14.2	107	6	0.75	802	162	94	22	700	120	50	650	20	22	0.76	0.89	0	0.85	0.82	123
1021	Mixed grain (barley and oats, 1:1)	860	12.6	94	-19	0.78	766	121	41	79	726	250	76	525	19	34	0.68	0.74	0.30	0.86	0.8	83
1030	Wheat, over 80 kg/hl	860	13.6	96	-12	0.85	843	133	22	23	802	110	20	685	30	20	0.69	0.64	0.30	0.91	0.86	92
1031	Wheat, 76–80 kg/hl	860	13.6	96	-12	0.85	843	133	22	23	802	110	20	675	30	20	0.69	0.64	0.30	0.91	0.86	92
1032	Wheat, 72–76 kg/hl	860	13.4	96	-7	0.85	833	137	22	25	796	150	20	670	30	20	0.69	0.64	0.30	0.9	0.85	95
1033	Wheat, under 72 kg/hl	860	12.8	92	-1	0.85	795	137	22	33	788	150	20	645	30	20	0.68	0.64	0.30	0.86	0.81	93
1041	Rye	860	13.6	94	-33	0.85	848	110	20	28	820	200	40	650	36	22	0.66	0.61	0.30	0.92	0.87	73
1042	Triticale	860	13.7	94	-36	0.85	848	106	26	26	820	190	30	625	55	22	0.64	0.69	0.30	0.92	0.87	68
1043	Maize grain	860	14.5	106	-58	0.70	874	100	46	24	815	110	10	710	12	15	0.63	0.81	0.30	0.94	0.89	63
1051	Rice, grain	860	12.6	93	-42	0.75	781	97	25	99	718	90	..	700	0	61	0.61	0.68	0.30	0.94	0.83	59
1052	Rice, grain, husked	874	14.3	103	-63	0.75	892	92	13	5	878	10	..	868	15	12	0.61	0.68	0.30	0.94	0.90	56
1071	Pea, seed	860	13.3	116	62	0.80	849	230	11	57	676	130	5	480	55	31	0.82	0.32	0.50	0.93	0.88	189
1072	Faba bean, seed	860	12.8	123	125	0.80	818	300	15	85	564	160	10	380	40	36	0.85	0.49	0.50	0.91	0.85	255
1074	Soya bean, seed	900	15.5	149	194	0.75	796	400	190	60	295	120	10	54	77	55	0.88	0.92	0.50	0.81	0.84	352
1075	Lupin, seed	860	13.2	117	171	0.85	826	340	51	178	401	250	5	10	55	30	0.87	0.82	0.83	0.85	0.85	296
1081	Rapeseed (*Brassica napus*)	920	19.8	127	62	0.70	769	240	450	75	192	190	70	0	55	50	0.82	0.94	0.30	0.66	0.81	197
1082	Rapeseed (*Brassica rapa* subsp. Oleifera)	920	19.0	124	60	0.70	757	235	415	85	215	200	70	0	55	50	0.82	0.94	0.30	0.69	0.80	193

Feed code	Feed	DM, g/kg	ME, MJ/kg DM	MP, g/kg DM	PB, g/kg DM	EPD	D value, g/kg DM	Composition, g/kg DM									Digestibility, g/g					dCP, g/kg DM
								CP	EE	CF	NFE	NDF	INDF	Sta	Sug	Ash	CPd	EEd	CFd	NFEd	OMd	
1083	Flax, seed	920	18.6	120	80	0.75	770	250	380	75	250	150	40	16	29	45	0.83	0.94	0.30	0.73	0.81	208
1084	Buckwheat, seed	860	10.1	84	8	0.75	621	130	30	155	650	480	50	..	..	35	0.70	0.73	0.30	0.71	0.64	91
1085	Sunflower, seed	940	17.8	98	45	0.75	662	185	440	155	185	310	..	35	60	35	0.78	0.94	0.30	0.31	0.69	144
1086	Hemp, seed	920	15.5	122	91	0.70	676	260	300	230	155	325	290	..	..	55	0.84	0.94	0.30	0.69	0.72	218
02 Cakes and meals																						
2001	Rapeseed expeller, heat treated	910	12.3	171	131	0.60	692	358	98	115	355	300	140	37	72	74	0.79	0.89	0.30	0.81	0.75	283
2002	Rapeseed meal	890	11.4	169	154	0.63	696	379	44	126	371	270	125	45	87	80	0.84	0.80	0.30	0.82	0.76	318
2003	Rapeseed expeller, cold pressed	910	15.6	149	106	0.65	732	309	248	102	278	230	110	..	87	63	0.85	0.93	0.30	0.75	0.78	263
2011	Soya bean expeller	890	13.9	169	264	0.75	821	493	81	58	304	115	10	77	100	64	0.91	0.87	0.70	0.86	0.88	449
2012	Soya bean meal	880	13.0	173	285	0.75	819	520	34	58	321	120	10	74	95	67	0.91	0.75	0.70	0.87	0.88	473
2021	Flax expeller	900	15.5	131	138	0.75	754	320	226	90	316	180	50	..	45	48	0.86	0.93	0.35	0.75	0.79	275
2022	Flax expeller, cold pressed	910	14.3	137	169	0.75	748	359	160	86	336	190	50	..	29	59	0.87	0.92	0.35	0.77	0.80	312
2023	Flax meal	900	11.4	141	197	0.75	724	390	20	105	420	230	50	..	29	65	0.88	0.61	0.35	0.79	0.77	343
2024	Hemp seed expeller, cold pressed	920	11.7	137	165	0.70	631	350	130	290	165	400	330	..	..	65	0.87	0.90	0.30	0.74	0.67	305
2027	Faba bean meal, decorticated, heat treated	900	12.9	128	158	0.80	818	340	20	65	535	116	5	330	..	40	0.85	0.49	0.50	0.91	0.85	289
2031	Palm kernel expeller	900	11.3	89	26	0.75	634	155	90	190	515	650	140	7	15	50	0.75	0.88	0.30	0.74	0.67	116
2032	Palm kernel meal	900	94	89	41	0.75	608	169	10	207	560	700	150	7	15	54	0.76	0.26	0.30	0.74	0.64	128
2041	Sunflower expeller, dehulled seeds	900	12.2	144	234	0.75	688	430	100	140	260	400	190	22	67	70	0.89	0.89	0.30	0.67	0.74	383
2042	Sunflower meal, dehulled seeds, CF 18 %	900	10.1	147	262	0.75	658	460	10	160	300	400	190	23	85	70	0.89	0.26	0.30	0.66	0.71	409
3 Plant by-products																						
3007	Wheat germs	880	14.4	124	123	0.80	828	300	90	35	525	..	..	230	69	50	0.85	0.88	0.45	0.91	0.87	255
3008	Wheat germ feed	880	14.0	117	86	0.80	824	255	70	45	585	143	..	234	69	45	0.83	0.86	0.45	0.91	0.86	212
3009	Wheat middlings	880	13.7	99	16	0.85	839	165	35	45	725	180	70	482	69	30	0.76	0.76	0.45	0.92	0.87	125
3010	Wheat middlings, rich in germs	880	13.6	101	47	0.85	821	197	51	57	653	261	..	430	62	42	0.78	0.80	0.45	0.92	0.86	154
3011	Wheat bran	870	11.2	90	38	0.80	680	170	40	92	644	420	100	156	64	54	0.77	0.79	0.30	0.76	0.72	131
3012	Rye middlings	880	13.1	94	14	0.85	799	155	35	40	740	161	..	300	120	30	0.75	0.76	0.30	0.87	0.82	116
3013	Rye bran	880	10.9	87	32	0.80	663	160	40	100	650	161	..	60	10	50	0.75	0.79	0.30	0.74	0.70	120
3014	Barley middlings	880	12.5	95	4	0.80	765	145	35	80	700	216	..	280	73	40	0.73	0.76	0.30	0.87	0.80	106
3015	Barley hull bran	880	10.3	83	28	0.80	634	150	35	160	590	216	..	250	20	65	0.74	0.76	0.30	0.76	0.68	111
3016	Oat middlings	880	12.7	88	29	0.85	729	160	80	55	670	372	..	400	10	35	0.75	0.87	0.30	0.78	0.76	120
3017	Oat bran	900	9.1	70	-10	0.75	550	93	38	184	641	500	300	190	10	44	0.60	0.78	0.26	0.65	0.58	56
3018	Oat hull bran	880	6.5	51	-5	0.75	399	70	30	260	590	372	..	105	11	50	0.48	0.73	0.30	0.45	0.42	34
3019	Oat hull flour	880	5.2	41	-11	0.75	329	50	25	300	575	372	..	120	81	50	0.29	0.68	0.30	0.36	0.35	15

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								CP	EE	CF	NFE	NDF	INDF	Sta	Sug	Ash	CPd	EEd	CFd	NFEd	OMd	
3020	Rice middlings	880	13.4	94	13	0.75	692	150	155	80	520	10	..	200	37	95	0.74	0.91	0.30	0.80	0.76	111
3021	Cereal waste granules	880	6.7	57	37	0.80	410	120	29	224	553	..	..	..	..	74	0.68	0.72	0.26	0.45	0.44	82
3022	Hemp bran	920	11.3	94	69	0.70	525	200	220	350	185	460	685	..	..	45	0.75	0.85	0.30	0.45	0.55	150
3031	Barley malt germs	920	11.5	118	153	0.80	740	320	20	140	460	447	..	54	141	60	0.86	0.61	0.70	0.77	0.79	275
3032	Barley germ feed	900	11.7	104	69	0.80	747	220	20	130	570	447	..	54	141	60	0.81	0.61	0.60	0.84	0.79	178
3033	Barley malt feed	890	12.5	103	38	0.80	786	189	22	92	655	..	..	97	128	42	0.79	0.64	0.57	0.87	0.82	149
3034	Brewers grain, moist	220	10.7	108	80	0.70	601	230	89	170	471	570	185	75	9	40	0.76	0.88	0.30	0.63	0.63	175
3035	Dried brewers grain	920	10.0	105	85	0.70	566	230	80	170	475	570	185	50	10	45	0.74	0.87	0.30	0.58	0.59	170
3038	Wheat distillers grain, moist	70	11.2	103	124	0.80	660	270	60	70	540	..	..	..	..	60	0.84	0.84	0.30	0.67	0.70	227
3039	Wheat distillers grain feed	920	11.0	115	200	0.80	651	360	60	90	400	422	..	42	8	90	0.87	0.84	0.30	0.65	0.71	313
3040	Wheat distillers grain mix	920	10.2	108	189	0.80	612	340	50	75	395	..	..	..	..	140	0.87	0.82	0.30	0.64	0.71	296
3041	Barley starch distillers grains, moist	110	13.3	153	218	0.75	782	428	73	0	422	72	..	17	111	77	0.88	0.87	0.55	0.81	0.85	377
3042	Barley distillers solubles	312	13.2	122	94	0.75	761	266	77	0	543	19	..	33	185	114	0.82	0.85	0.85	0.88	0.86	218
3043	Barley distillers solids	150	13.7	212	244	0.65	816	524	70	0	348	80	..	22	77	58	0.90	0.84	0.55	0.82	0.87	472
3045	Barley hulls	934	7.7	58	-8	0.80	484	79	32	275	549	690	..	77	33	65	0.98	0.68	0.38	0.51	0.52	77
3046	Barley hull bran (from starch process)	890	9.1	70	9	0.80	555	112	37	213	585	..	250	250	20	53	0.66	0.77	0.31	0.66	0.59	74
3047	Barley fibre, dried	960	11.8	102	-1	0.65	672	144	98	223	504	622	..	75	29	31	0.70	0.82	0.46	0.77	0.69	101
3049	Barley protein	222	14.7	157	59	0.65	896	277	46	0	675	21	..	385	154	51	0.86	0.79	0.50	0.92	0.94	238
3072	Sugar beet molasses	770	12.7	83	22	0.95	802	150	0	0	730	0	0	0	650	120	0.77	0	0	0.94	0.91	116
3073	Sugar cane molasses	740	12.4	77	-86	0.95	783	35	0	0	870	0	0	0	650	95	0	0	0	0.90	0.87	0
3074	Process molasses	780	13.1	81	-82	0.95	823	45	0	0	885	0	0	..	650	70	0	0	0	0.93	0.89	0
3075	Beet molasses and vinasses separation mixture	600	11.2	77	102	0.95	713	220	0	0	580	0	0	0	100	200	0.84	0	0	0.91	0.89	185
3076	Molasses mix, beet and process molasses	740	13.0	83	-29	0.95	822	100	2	0	798	0	0	..	650	100	0.72	0	0	0.94	0.91	72
3078	Molasses mix, beet based	750	12.8	83	-8	0.95	809	120	2	0	758	0	0	..	540	120	0.80	0	0	0.94	0.92	96
3080	Sugar beet pulp, pressed	260	11.9	107	-46	0.60	780	110	5	195	620	450	35	..	..	70	0.66	0	0.80	0.89	0.84	73
3081	Sugar beet pulp, dried	900	12.0	108	-47	0.60	787	110	5	196	627	450	35	0	70	62	0.66	0	0.80	0.89	0.84	73
3082	Molassed sugar beet pulp	900	12.2	101	-38	0.70	796	112	5	179	634	355	30	0	110	70	0.68	0	0.80	0.91	0.86	76
3084	Wheat gluten	920	13.4	267	494	0.70	873	840	10	5	140	0	0	0	..	5	0.92	0.26	0	0.70	0.88	773
3085	Wheat syrup	710	14.4	87	-109	0.95	891	28	20	0	935	0	0	0	593	17	0	0.61	0	0.94	0.91	0
3086	Maize gluten	895	14.3	255	345	0.65	860	677	71	12	219	26	5	192	4	21	0.92	0.82	0.30	0.80	0.88	623
3087	Maize gluten feed	880	12.7	100	72	0.85	786	219	31	85	595	384	35	205	19	70	0.83	0.82	0.65	0.88	0.85	182
3088	Sugar ethanol mix	520	14.4	88	-138	0.75	908	0	0	0	998	0	0	0	..	2	0	0	0	0.91	0.91	0

Feed code	Feed	DM, g/kg	ME, MJ/kg DM	MP, g/kg DM	PB, g/kg DM	EPD	D value, g/kg DM	Composition, g/kg DM									Digestibility, g/g					dCP, g/kg DM
								CP	EE	CF	NFE	NDF	INDF	Sta	Sug	Ash	CPd	EEd	CFd	NFEd	OMd	
3089	Glucose molasses	570	14.5	89	-136	0.75	912	3	3	2	991	0	0	0	..	1	0	0	0	0.92	0.91	0
3101	Potato feed, moist	160	12.3	92	-76	0.70	808	63	3	220	674	..	..	..	..	40	0.43	0	0.70	0.93	0.84	27
3102	Potato feed with cell solubles, moist	160	11.9	103	-26	0.70	782	125	3	210	597	..	..	..	..	65	0.69	0	0.70	0.92	0.84	86
3103	Potato pulp, pressed	270	11.0	81	-72	0.70	721	50	3	190	617	250	33	290	10	140	0.29	0	0.73	0.92	0.84	15
3104	Potato pulp, dry	880	11.0	81	-72	0.70	721	50	3	190	617	250	33	290	10	140	0.29	0	0.73	0.92	0.84	15
4 Feeds of animal origin																						
4001	Full milk (calves)	130	20.6	268	..	..	920	248	340	0	358	0	0	0	367	54	0.95	0.98	0	0.98	0.97	236
4004	Feed milk powder (calves)	970	13.6	336	..	..	845	352	20	0	535	0	0	0	480	93	0.90	0.98	0	0.95	0.93	317
4005	Feed milk powder (ruminants)	970	12.9	117	184	0.85	811	352	20	0	535	0	0	0	..	93	0.87	0.61	0	0.92	0.89	306
4011	Whey (calves)	60	14.2	165	..	..	885	110	10	0	800	0	0	0	643	80	0.90	0.99	0	0.97	0.96	99
4012	Whey (ruminants)	60	13.1	104	-44	0.70	827	110	10	0	800	0	0	0	..	80	0.66	0.26	0	0.94	0.90	73
4013	Whey meal (calves)	960	14.1	176	0	0	881	125	10	0	792	0	0	0	750	73	0.89	0.99	0	0.96	0.95	111
4014	Whey meal (ruminants)	960	13.2	108	-33	0.70	833	125	10	0	792	0	0	0	..	73	0.69	0.26	0	0.94	0.90	86
4015	Low lactose whey meal (calves)	970	12.6	258	..	..	775	253	26	0	546	0	0	0	380	175	0.89	0.99	0	0.96	0.94	225
4016	Low lactose whey meal (ruminants)	970	11.8	126	78	0.70	730	253	26	0	546	0	0	0	..	175	0.83	0.69	0	0.92	0.89	210
4221	Animal fat	1000	32.3	92	-144	0.75	945	0	995	0	5	0	0	0	0	0	0	0.95	0	0	0.95	0
5 Roots, tubers, fruits and cabbages																						
5001	Potato, raw	220	13.3	96	-50	0.80	845	95	0	30	820	70	5	620	0	55	0.61	0	0.55	0.94	0.89	58
5011	Tapioca flour	870	13.9	88	-116	0.80	875	20	5	30	915	..	..	792	31	30	0	0	0.50	0.94	0.90	0
5012	Sugar beet	230	13.0	88	-79	0.80	823	55	0	55	820	..	..	..	..	70	0.35	0	0.60	0.94	0.89	19
5013	Feed sugar beet	180	12.9	90	-63	0.80	822	75	0	60	795	..	..	..	..	70	0.51	0	0.60	0.94	0.88	38
5014	Feed beet / mangel	130	12.3	89	-44	0.80	784	90	10	70	730	..	..	..	..	100	0.59	0.26	0.60	0.94	0.87	53
5015	Swede	120	12.8	93	-40	0.80	812	100	15	100	715	..	..	..	..	70	0.63	0.49	0.70	0.94	0.87	63
5016	Turnip (*Brassica campestris ssp. rapa*)	90	12.3	93	-19	0.80	782	120	15	120	655	..	..	..	..	90	0.68	0.49	0.70	0.93	0.86	82
5017	Turnip (*Brassica rapa ssp. rapa*)	90	11.3	88	-11	0.80	727	120	10	110	650	..	..	..	..	110	0.68	0.26	0.70	0.87	0.82	82
5018	Carrot	120	12.6	92	-39	0.80	803	100	15	100	705	..	..	..	..	80	0.63	0.49	0.70	0.94	0.87	63
5019	Red beet	210	12.1	93	-18	0.80	777	120	5	70	695	..	..	..	..	110	0.68	0	0.70	0.93	0.87	82
5031	Apple	140	13.4	85	-112	0.80	847	20	20	140	800	..	..	..	..	20	0	0.61	0.65	0.93	0.86	0
5032	Apple residue (from juice press)	200	11.3	75	-60	0.80	696	55	45	190	690	..	..	..	..	20	0.35	0.80	0.65	0.75	0.71	19
5033	Citrus pulp	900	12.8	93	-70	0.70	806	70	26	132	707	..	..	..	..	65	0.48	0.69	0.79	0.92	0.86	34
5041	Sugar beet tops	130	10.1	92	63	0.80	653	195	20	105	485	280	80	..	..	195	0.78	0.27	0.75	0.86	0.81	152
5042	Kale, late cut	160	10.2	80	-10	0.80	664	110	20	240	515	380	..	..	..	115	0.62	0.27	0.55	0.89	0.75	68
5043	Forage rape, late cut	150	10.8	85	-2	0.80	695	125	30	190	525	380	..	..	..	130	0.66	0.44	0.75	0.87	0.80	83

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								CP	EE	CF	NFE	NDF	INDF	Sta	Sug	Ash	CPd	EEd	CFd	NFEd	OMd	
6 Fresh forages and pasture																						
6001	Pasture grass	200	11.3	94	42	0.80	705	180	35	280	405	535	50	0	125	100	0.75	0.49	0.79	0.82	0.78	135
6002	Pasture grass, maturing	210	10.5	88	37	0.80	657	165	30	290	420	580	85	0	130	95	0.72	0.44	0.74	0.74	0.73	119
6003	Grass, early 1st cut	190	11.7	96	34	0.80	730	175	35	295	410	530	35	0	..	85	0.76	0.49	0.81	0.84	0.80	133
6004	Grass, average 1st cut	200	11.2	92	31	0.80	700	165	35	325	395	570	60	0	..	80	0.74	0.49	0.77	0.79	0.76	122
6005	Grass, late 1st cut	200	10.7	87	23	0.80	670	150	30	345	400	610	85	0	..	75	0.72	0.44	0.74	0.74	0.72	108
6006	Grass, very late 1st cut	210	10.2	82	15	0.80	640	135	25	355	415	640	110	0	..	70	0.69	0.37	0.70	0.70	0.69	93
6007	Grass, high digestibility regrowth	200	11.4	95	42	0.80	710	180	35	280	405	520	30	0	..	100	0.76	0.49	0.82	0.80	0.79	137
6008	Grass, average digestibility regrowth	210	10.7	89	35	0.80	670	165	30	290	420	540	70	0	..	95	0.74	0.44	0.77	0.74	0.74	122
6009	Grass, low digestibility regrowth	230	10.1	82	25	0.80	630	145	25	295	440	560	100	0	..	95	0.71	0.37	0.72	0.70	0.70	103
6010	Italian ryegrass	190	11.3	99	67	0.80	708	210	47	210	423	350	100	0	140	110	0.79	0.75	0.80	0.80	0.80	166
6011	Grass from permanent meadows	210	10.3	82	15	0.80	641	135	25	355	415	640	100	0	130	70	0.69	0.37	0.70	0.70	0.69	93
6021	Red clover, 1st & 2nd cut, early cut	150	11.4	103	87	0.80	710	235	40	160	450	300	45	0	..	115	0.81	0.55	0.75	0.84	0.80	190
6022	Red clover, 1st and 2nd cut, average cut	180	10.6	94	74	0.80	660	210	35	230	410	360	80	0	..	115	0.79	0.52	0.70	0.77	0.75	166
6023	Red clover, 1st and 2nd cut, late cut	210	9.8	87	65	0.80	610	190	30	290	380	420	120	0	..	110	0.77	0.49	0.65	0.69	0.69	146
6024	Lucerne, 1st cut, vegetative state	180	10.6	99	99	0.80	660	240	35	220	395	330	110	0	..	110	0.82	0.49	0.55	0.80	0.74	197
6025	Lucerne, 1st cut, bud stage	210	10.1	91	79	0.80	630	210	30	250	410	380	130	0	..	100	0.79	0.44	0.55	0.74	0.70	166
6026	Lucerne, 1st cut, beginning of blooming	230	9.4	85	68	0.80	590	190	30	290	390	410	215	0	..	100	0.77	0.44	0.50	0.71	0.66	146
6027	Lucerne, 1st cut, full blooming	250	8.6	74	42	0.80	540	150	30	310	415	480	290	0	..	95	0.72	0.44	0.40	0.69	0.60	108
6040	Pea stand, blooming, pods emerging	140	10.6	96	82	0.80	664	220	35	..	..	400	130	0	130	65	0.80	0.49	0.60	0.76	0.71	176
6041	Pea stand, early pods, partly filled	160	10.6	89	41	0.80	660	170	35	..	..	430	150	135	90	70	0.80	0.49	0.60	0.76	0.71	136
6042	Pea stand, pods filled, partly yellow	210	10.2	84	27	0.80	640	150	35	..	..	450	130	195	80	70	0.77	0.49	0.55	0.65	0.69	116
6043	Faba bean stand, blooming	110	10.7	94	64	0.80	670	200	30	..	..	420	130	40	..	140	0.79	0.44	0.50	0.88	0.78	1158
6044	Faba bean forage, early pods	130	10.2	88	52	0.80	640	180	25	..	..	415	120	60	..	120	0.77	0.37	0.50	0.78	0.73	139
6045	Faba bean forage, pods filled, green	170	10.2	85	36	0.80	640	160	20	..	..	460	140	100	..	140	0.76	0.27	0.50	0.73	0.74	122
6061	Oats stand, early heading	180	9.1	70	1	0.80	570	105	30	280	495	..	..	..	..	90	0.60	0.44	0.60	0.70	0.63	63
6062	Oats, green, early blooming	220	9.0	67	-10	0.80	560	90	25	310	495	..	..	..	..	80	0.54	0.37	0.60	0.68	0.61	49

Feed code	Feed	DM, g/kg	ME, MJ/kg DM	MP, g/kg DM	PB, g/kg DM	EPD	D value, g/kg DM	Composition, g/kg DM									Digestibility, g/g					dCP, g/kg DM
								CP	EE	CF	NFE	NDF	INDF	Sta	Sug	Ash	CPd	EEd	CFd	NFEd	OMd	
6063	Oats-pea-vetch stand	240	9.6	83	19	0.75	600	140	29	280	464	430	..	60	120	87	0.68	0.57	0.58	0.68	0.66	95
6064	Barley stand, green	180	10.4	88	12	0.75	650	140	20	240	500	580	..	60	120	100	0.72	0.46	0.68	0.75	0.72	101
6065	Oats stand, yellow	220	9.4	73	-19	0.75	590	90	25	310	495	430	..	60	120	80	0.54	0.37	0.60	0.68	0.64	49
6070	Spring triticale, whole crop stand, dough stage	370	9.9	77	-19	0.75	620	95	..	..	..	475	160	..	..	52	..	..	..	.	0.65	0
7 Grass silages																						
7001	Grass silage, early 1st cut, DM 200–500 g/kg	350	11.5	88	39	0.85	720	170	45	305	395	520	40	0	50	85	0.76	0.61	0.79	0.81	0.79	129
7002	Grass silage, average/early 1st cut, DM 200–500 g/kg	350	11.0	84	35	0.85	690	160	40	330	390	550	70	0	50	80	0.75	0.58	0.76	0.76	0.75	120
7003	Grass silage, average/late 1st cut, DM 200–500 g/kg	350	10.6	80	26	0.85	660	145	40	350	390	580	90	0	50	75	0.73	0.58	0.72	0.71	0.71	106
7004	Grass silage, late 1st cut, DM 200–500 g/kg	350	10.1	75	18	0.85	630	130	35	360	400	590	110	0	50	75	0.70	0.55	0.69	0.68	0.68	91
7005	Grass silage, very late 1st cut, DM 200–500 g/kg	350	9.6	71	14	0.85	600	120	35	365	410	600	140	0	50	70	0.68	0.55	0.65	0.64	0.65	82
7006	Grass silage, high digestibility 2nd cut, DM 200–500 g/kg	350	10.9	84	45	0.85	680	170	50	290	395	520	60	0	70	95	0.71	0.51	0.78	0.77	0.75	121
7007	Grass silage, average digestibility 2nd cut, DM 200–500 g/kg	350	10.4	80	36	0.85	650	155	50	295	405	530	85	0	70	95	0.69	0.51	0.74	0.74	0.72	107
7008	Grass silage, low digestibility 2nd cut, DM 200–500 g/kg	350	9.9	76	32	0.85	620	145	45	300	420	540	115	0	70	90	0.67	0.48	0.70	0.69	0.68	97
7009	Grass silage, 3rd cut, DM 200–500 g/kg	350	11.2	87	46	0.85	700	175	55	285	390	510	45	0	70	95	0.72	0.53	0.81	0.80	0.77	126
7010	Italian ryegrass silage	340	10.6	81	39	0.85	660	160	45	257	424	500	..	0	46	113	0.74	0.74	0.74	0.75	0.74	118
7021	Red clover silage, early 1st & 2nd cut, DM 200–500 g/kg	350	11.2	101	85	0.80	700	230	50	170	435	310	35	0	40	115	0.81	0.57	0.75	0.82	0.79	186
7022	Red clover silage, average 1st & 2nd cut, DM 200–500 g/kg	350	10.4	93	71	0.80	650	205	45	240	400	370	90	0	40	110	0.79	0.55	0.70	0.74	0.73	162
7023	Red clover silage, late 1st & 2nd cut, DM 200–500 g/kg	350	9.6	85	62	0.80	600	185	40	300	365	430	140	0	40	110	0.77	0.52	0.65	0.66	0.67	142
7027	Red clover (25 %) silage, early 1st cut, DM 200–500 g/kg	350	10.7	89	35	0.80	670	165	40	300	410	515	75	0	50	85	0.77	0.55	0.74	0.77	0.73	127
7028	Red clover (25 %) silage, normal 1st cut, DM 200–500 g/kg	350	10.2	83	28	0.80	635	150	40	330	395	540	105	0	50	85	0.75	0.52	0.69	0.72	0.69	113
7029	Red clover (25 %) silage, late 1st cut, DM 200–500 g/kg	350	9.6	78	21	0.80	600	135	35	350	400	560	140	0	50	80	0.72	0.49	0.65	0.66	0.65	97
7030	Red clover (50 %) silage, early 1st cut, DM 200–500 g/kg	350	10.9	93	54	0.80	680	190	45	260	410	450	65	0	45	95	0.79	0.57	0.74	0.80	0.75	150

Feed code	Feed	DM, g/kg	ME, MJ/kg DM	MP, g/kg DM	PB, g/kg DM	EPD	D value, g/kg DM	Composition, g/kg DM									Digestibility, g/g					dCP, g/kg DM
								CP	EE	CF	NFE	NDF	INDF	Sta	Sug	Ash	CPd	EEd	CFd	NFEd	OMd	
7031	Red clover (50 %) silage, normal 1st cut, DM 200–500 g/kg	350	10.2	87	44	0.80	640	170	40	300	395	480	100	0	45	95	0.77	0.55	0.70	0.74	0.71	131
7032	Red clover (50 %) silage, late 1st cut, DM 200–500 g/kg	350	9.6	80	33	0.80	600	150	40	335	390	515	140	0	45	90	0.74	0.52	0.65	0.66	0.66	111
7033	Red clover (75 %) silage, early 1st cut, DM 200–500 g/kg	350	11.0	90	78	0.85	690	210	50	215	420	380	50	0	45	105	0.81	0.57	0.60	0.76	0.77	170
7034	Red clover (75 %) silage, normal 1st cut, DM 200–500 g/kg	350	10.4	84	67	0.85	650	190	45	270	390	430	95	0	45	100	0.79	0.55	0.55	0.71	0.72	150
7035	Red clover (75 %) silage, late 1st cut, DM 200–500 g/kg	350	9.6	77	57	0.85	600	170	40	315	380	475	140	0	45	100	0.77	0.55	0.50	0.68	0.67	131
7036	Lucerne silage, 1st cut, vegeta-tive	350	10.4	97	96	0.80	650	235	50	240	365	340	150	0	40	115	0.78	0.58	0.68	0.76	0.73	183
7037	Lucerne silage, 1st cut, bud stage	350	9.9	90	76	0.80	620	205	45	270	365	380	195	0	40	110	0.76	0.57	0.64	0.71	0.70	156
7038	Lucerne silage, 1st cut, beginning of blooming	350	9.3	83	65	0.80	580	185	45	310	355	420	215	0	40	105	0.74	0.55	0.60	0.68	0.65	137
7039	Lucerne (50 %) silage, early cut	350	10.5	84	66	0.85	655	190	45	295	380	460	120	0	45	95	0.77	0.58	0.72	0.76	0.72	145
7040	Lucerne (50 %) silage, average cut	350	10.0	79	52	0.85	625	168	40	315	385	485	150	0	45	93	0.75	0.58	0.68	0.71	0.69	125
7041	Lucerne (50 %) silage, late cut	350	9.4	74	44	0.85	590	153	40	340	380	510	180	0	45	88	0.72	0.55	0.65	0.68	0.65	110
8 Other silages																						
8001	Whole crop silage, barley, NDF 45 %	350	10.4	79	-19	0.80	670	100	..	..	..	450	80	..	..	70	..	..	..	..	0.72	..
8002	Whole crop silage, barley, NDF 50 %	350	9.9	76	-14	0.80	640	100	..	..	..	500	120	..	..	70	..	..	..	..	0.69	..
8003	Whole crop silage, barley, NDF 55 %	350	9.3	73	-8	0.80	600	100	..	..	..	550	150	..	..	70	..	..	..	..	0.65	..
8005	Whole crop silage, oats	350	9.0	70	-9	0.80	580	95	45	350	420	450	175	150	10	90	0.56	0.55	0.60	0.62	0.64	53
8010	Whole crop silage, wheat	410	10.4	79	-24	0.80	670	94	20	222	616	390	110	247	20	48	0.61	0.46	0.65	0.74	0.70	57
8011	Spring triticale, whole crop silage, dough stage	315	9.5	72	-18	0.80	610	90	20	..	..	495	145	170	0	50	..	..	..	..	0.64	0
8015	Maize silage, early stage	200	9.8	73	-29	0.80	630	80	18	..	..	500	100	50	200	52	0.61	0.46	0.65	0.74	0.68	49
8016	Maize silage, average stage	270	10.4	76	-35	0.80	670	80	18	..	..	450	90	200	100	50	0.61	0.46	0.65	0.74	0.71	49
8017	Maize silage, late stage	320	10.7	78	-38	0.80	690	80	18	..	..	400	80	300	20	48	0.61	0.46	0.65	0.74	0.72	49
8020	Whole crop silage, green barley	350	9.9	82	19	0.80	640	140	20	283	452	580	..	0	20	105	0.74	0.46	0.68	0.77	0.72	104
8021	Whole crop silage, early heading oats	350	8.7	66	11	0.85	560	110	50	320	420	..	..	..	..	100	0.62	0.57	0.60	0.67	0.62	68
8022	Whole crop silage, early blooming oats	350	8.5	64	-1	0.85	550	95	45	350	420	..	..	..	..	90	0.56	0.55	0.60	0.62	0.60	53
8023	Oats-pea-vetch silage	340	9.1	71	19	0.85	590	125	20	286	488	460	170	150	10	81	0.81	0.75	0.50	0.83	0.64	101
8040	Kale silage, early cut	170	9.9	79	42	0.85	640	160	40	230	440	..	..	..	..	130	0.73	0.52	0.60	0.83	0.74	117

Feed code	Feed	DM, g/kg	ME, MJ/kg DM	MP, g/kg DM	PB, g/kg DM	EPD	D value, g/kg DM	Composition, g/kg DM									Digestibility, g/g					dCP, g/kg DM
								CP	EE	CF	NFE	NDF	INDF	Sta	Sug	Ash	CPd	EEd	CFd	NFEd	OMd	
8041	Sugar beet top silage	180	9.6	81	72	0.85	620	190	45	150	435	..	..	..	..	180	0.77	0.55	0.70	0.80	0.76	146
8042	Pea silage	200	9.8	77	31	0.85	630	145	50	270	350	450	150	..	..	130	0.78	0.57	0.50	0.87	0.72	113
8043	Faba bean silage	200	9.8	78	40	0.85	630	155	20	..	..	450	150	45	..	95	0.77	0.59	0.50	0.67	0.70	119
8044	Goats rue silage, 1st cut	160	9.8	86	105	0.85	630	230	43	278	364	..	..	..	..	85	0.81	0.54	0.52	0.75	0.69	186
8045	Goats rue silage, 2nd cut	230	8.7	73	69	0.85	560	177	38	268	434	..	..	..	..	83	0.72	0.57	0.43	0.69	0.61	127
9 Hay and artificially dried grasses																						
9001	Hay and haylage, very early 1st cut, DM 500–860 g/kg	860	10.6	99	37	0.75	690	180	35	315	380	580	60	0	..	90	0.76	0.49	0.70	0.82	0.76	137
9002	Hay and haylage, early 1st cut, DM 500–860 g/kg	860	10.4	95	23	0.75	680	160	30	335	390	610	70	0	101	85	0.73	0.44	0.70	0.81	0.74	117
9003	Hay and haylage, average/early 1st cut, DM 500–860 g/kg	860	9.9	88	12	0.75	650	140	30	350	400	630	100	0	101	80	0.70	0.44	0.70	0.74	0.71	98
9004	Hay and haylage, average/late 1st cut, DM 500–860 g/kg	860	9.4	82	0	0.75	620	120	25	360	420	650	120	0	..	75	0.66	0.37	0.67	0.69	0.67	79
9005	Hay and haylage, late 1st cut, DM 500–860 g/kg	860	8.9	75	-11	0.75	590	100	20	365	445	670	145	0	..	70	0.64	0.27	0.64	0.65	0.63	64
9006	Hay and haylage, very late 1st cut, DM 500–860 g/kg	900	8.4	69	-22	0.75	560	80	20	364	471	670	170	0	..	65	0.58	0.27	0.62	0.60	0.60	46
9021	Grass leaf meal	900	11.0	112	41	0.70	710	200	40	210	450	..	..	57	12	100	0.78	0.52	0.75	0.83	0.79	156
9022	Grass meal	900	10.4	101	21	0.70	670	165	35	250	460	..	..	46	9	90	0.74	0.49	0.70	0.78	0.74	122
9023	Hay meal	900	9.9	93	6	0.70	650	140	30	270	480	..	..	45	9	80	0.70	0.44	0.65	0.75	0.71	98
9024	Clover leaf meal	850	10.6	110	56	0.70	660	210	40	210	440	..	..	50	10	100	0.76	0.52	0.65	0.81	0.73	160
9025	Clover meal	850	9.9	100	33	0.70	640	175	35	250	450	..	..	50	10	90	0.74	0.49	0.62	0.75	0.70	130
9026	Clover hay meal	850	9.7	94	16	0.70	630	150	30	280	460	..	..	50	9	80	0.72	0.44	0.60	0.75	0.68	108
10 Straw																						
10001	Straw of oats and barley	750	6.0	47	-42	0.75	430	30	15	450	440	..	..	..	..	65	0	0.27	0.50	0.48	0.46	0
10002	Straw of wheat and rye	420	5.3	59	37	0.75	380	120	20	430	365	..	..	..	..	65	0	0.09	0.45	0.39	0.41	0
11 Minerals																						
11001	Calcium carbonate	1000	..	..	..	..	..	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	0
11002	Monocalcium phosphate	1000	..	..	..	..	..	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..
11003	Monosodium phosphate	1000	..	..	..	..	..	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..
11004	Magnesium oxide	1000	..	..	..	..	..	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..
11005	Magnesium carbonate	1000	..	..	..	..	..	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..
11006	Magnesium phosphate	1000	..	..	..	..	..	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..
11007	Salt (sodium chloride)	1000	..	..	..	..	..	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..
11008	Dicalcium phosphate, anhydrous	1000	..	..	..	..	..	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..

RUMINANTS AND HORSES

Feed code	Feed	DM, g/kg	ME, MJ/kg DM	MP, g/kg DM	PB, g/kg DM	EPD	D value, g/kg DM	Composition, g/kg DM									Digestibility, g/g					dCP, g/kg DM
								CP	EE	CF	NFE	NDF	INDF	Sta	Sug	Ash	CPd	EEd	CFd	NFEd	OMd	
11009	Dicalcium phosphate, dihydrous	1000	..	..	..	..	..	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..
11010	Phosphoric acid	1000	..	..	..	..	..	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..
11011	Calcium formate	1000	..	..	..	..	..	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..
11012	Sodium bicarbonate	1000	..	..	..	..	..	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..
11014	Sodium sulphate	1000	..	..	..	..	..	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..
90 Other feeds																						
90001	Urea	1000	..	0	2874	1.00	..	2874	0	0	0	..	..	..	..	0	1.00	0	0	..	..	2874
90010	Feed yeast	920	12.8	216	269	0.70	780	520	50	10	350	66	..	73	5	70	0.90	0.82	0.70	0.76	0.84	468
90011	Brewers yeast	100	13.1	227	288	0.70	800	550	50	15	315	66	..	62	15	70	0.90	0.82	0.70	0.80	0.86	495
90021	Vegetable oil	1000	32.5	92	-144	0.75	950	0	1000	0	0	0	0	0	0	0	0	0.95	0	0	0.95	0
90023	Protected fat (Ca salt of fatty acids)	990	27.6	75	-118	0	950	0	850	0	0	..	..	..	..	150	0	0.95	0	0	0.95	0
90040	L-Lysine HCL	995	..	..	..	..	..	959	..	..	68	..	..	..	..	..	..	..	..	..	..	..
90041	L-Threonine	995	..	..	..	..	..	735	..	..	278	..	..	..	..	..	..	..	..	..	..	..
90042	DL-Methionine	995	..	..	..	..	..	587	..	..	478	..	..	..	..	..	..	..	..	..	..	..
90043	L-Tryptophan	995	..	..	..	..	..	857	..	..	143	..	..	..	..	..	..	..	..	..	..	..
90044	L-Valine	985	..	..	..	..	..	747	..	..	253	..	..	..	..	..	..	..	..	..	..	..

5.2. Feed tables - Pigs

PIGS			MJ/kg DM		Composition, g/kg DM							Digestibility, g/g			g/kg DM		Ileal digestible amino acids, g/kg DM				
Feed code	Feed	DM g/kg	NEg	NEa	CP	EE	CF	NDF	Sta	Sug	Ash	Ndg	Nda	Pd	dCPg	dCPa	dLys	dThr	dMet+ dCys	dTrp	dVal
1 Grains and seeds																					
1000	Barley, over 69 kg/hl	860	11.15	11.36	113	22	46	210	620	20	29	0.75	0.80	0.32	85	90	2.9	2.8	4.0	1.1	4.6
1001	Barley, 64–69 kg/hl	860	11.10	11.31	115	22	48	210	610	20	29	0.75	0.80	0.32	86	92	2.9	2.8	4.0	1.1	4.7
1002	Barley, 60–64 kg/hl	860	10.98	11.20	119	22	54	210	600	20	29	0.75	0.80	0.32	89	95	3.0	2.9	4.2	1.1	4.8
1003	Barley, 57–60 kg/hl	860	10.82	11.06	122	22	56	230	595	20	29	0.75	0.80	0.32	92	98	3.1	3.0	4.3	1.2	5.0
1004	Barley, under 57 kg/hl	860	10.76	11.01	127	22	58	230	585	20	29	0.75	0.80	0.32	95	102	3.2	3.1	4.5	1.2	5.2
1005	Barley, naked	860	11.84	11.98	150	28	36	216	700	30	25	0.79	0.84	0.32	119	126	3.9	3.5	5.4	1.4	6.7
1011	Oats, over 58 kg/hl	860	10.19	10.44	125	60	103	280	460	18	38	0.81	0.90	0.32	101	113	3.8	3.0	4.4	1.1	5.2
1012	Oats, 54–58 kg/hl	860	10.01	10.28	127	60	109	290	440	18	38	0.81	0.90	0.32	103	114	3.9	3.1	4.5	1.1	5.3
1013	Oats, 45–54 kg/hl	860	9.64	9.96	130	60	124	310	420	18	36	0.79	0.89	0.32	103	116	4.0	3.1	4.6	1.1	5.4
1014	Oats, 35–45 kg/hl	860	8.93	9.35	120	60	151	350	350	18	31	0.76	0.86	0.32	91	103	3.7	2.9	4.2	1.0	5.0
1015	Oats, hulless or dehulled	860	13.43	13.58	162	94	22	120	650	20	22	0.85	0.88	0.32	138	143	5.5	4.4	7.8	2.1	7.0
1030	Wheat, over 80 kg/hl	860	12.43	12.53	133	22	23	110	685	30	20	0.86	0.89	0.30	114	118	3.0	3.3	4.3	1.3	5.1
1031	Wheat, 76–80 kg/hl	860	12.42	12.52	133	22	23	110	675	30	20	0.86	0.89	0.30	114	118	3.0	3.3	4.3	1.3	5.1
1032	Wheat, 72–76 kg/hl	860	12.11	12.26	137	22	25	150	670	30	20	0.84	0.88	0.30	115	121	3.1	3.4	4.6	1.3	5.3
1033	Wheat, under 72 kg/hl	860	11.85	12.04	137	22	33	150	645	30	20	0.84	0.88	0.30	115	121	3.1	3.4	4.6	1.3	5.3
1041	Rye	860	11.15	11.44	110	20	28	200	650	36	22	0.70	0.76	0.30	77	84	2.9	2.5	3.2	0.9	3.8
1042	Triticale	860	11.72	11.89	106	26	26	190	625	55	22	0.82	0.86	0.30	87	91	3.2	2.9	4.3	1.1	4.6
1043	Maize, grain	860	12.93	13.25	100	46	24	110	710	12	15	0.82	0.92	0.28	82	92	2.2	3.2	4.0	0.6	4.4
1051	Rice, grain	860	11.62	11.79	97	25	99	90	700	0	61	0.83	0.86	0.12	81	83	2.6	2.6	2.5	0.7	4.3
1052	Rice, grain, husked	874	13.71	13.74	92	13	5	10	868	15	12	0.90	0.91	0.12	83	84	2.6	2.4	3.5	0.8	4.2
1071	Pea, seed	860	11.33	11.63	230	11	57	130	480	55	31	0.83	0.87	0.47	191	200	13.5	6.3	4.5	1.5	8.1
1072	Faba bean, seed	860	10.81	10.96	300	15	80	160	380	40	36	0.83	0.84	0.37	249	252	15.6	7.7	4.2	2.2	10.1
1074	Soya bean, seed	900	12.08	12.98	400	190	60	120	54	77	55	0.86	0.91	0.32	344	364	20.9	13.4	9.9	4.0	16.8
1075	Lupin, seed	860	8.83	9.89	340	51	178	250	10	55	30	0.83	0.90	0.50	282	306	13.9	9.6	6.5	2.1	11.7
1081	Rapeseed (*Brassica napus*)	920	18.42	18.79	240	450	75	190	0	55	50	0.83	0.87	0.30	199	209	10.9	7.5	6.4	2.1	8.2
1082	Rapeseed (*Brassica rapa* subsp. Oleifera)	920	17.15	17.57	235	415	85	200	0	55	50	0.82	0.86	0.30	193	202	10.6	7.3	6.2	2.1	8.1
1083	Flax, seed	920	16.66	16.82	250	380	75	150	16	29	45	0.94	0.97	0.20	235	243	6.8	6.8	6.1	2.3	9.7
1086	Hemp, seed	920	11.07	12.05	260	300	230	325	15	..	55	0.73	0.83	0.20	190	216	6.4	5.7	6.9	2.2	8.5
2 Cakes and meals																					
2001	Rapeseed expeller, heat treated	910	8.59	9.12	358	98	115	300	37	72	74	0.76	0.79	0.32	272	283	15.6	11.8	10.0	3.4	13.5
2002	Rapeseed meal	890	7.88	8.38	379	44	126	270	45	87	80	0.78	0.81	0.32	296	307	16.5	12.5	10.5	3.7	14.3
2003	Rapeseed expeller, cold pressed	910	11.48	11.93	309	248	102	230	..	87	63	0.76	0.77	0.32	235	238	13.4	10.2	8.6	3.0	11.7

PIGS		DM g/kg	MJ/kg DM		Composition, g/kg DM							Digestibility, g/g			g/kg DM		Ileal digestible amino acids, g/kg DM				
Feed code	Feed		NEg	NEa	CP	EE	CF	NDF	Sta	Sug	Ash	Ndg	Nda	Pd	dCPg	dCPa	dLys	dThr	dMet+ dCys	dTrp	dVal
2011	Soya bean expeller	890	10.68	11.33	493	81	58	115	77	100	64	0.86	0.88	0.32	424	434	29.5	17.6	12.1	5.8	21.7
2012	Soya bean meal	880	9.85	10.49	520	34	58	120	74	95	67	0.87	0.90	0.32	452	468	29.7	18.5	12.8	6.2	22.9
2013	Soya bean meal, CP > 50 %	870	9.74	10.35	537	30	42	..	..	105	68	0.90	0.92	0.32	483	494	30.6	19.1	13.2	6.4	23.7
2014	Soya protein	910	9.61	10.22	607	30	43	..	..	105	73	0.95	0.98	0.32	577	595	34.6	21.6	16.0	7.2	28.4
2016	Soya bean meal, CP 46 %	876	9.16	9.86	494	19	70	..	..	97	74	0.87	0.90	0.32	430	445	27.3	16.6	12.9	5.7	20.9
2021	Flax expeller	900	12.27	12.6	320	226	90	180	..	45	48	0.89	0.90	0.12	285	288	8.6	8.8	7.9	3.0	12.4
2023	Flax meal	900	8.18	8.57	390	20	105	230	..	29	65	0.91	0.94	0.12	355	367	10.5	10.7	9.5	3.6	15.2
2024	Hemp seed expeller, cold pressed	920	6.78	7.97	350	130	290	400	15	..	65	0.74	0.86	0.20	257	301	11.2	9.7	11.9	3.4	15.4
2027	Faba bean meal, decorticated, heat treated	900	10.8	10.9	340	20	65	116	330	..	40	0.87	0.89	0.45	296	303	16.2	9.2	5.4	1.9	11.4
2031	Palm kernel expeller	900	5.86	6.54	155	90	190	650	7	15	50	0.65	0.78	0.31	101	121	1.9	2.7	3.6	0.6	5.7
2032	Palm kernel meal	900	4.44	5.21	169	10	207	700	7	15	54	0.64	0.77	0.31	108	130	2.1	2.9	3.9	0.6	6.2
2041	Sunflower expeller, dehulled seeds	900	8.19	8.62	430	100	140	400	22	67	70	0.90	0.92	0.19	387	396	12.3	13.2	14.7	4.3	18.2
2042	Sunflower meal, dehulled seeds, CF 18 %	900	6.66	7.13	460	10	160	400	23	85	70	0.90	0.92	0.19	414	423	13.2	14.2	15.7	4.6	19.5
2043	Groundnut expeller, dehulled seeds	900	10.67	10.93	530	70	55	..	96	91	60	0.91	0.92	0.30	482	488	10.3	10.2	9.5	3.8	18.0
2044	Groundnut meal, CF < 9 %	896	9.55	9.86	546	38	76	..	..	103	67	0.90	0.91	0.30	491	497	10.9	10.3	8.4	4.5	17.2
2045	Sunflower meal, not dehulled	887	5.14	5.87	313	23	287	..	..	59	70	0.70	0.77	0.19	219	241	9.0	9.3	11.0	3.3	12.8
2046	Sunflower meal, dehulled, CF > 20 %	897	5.89	6.53	373	19	236	..	..	63	75	0.74	0.79	0.19	276	295	10.8	10.9	13.0	3.9	15.2
3 Plant by-products																					
3003	Dehulled barley, barley flakes or meal	880	12.61	12.63	110	10	10	..	722	23	10	0.80	0.83	0.32	88	91	2.8	2.7	3.9	1.0	4.5
3004	Dehulled oats, oats flakes or meal	880	13.38	13.50	150	80	25	..	652	17	20	0.84	0.88	0.32	126	132	5.1	4.1	7.3	2.0	6.6
3005	Dehulled rice, rice grits	880	13.26	13.30	80	5	10	..	740	4	10	0.88	0.89	0.12	70	71	2.2	2.1	2.1	0.6	3.5
3008	Wheat germ feed	880	10.96	11.28	255	70	45	143	234	69	45	0.90	0.96	0.30	230	245	8.7	7.2	10.4	2.2	10.7
3009	Wheat middlings	880	11.08	11.33	165	35	45	180	482	69	30	0.79	0.83	0.25	130	137	4.7	4.4	4.9	1.8	6.7
3010	Wheat middlings, rich in germs	880	10.27	10.66	197	51	57	261	430	62	42	0.78	0.84	0.25	154	165	5.7	5.3	5.8	2.2	8.0
3011	Wheat bran	870	7.64	8.18	170	40	92	420	156	64	54	0.67	0.75	0.25	114	128	4.6	3.6	4.2	1.7	5.9
3012	Rye middlings	880	10.71	11.01	155	35	40	161	300	120	30	0.72	0.79	0.30	112	122	4.1	3.5	4.6	1.3	5.3
3013	Rye bran	880	8.91	9.42	160	40	100	161	60	10	50	0.65	0.74	0.30	104	118	..	..	..	..	..
3014	Barley middlings	880	9.64	9.99	145	35	80	216	280	73	40	0.74	0.80	0.32	107	116	3.7	3.6	5.1	1.4	5.9
3015	Barley hull bran	880	6.61	7.33	150	35	160	216	250	20	65	0.64	0.73	0.32	96	110	4.9	3.6	5.3	0.8	6.0
3016	Oat middlings	880	11.87	11.91	160	80	55	372	400	10	35	0.89	0.96	0.32	142	154	4.9	3.9	5.7	1.5	6,7
3018	Oat hull bran	880	4.63	5.56	70	30	260	372	105	11	50	0.57	0.71	0.32	40	50	2.1	1.7	2.3	0.5	2.7
3019	Oat hull flour	880	3.54	4.63	50	25	300	372	120		50	0.51	0.66	0.32	26	33	1.5	1.2	1.6	0.4	1.9
3020	Rice middlings	880	12.88	13.14	150	155	80	10	200	37	95	0.85	0.89	0.12	128	134	5.2	3.8	3.7	1.2	7.0
3022	Hemp bran	920	4.75	5.56	200	220	350	460	5	..	45	0.57	0.70	0.20	113	140	2.2	2.2	2.8	0.4	3.1
3031	Barley malt germs	920	6.49	6.94	320	20	140	447	54	141	60	0.79	0.85	0.20	253	272	11.3	7.8	5.6	2.0	12.7
3032	Barley germ feed	900	6.95	7.36	220	20	130	447	54	141	60	0.74	0.78	0.20	163	172	7.8	5.3	3.9	1.4	8.7

PIGS			MJ/kg DM		Composition, g/kg DM							Digestibility, g/g			g/kg DM		Ileal digestible amino acids, g/kg DM				
Feed code	Feed	DM g/kg	NEg	NEa	CP	EE	CF	NDF	Sta	Sug	Ash	Ndg	Nda	Pd	dCPg	dCPa	dLys	dThr	dMet+ dCys	dTrp	dVal
3034	Brewers grain, moist	220	6.88	7.39	230	89	170	570	75	9	40	0.75	0.80	0.32	173	184	6.6	6.6	5.6	2.1	10.5
3035	Dried brewers grain	920	6.70	7.21	230	80	170	570	50	10	45	0.75	0.80	0.32	173	184	6.6	6.6	5.6	2.1	10.5
3036	Beer yeast liquid	140	9.96	10.28	287	18	15	66	..	..	39	0.71	0.70	0.20	204	201	7.2	6.3	6.9	1.9	9.6
3037	Barley fibre, moist	188	9.05	9.50	188	60	106	338	157	120	44	0.73	0.81	0.21	137	152	6.2	4.8	6.2	1.5	7.5
3039	Wheat distillers grain feed	920	7.52	8.05	360	60	90	422	42	8	90	0.66	0.70	0.20	238	252	6.7	8.6	11.5	3.2	13.0
3041	Barley starch distillers grains, moist	110	11.00	11.07	428	73	..	72	17	111	77	0.88	0.86	0.55	377	368	14.8	13.0	14.0	4.0	18.3
3042	Barley distillers solubles	312	11.34	11.49	266	77	..	19	33	185	114	0.84	0.82	0.55	223	218	10.4	9.4	10.3	2.1	12.4
3043	Barley distillers solids	150	11.03	11.11	524	70	..	80	22	77	58	0.95	0.94	0.68	498	493	16.6	14.7	16.6	5.1	22.2
3044	Barley starch	910	14.00	14.00	6	6	..	..	989	..	1	..	..	..	..	..	..	..	..	..	..
3047	Barley fibre, dried	960	6.27	7.18	144	98	223	622	75	29	31	0.55	0.67	..	79	96	1.4	1.1	2.1	0.4	..
3049	Barley protein	222	11.97	12.13	277	46	..	21	385	154	51	0.84	0.83	0.33	233	230	9.8	9.3	10.6	2.8	13.3
3053	Barley protein feed, A-Rehu OVR	210	10.70	10.90	410	70	35	75	40	15	70	0.87	0.86	0.54	355	354	12.6	11.2	13.2	3.9	18.1
3071	White sugar	1000	10.14	10.44	0	0	0	..	0	960	0	..	..	..	..	..	..	..	..	..	..
3072	Sugar beet molasses	770	8.77	9.03	150	0	0	0	0	650	120	0.50	0.54	0.20	75	81	1.7	0.7	1.0	0.9	2.0
3076	Molasses mix, beet and process molasses	740	9.06	9.32	100	2	0	0	..	650	100	0.50	0.54	0.20	50	54	1.1	0.5	0.7	0.6	1.3
3078	Molasses mix, beet based	750	8.83	9.09	120	2	..	0	..	540	120	0.50	0.54	0.20	60	65	1.3	0.6	0.8	0.7	1.6
3081	Sugar beet pulp, dried	900	6.95	8.01	110	5	196	450	0	70	62	0.51	0.76	0.20	56	84	3.0	1.5	1.2	0.5	2.3
3082	Molassed sugar beet pulp	900	7.62	8.40	112	5	179	355	0	110	70	0.57	0.78	0.20	64	87	4.6	1.7	1.5	0.5	3.1
3083	Wheat starch, cooked	900	13.84	13.83	5	0	0	0	960	..	0	..	..	0.30	..	..	..	..	..	..	..
3084	Wheat gluten	920	11.63	11.77	840	10	5	0	..	..	5	0.97	0.97	0.20	815	815	12.0	18.9	22.7	6.3	26.2
3085	Wheat syrup	710	11.42	11.52	28	20	0	0	0	593	17	..	..	..	..	..	..	..	..	..	..
3086	Maize gluten	895	12.86	13.26	677	71	12	26	192	4	21	0.87	0.88	0.19	589	596	10.6	20.9	26.6	2.8	28.4
3087	Maize gluten feed	880	7.75	9.01	219	31	85	384	205	19	70	0.60	0.74	0.22	131	162	4.4	5.2	6.1	0.9	7.6
3109	Potato protein	923	11.08	11.26	841	10	9	65	7	10	28	0.95	0.95	0.20	799	799	56.8	42.0	25.8	7.7	49.4
3110	Soya bean hulls	894	4.66	6.68	134	25	382	631	0	17	53	0.42	0.78	0.20	56	105	4.8	3.0	2.4	1.0	3.5
4 Feeds of animal origin																					
4001	Full milk	130	18.31	18.36	248	340	0	0	0	367	54	0.95	0.95	0.90	236	236	17.9	11.0	7.9	3.4	13.5
4002	Full fat milk powder	960	16.75	16.81	280	270	0	0	0	370	60	0.98	0.98	0.90	274	274	19.7	12.1	8.3	3.8	16.7
4004	Feed milk powder	970	11.97	11.91	352	20	0	0	0	480	93	0.95	0.94	0.90	334	331	27.0	14.7	10.3	3.8	20.4
4011	Whey	60	11.92	11.79	110	10	0	0	0	643	80	0.96	0.96	0.90	106	106	7.6	6.0	4.0	1.1	5.2
4013	Whey meal	960	12.39	12.19	125	10	0	0	0	750	73	0.95	0.95	0.90	119	119	8.7	6.8	4.6	1.2	5.9
4015	Low lactose whey meal	970	10.97	10.84	253	26	0	0	0	380	175	0.95	0.95	0.90	240	240	17.5	13.8	9.4	2.4	11.9
4017	Whey protein meal, 35 % CP	950	13.29	13.14	486	31	0	0	0	450	21	0.95	0.95	0.90	462	462	38.9	29.8	19.3	..	32.1
4018	Whey protein meal, 75 % CP	940	13.02	12.95	745	31	0	0	0	80	18	0.95	0.95	0.90	708	708	65.0	48.8	29.5	..	50.4
4020	Casein	920	11.55	11.60	885	10	0	..	0	..	40	0.95	0.95	0.90	841	841	66.2	35.8	32.2	12.9	56.0
4031	Sow milk	190	17.79	17.85	350	310	..	..	..	367	45	0.95	0.95	0.90	333	333	21.8	13.8	11.6	4.3	16.0

PIGS		DM g/kg	MJ/kg DM		Composition, g/kg DM							Digestibility, g/g			g/kg DM		Ileal digestible amino acids, g/kg DM				
Feed code	Feed		NEg	NEa	CP	EE	CF	NDF	Sta	Sug	Ash	Ndg	Nda	Pd	dCPg	dCPa	dLys	dThr	dMet+ dCys	dTrp	dVal
4101	Fish meal, high fat	920	10.94	10.89	762	110	0	..	0	0	128	0.85	0.85	0.77	648	648	55.2	31.6	27.9	8.1	37.2
4102	Fish meal, medium fat	940	8.77	8.72	734	34	0	..	0	0	232	0.85	0.85	0.77	624	624	53.2	30.4	26.8	7.8	35.8
4121	Freshwater fish, fresh	280	11.20	11.14	700	150	0	..	0	0	150	0.85	0.85	0.77	595	595	..	..	..	..	..
4221	Animal fat	1000	29.66	29.66	0	995	0	0	..	..	0	..	..	..	..	..	..	..	..	..	..
5 Roots, tubers, fruits, and cabbages																					
5003	Potato, dried	900	11.92	12.02	95	0	30	0	620	0	55	0.60	0.63	0.20	57	60	3.7	2.3	2.0	0.7	3.5
9 Hay and artificially dried grasses																					
9002	Hay and haylage, early 1st cut, DM 500–860 g/kg	860	2.94	3.91	160	30	335	610	0	101	85	0.38	0.54	0.20	61	86	..	..	..	..	..
9004	Hay and haylage, early 1st cut, DM 500–860 g/kg	860	2.67	3.71	140	30	350	630	0	101	80	0.32	0.49	0.20	45	69	..	..	..	..	..
10 Straw																					
10001	Straw of oats and barley	850	0.86	1.45	40	20	430	830	0	16	65	..	..	0.20	..	..	..	..	..	..	..
11 Minerals																					
11002	Monocalcium phosphate	1000	..	..	..	..	..	..	..	..	1000	..	..	0.83	..	..	..	..	..	..	..
11003	Monosodium phosphate	1000	..	..	..	..	..	..	..	..	1000	..	..	0.90	..	..	..	..	..	..	..
11008	Dicalcium phosphate, anhydrous	1000	..	..	..	..	..	..	..	..	1000	..	..	0.66	..	..	..	..	..	..	..
11009	Dicalcium phosphate, dihydrous	1000	..	..	..	..	..	..	..	..	1000	..	..	0.66	..	..	..	..	..	..	..
11010	Phosphoric acid	1000	..	..	..	..	..	..	..	..	1000	..	..	0.75	..	..	..	..	..	..	..
90 Other feeds																					
90010	Feed yeast	920	10.14	10.44	520	50	10	66	73	5	70	0.88	0.89	0.20	458	463	25.8	16.5	8.0	3.1	17.2
90011	Brewers yeast	100	10.00	10.32	550	50	15	66	62	15	70	0.89	0.91	0.20	490	501	28.5	16.7	6.1	3.1	19.2
90021	Vegetable oil	1000	29.77	29.77	0	1000	0	0	..	..	0	..	..	..	..	..	..	..	..	..	..
90040	L-Lysine HCl	995	14.24	14.22	959	..	..	..	..	..	..	1.00	1.00	..	959	959	802	..	..	..	..
90041	L-Threonine	995	12.34	12.32	735	..	..	..	..	..	..	1.00	1.00	..	735	735	..	995	..	..	..
90042	DL-Methionine	995	17.36	17.35	587	..	..	..	..	..	..	1.00	1.00	..	587	587	..	..	995	..	..
90043	L-Tryptophan	995	20.06	20.05	857	..	..	..	..	..	..	1.00	1.00	..	857	857	..	..	..	990	..
90044	L-Valine	985	18.01	17.99	747	..	..	..	..	..	..	1.00	1.00	..	747	747	..	..	..	..	980

5.3. Feed tables - Poultry

POULTRY				Composition, g/kg DM								Digestibility, g/g			g/kg DM					
Feed code	Feed	DM, g/kg	ME, MJ/kg DM	CP	EE	CF	NFE	NDF	Sta	Sug	Ash	CPd	EEd	NFEd	Lys	Met	Cys	Ca	Available P	Linolic acid	For-mula code
1 Grains and seeds																					
1000	Barley, over 69 kg/hl	860	13.2	113	22	46	790	210	620	20	29	0.70	0.60	0.85	3.8	1.9	2.8	0.3	1.2	12	R1
1001	Barley, 64–69 kg/hl	860	13.1	115	22	48	786	210	610	20	29	0.70	0.60	0.85	3.9	2.0	2.9	0.3	1.2	12	R1
1002	Barley, 60–64 kg/hl	860	13.1	119	22	54	776	210	600	20	29	0.68	0.60	0.80	4.0	2.0	3.0	0.3	1.2	12	R1
1003	Barley, 57–60 kg/hl	860	13.0	122	22	56	771	230	595	20	29	0.64	0.60	0.77	4.1	2.1	3.1	0.3	1.2	12	R1
1004	Barley, under 57 kg/hl	860	13.0	127	22	58	764	230	585	20	29	0.50	0.55	0.70	4.3	2.2	3.2	0.3	1.2	12	R1
1005	Barley, naked	860	14.5	150	28	36	761	216	700	30	25	0.80	0.68	0.88	5.3	2.9	3.6	0.3	1.8	15	D
1011	Oats, over 58 kg/hl	860	12.8	125	60	103	674	280	460	18	38	0.75	0.90	0.75	5.3	2.1	3.5	0.5	1.1	19	R3
1012	Oats, 54–58 kg/hl	860	12.6	127	60	109	666	290	440	18	38	0.73	0.90	0.73	5.3	2.2	3.6	0.5	1.1	19	R3
1013	Oats, 45–54 kg/hl	860	12.3	130	60	124	650	310	420	18	36	0.68	0.84	0.63	5.5	2.2	3.6	0.5	1.1	19	R3
1014	Oats, 35–45 kg/hl	860	9.0	120	60	151	638	350	350	18	31	0.50	0.80	0.55	5.0	2.0	3.4	0.5	1.1	19	D
1015	Oats, hulless or dehulled	860	16.7	162	94	22	700	120	650	20	22	0.82	0.90	0.80	0	0	0	0.6	1.7	29	R3
1021	Mixed grain (barley and oats, 1:1)	860	12.9	121	41	79	726	250	525	19	34	0.72	0.75	0.79	4.6	2.1	3.2	0.4	1.1	16	R1. R3
1030	Wheat, over 80 kg/hl	860	14.7	133	22	23	802	110	685	30	20	0.80	0.68	0.88	3.7	2.1	2.9	0.3	1.1	12	D
1031	Wheat, 76–80 kg/hl	860	14.7	133	22	23	802	110	675	30	20	0.80	0.68	0.88	3.7	2.1	2.9	0.3	1.1	12	D
1032	Wheat, 72–76 kg/hl	860	14.7	137	22	25	796	150	670	30	20	0.80	0.68	0.88	3.8	2.2	3.0	0.3	1.1	12	D
1033	Wheat, under 72 kg/hl	860	14.6	137	22	33	788	150	645	30	20	0.80	0.68	0.88	3.8	2.2	3.0	0.3	1.1	12	D
1041	Rye	860	12.1	110	20	28	820	200	650	36	22	0.60	0.32	0.75	4.1	1.8	2.2	0.4	1.2	10	D
1042	Triticale	860	14.4	106	26	26	820	190	625	55	22	0.80	0.67	0.86	3.8	1.8	3.0	0.6	1.1	12	D
1043	Maize grain	860	15.9	100	46	24	815	110	710	12	15	0.84	0.92	0.90	2.8	2.3	2.1	0.3	0.9	20	D
1051	Rice, grain	860	12.8	97	25	99	718	90	700	0	61	0.80	0.85	0.85	3.4	1.9	1.3	0.4	0.2	12	D
1052	Rice, grain, husked	874	14.7	92	13	5	878	10	868	15	12	0.80	0.85	0.85	3.4	2.2	2.2	0.1	0.3	..	D
1071	Pea, seed	860	12.9	230	11	57	676	130	480	55	31	0.86	0.80	0.77	16.3	2.1	3.9	0.7	1.9	7	D
1072	Faba bean, seed	860	11.6	300	15	80	565	160	380	40	36	0.80	0.66	0.70	17.7	1.8	3.6	1.0	2.1	7	D
1073	Vetch, seed	..	11.8	300	20	70	570	..	380	40	40	0.80	0.66	0.70	0	0	0	1.5	..	6	D
1074	Soya bean, seed	900	14.6	400	190	60	295	120	54	77	55	0.85	0.84	0.45	24.0	6.0	6.0	2.7	2.0	100	D
1075	Lupin, seed	860	8.0	340	51	178	401	250	10	55	30	0.92	0.85	0.09	16.0	2.4	5.1	4.4	3.3	47	D
1081	Rapeseed (*Brassica napus*)	920	19.6	240	450	75	192	190	0	55	50	0.70	0.90	0.25	13.9	4.3	3.6	4.5	2.8	120	D
1082	Rapeseed (*Brassica rapa* subsp. Oleifera)	920	18.4	235	415	85	215	200	0	55	50	0.70	0.90	0.25	13.6	4.2	3.5	4.5	2.8	120	D
1083	Flax, seed	920	17.6	250	380	75	250	150	16	29	45	0.68	0.92	0.22	8.8	3.8	4.0	2.5	1.2	57	D
1084	Buckwheat, seed	860	10.5	130	30	155	650	480	..	..	35	0.68	0.90	0.70	0	0	0	0.2	..	..	D

POULTRY				Composition, g/kg DM								Digestibility, g/g			g/kg DM						
Feed code	Feed	DM, g/kg	ME, MJ/kg DM	CP	EE	CF	NFE	NDF	Sta	Sug	Ash	CPd	EEd	NFEd	Lys	Met	Cys	Ca	Available P	Linolic acid	For-mula code
1085	Sunflower, seed	940	13.6	185	440	155	185	310	35	60	35	0.85	0.60	0.15	6.5	4.3	3.0	2.6	..	..	D
1086	Hemp, seed	920	14.4	260	300	230	155	325	15	..	55	0.70	0.90	0.25	7.5	4.8	3.1	1.5	2.3	..	D
2 Cakes and meals																					
2001	Rapeseed expeller, heat treated	910	9.9	358	98	115	355	300	37	72	74	0.80	0.75	0.30	20.8	6.4	5.4	8.1	3.7	22	D
2002	Rapeseed meal	890	8.2	379	44	126	371	270	45	87	80	0.80	0.50	0.30	22.0	6.8	5.7	8.3	4.2	7	D
2003	Rapeseed expeller, cold pressed	910	13.1	309	248	102	278	230	..	87	63	0.80	0.75	0.30	17.9	5.6	4.6	7.4	3.5	..	D
2011	Soya bean expeller	890	12.0	493	81	58	304	115	77	100	64	0.87	0.76	0.36	29.6	7.4	7.4	2.3	2.0	34	D
2012	Soya bean meal	880	10.8	520	34	58	321	120	74	95	67	0.87	0.50	0.36	31.2	7.8	7.8	3.0	2.2	6	D
2013	Soya bean meal, CP > 50 %	870	11.0	537	30	42	323	..	..	105	68	0.87	0.50	0.36	33.3	7.5	7.0	3.0	2.2	..	D
2014	Soya protein	910	11.6	607	30	43	247	..	..	105	73	0.87	0.50	0.36	37.6	8.5	9.1	4.4	2.8	..	D
2016	Soya bean meal, CP 46 %	876	10.3	494	19	70	344	..	..	97	74	0.87	0.50	0.36	30.1	6.9	7.4	3.9	2.3	..	D
2021	Flax expeller	900	11.1	320	226	90	316	180	..	45	48	0.56	0.75	0.24	11.2	4.8	5.1	4.2	1.1	9	D
2023	Flax meal	900	6.2	390	20	105	420	230	..	29	65	0.56	0.70	0.24	13.7	5.9	6.2	4.5	1.1	3	D
2024	Hemp seed expeller, cold pressed	920	9.3	350	130	290	165	400	15	..	65	0.74	0.75	0.30	13.1	7.5	6.3	1.9	2.5	..	D
2031	Palm kernel expeller	900	7.3	155	90	190	515	650	7	15	50	0.70	0.90	0.25	5.3	3.4	2.8	3.0	2.0	..	D
2032	Palm kernel meal	900	4.9	169	10	207	560	700	7	15	54	0.70	0.90	0.25	5.7	3.7	3.0	2.1	2.0	..	D
2041	Sunflower expeller, dehulled seeds	900	9.6	430	100	140	260	400	22	67	70	0.85	0.64	0.08	15.1	9.9	7.3	4.0	2.3	56	R10
2042	Sunflower meal, dehulled seeds, CF 18 %	900	7.6	460	10	160	300	400	23	85	70	0.85	0.47	0.10	16.1	10.6	7.8	4.2	2.3	6	R10
2043	Groundnut expeller, dehulled seeds	900	12.8	530	70	55	285	..	96	91	60	0.85	0.83	0.48	17.0	5.8	6.9	2.1	2.2	17	E1
2044	Groundnut meal, CF < 9 %	896	11.5	546	38	76	273	..	..	103	67	..	..	..	18.0	5.5	5.5	2.2	1.9	..	E1
2045	Sunflower meal, not hulled	887	5.8	313	23	287	307	..	..	59	70	..	..	..	11.3	7.2	5.3	4.4	2.1	..	E3
2046	Sunflower meal, dehulled, CF > 20 %	897	6.9	373	19	236	297	..	..	63	75	..	..	..	13.1	8.6	6.3	4.5	2.3	..	R10
3 Plant by-products																					
3001	Dehulled wheat, wheat flakes or meal	880	15.8	120	15	0	860	..	650	120	5	0.80	0.82	0.91	3.0	2.2	3.0	0.2	0.3	11	D
3002	Dehulled rye, rye flakes or meal	880	12.5	120	15	0	850	..	580	..	15	0.60	0.32	0.75	0	0	0	0.3	1.1	11	D
3003	Dehulled barley, barley flakes or meal	880	15.3	110	10	10	860	..	722	23	10	0.71	0.76	0.90	3.9	2.1	2.6	0.3	1.0	6	R4
3004	Dehulled oats, oats flakes or meal	880	15.7	150	80	25	725	..	652	17	20	0.83	0.74	0.89	6.5	4.2	4.4	0.6	1.8	25	D

POULTRY				Composition, g/kg DM								Digestibility, g/g			g/kg DM						
Feed code	Feed	DM, g/kg	ME, MJ/kg DM	CP	EE	CF	NFE	NDF	Sta	Sug	Ash	CPd	EEd	NFEd	Lys	Met	Cys	Ca	Available P	Linolic acid	For-mula code
3005	Dehulled rice, rice grits	880	16.8	80	5	10	895	..	740	4	10	0.82	0.88	0.98	3.0	1.9	1.9	0	0.2	11	R6
3007	Wheat germs	880	10.1	300	90	35	525	..	230	69	50	0.60	0.65	0.50	17.1	4.5	5.4	0.5	3.5	51	D
3008	Wheat germs feed	880	9.6	255	70	45	585	143	234	69	45	0.60	0.65	0.50	10.7	4.1	5.1	..	..	40	D
3009	Wheat middlings	880	13.2	165	35	45	725	180	482	69	30	0.80	0.87	0.80	5.8	2.6	3.1	0.7	2.4	17	R7
3010	Wheat middlings, rich in germs	880	12.1	197	51	57	653	261	430	62	42	..	..	..	6.9	3.2	3.7	..	..	..	R7
3011	Wheat bran	870	9.5	170	40	92	644	420	156	64	54	0.73	0.60	0.42	6.8	2.4	3.4	0.9	3.2	26	R7
3012	Rye middlings	880	10.4	155	35	40	740	161	300	120	30	0.60	0.40	0.64	5.7	2.5	3.1	0.1	3.3	19	D
3013	Rye bran	880	4.6	160	40	100	650	161	60	10	50	0.60	0.40	0.20	0	0	0	0.5	2.6	23	D
3014	Barley middlings	880	11.2	145	35	80	700	216	280	73	40	0.70	0.74	0.49	0	0	0	..	..	19	R4
3015	Barley hull bran	880	7.8	150	35	160	590	216	250	20	65	0.70	0.76	0.57	6.6	3.0	3.3	1.1	2.6	19	R4
3016	Oat middlings	880	14.7	160	80	55	670	372	400	10	35	0.80	0.73	0.87	0	0	0	..	..	25	D
3018	Oat hull bran	880	4.6	70	30	260	590	372	105	11	50	0.40	0.85	0.30	0	0	0	2.0	2.5	9	D
3019	Oat hull flour	880	1.7	50	25	300	575	372	120	81	50	0.40	0.60	0.08	2.1	0.9	1.2	1.3	1.0	8	D
3020	Rice middlings	880	13.4	150	155	80	520	10	200	37	95	0.70	0.87	0.75	6.8	2.7	2.0	..	..	11	R6
3022	Hemp bran	920	10.0	200	220	350	185	460	5	..	45	0.74	0.75	0.30	3.6	2.4	1.5	1.8	1.5	..	R6
3031	Barley malt germs	920	11.5	320	20	140	460	447	54	141	60	0.86	0.67	0.76	14.7	4.2	2.9	2.5	1.7	11	D
3032	Barley germ feed	900	11.4	220	20	130	570	447	54	141	60	0.86	0.67	0.76	10.1	2.9	2.0	..	..	11	D
3033	Barley malt feed	890	12.1	189	22	92	655	..	97	128	42	0.86	0.67	0.76	0	0	0	..	..	11	D
3035	Dried brewers grain	920	10.2	230	80	170	475	570	50	10	45	0.84	0.67	0.52	8.1	3.7	3.0	2.2	1.1	33	R9
3045	Barley hulls	934	3.2	79	32	275	549	690	77	33	65	0	0	0.20	3.5	1.8	1.9	0.9	0.9	19	R4
3046	Barley hull bran (from starch process)	890	6.2	112	37	213	585	..	250	20	53	0.70	0.76	0.57	0	0	0	..	..	..	R4
3047	Barley fibre, dried	960	5.6	144	98	223	504	622	75	29	31	0.54	0.55	0.48	4.2	2.3	2.7	0.4	..	0	R4
3071	White sugar	1000	16.6	0	0	0	1000	..	0	960	0	0	0	0.10	0	0	0	..	..	0	S
3072	Sugar beet molasses	780	11.3	150	0	0	730	0	0	650	120	0.40	0	0.80	0	0	0	3.0	0.1	0	S
3073	Sugar cane molasses	740	11.3	35	0	0	870	0	0	650	95	0.40	0	0.80	0	0	0	10.0	..	0	S
3075	Beet molasses and vinasses separation mixture	740	1.7	220	0	0	580	0	0	100	200	0.40	0	0.75	0	0	0	7.0	..	0	S
3076	Molasses mix, beet and pro-cess molasses	740	11.3	100	2	0	798	0	..	650	100	0.40	0	0.80	0	0	0	..	..	0	S
3078	Molasses mix, beet based	740	9.4	120	2	..	758	0	..	540	120	0.40	0	0.80	0	0	0	..	..	0	S
3079	Glucose, fructose	1000	1.7	0	0	0	1000	..	0	1000	0	0	0	0.10	0	0	0	..	0	0	S
3081	Sugar beet pulp, dried	900	5.1	110	5	196	627	450	0	70	62	0.40	0	0.40	0	0	0	7.0	0.2	0	D
3082	Molassed sugar beet pulp	900	5.2	112	5	179	634	355	0	110	70	0.40	0	0.40	6.0	1.6	1.2	9.5	0.2	0	D
3083	Wheat starch, cooked	900	17.1	5	0	0	995	0	960	..	0	0	0	0.99	0	0	0	0	0	0	D
3084	Wheat gluten	920	16.7	840	10	5	140	0	..	..	5	0.95	0.95	0.80	13.4	13.4	13.4	0.6	0.4	4	D

POULTRY				Composition, g/kg DM								Digestibility, g/g			g/kg DM						
Feed code	Feed	DM, g/kg	ME, MJ/kg DM	CP	EE	CF	NFE	NDF	Sta	Sug	Ash	CPd	EEd	NFEd	Lys	Met	Cys	Ca	Available P	Linolic acid	For-mula code
3085	Wheat syrup	710	13.4	28	20	0	935	0	0	593	17	0.80	0	0.80	1.3	0.6	0.7	..	..	7	D
3086	Maize gluten	895	17.2	677	71	12	219	26	192	4	21	0.95	0.95	0.80	12.2	16.2	12.2	0.8	1.0	22	D
3087	Maize gluten feed	880	8.8	219	31	85	595	384	205	19	70	0.85	0.58	0.44	6.6	3.7	4.4	1.8	2.2	23	R5
4 Feeds of animal origin																					
4004	Feed milk powder	970	10.5	352	20	0	535	0	0	480	93	0.84	0.84	0.49	27.8	8.1	2.8	13.1	9.4	..	D
4013	Whey meal	960	8.90	125	10	0	792	0	0	750	73	0.84	0.84	0.49	9.8	2.6	2.5	5.5	5.4	..	D
4015	Low lactose whey meal	970	9.30	253	26	0	546	0	0	380	175	0.84	0.84	0.49	19.7	5.3	5.1	8.3	9.3	..	D
4017	Whey protein meal, 35 % CP	950	12.3	486	31	0	462	0	0	450	21	0.84	0.84	0.49	43.7	10.2	11.2	2.6	2.2	..	D
4018	Whey protein meal, 75 % CP	940	14.0	745	31	0	206	0	0	80	18	0.84	0.84	0.49	..	..	..	3.8	3.2	..	D
4019	Lactose	1000	0.90	4	0	0	995	0	980	0	1	0	0	0.05	..	..	..	0	0	0	D
4101	Fish meal, high fat	920	15.1	762	110	0	0	..	0	0	128	0.88	0.86	0	59.4	22.9	7.6	33.0	16.2	8	R12
4102	Fish meal, medium fat	940	12.3	734	34	0	0	..	0	0	232	0.88	0.86	0	57.3	22.0	7.3	56.0	26.2	4	R12
4103	Fish waste meal, high fat	920	12.8	570	110	0	30	..	0	0	290	0.85	0.86	0	37.1	14.3	4.6	95.0	..	9	R12
4104	Fish waste meal, medium fat	920	12.0	690	40	0	10	..	0	0	260	0.85	0.86	0	44.9	17.3	5.5	0.0	..	3	R12
4105	Fish bone meal	920	10.0	560	30	0	20	..	0	0	390	0.80	0.86	0	..	..	..	0.0	..	2	R12
4106	Fish meal, extracted	920	13.3	840	10	0	20	..	0	0	130	0.88	0.86	0	..	..	..	43.0	..	1	R12
4221	Animal fat	1000	35.5	0	995	0	5	0	..	..	0	0	0.92	0	0	0	0	..	0	100	D
4222	Tallow	1000	29.5	0	1000	0	0	..	0	0	0	0	0.76	0	0	0	0	..	0	30	D
4224	Pork fat	1000	36.1	0	1000	0	0	..	0	0	0	0	0.93	0	0	0	0	..	0	100	D
5 Roots, tubers, fruits and cabbages																					
5003	Potato, dried	900	14.2	95	0	30	820	0	620	0	55	0.10	0	0.99	4.8	1.2	1.3	..	..	0	D
5011	Tapioca flour	870	14.8	20	5	30	915	..	792	31	30	0.29	0.18	0.92	0.7	0.3	0.2	1.5	..	0	R8
9 Hay and artificially dried grasses																					
9021	Grass leaf meal	900	5.90	200	40	210	450	..	57	12	100	0.66	0.59	0.34	9.2	3.4	2.2	0	..	6	D
9022	Grass meal	900	3.50	165	35	250	460	..	46	9	90	0.45	0.32	0.22	7.6	2.8	1.8	6.0	..	6	D
9023	Hay meal	900	3.30	140	30	270	480	..	45	9	80	0.45	0.32	0.22	6.4	2.4	1.5	0	..	4	D
9024	Clover leaf meal	900	3.90	210	40	210	440	..	50	10	100	0.45	0.32	0.22	9.7	3.6	2.3	0	..	6	D
9025	Clover meal	900	5.50	175	35	250	450	..	50	10	90	0.66	0.59	0.34	8.1	3.0	1.9	0	..	4	D
9026	Clover hay meal	900	4.50	150	30	280	460	..	50	9	80	0.59	0.43	0.30	6.9	2.6	1.7	0	..	4	D
11 Minerals																					
11001	Calcium carbonate	1000	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..	380	..	..	
11002	Monocalcium phosphate	1000	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..	180	183	..	
11003	Monosodium phosphate	1000	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..	..	216	..	
11004	Magnesium oxide	1000	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..	..	..	..	

POULTRY																				
Feed code	Feed	DM, g/kg	ME, MJ/kg DM	Composition, g/kg DM								Digestibility, g/g			g/kg DM						For-mula code
				CP	EE	CF	NFE	NDF	Sta	Sug	Ash	CPd	EEd	NFEd	Lys	Met	Cys	Ca	Available P	Linolic acid	
11005	Magnesium carbonate	1000	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..	..	..	..	
11006	Magnesium phosphate	1000	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..	..	..	..	
11007	Salt (sodium chloride)	1000	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..	..	..	..	
11008	Dicalcium phosphate, anhy-drous	1000	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..	260	125	..	
11009	Dicalcium phosphate, dihy-drous	1000	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..	240	112	..	
11010	Phosphoric acid	1000	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..	..	249	..	
11011	Calcium formate	1000	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..	330	..	..	
11012	Sodium bicarbonate	1000	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..	..	..	..	
11014	Sodium sulfate	1000	..	..	..	..	..	..	..	..	1000	..	..	..	..	..	..	..	..	..	
90 Other feeds																					
90010	Feed yeast	920	10.7	520	50	10	350	66	73	5	70	0.80	0.70	0.30	34.8	8.30	4.70	1.40	6.50	2	
90011	Brewers yeast	100	13.3	550	50	15	315	66	62	15	70	0.76	0.57	0.85	38.5	6.10	3.90	2.20	7.80	2	
90021	Vegetable oil	1000	37.7	0	1000	0	0	0	..	..	0	0	0.97	0	0	0	0	..	..	200	D
90022	Fish oil	1000	37.3	0	1000	0	0	..	0	0	0	0	0.96	0	0	0	0	..	..	70	D
90023	Protected fat (Ca salt of fatty acids)	990	31.4	0	850	0	0	..	..	..	150	0	0.95	0	0	0	0	84.0	..	..	
90040	L-Lysine HCl	995	..	959	..	..	68	..	..	..	..	..	..	..	802	0	0	..	..	..	
90041	L-Threonine	995	..	735	..	..	278	..	..	..	..	..	..	..	0	0	0	..	..	..	
90042	DL-Methionine	995	..	587	..	..	478	..	..	..	..	..	..	..	0	995	0	..	..	..	
90043	L-Tryptophan	..	..	857	..	..	143	..	..	..	..	..	..	..	0	0	0	..	..	..	
90044	L-Valine	..	..	747	..	..	253	..	..	..	..	..	..	..	0	0	0	..	..	..	

5.4. Minerals

MINERALS		g/kg DM								mg/kg DM							
Feed code	Feed	Ash	Ca	P	Mg	K	Na	S	Cl	Fe	Cu	Zn	Mn	I	Co	Mo	Se
	Barley	29	0.3	3.6	1.2	5.0	0.3	1.2	1.4	53	4	30	10	0.2	0.13	0.3	0.09
	Oats	38	0.5	3.5	1.2	5.0	0.2	1.4	1.0	72	4	28	30	0.1	0.07	0.4	0.09
	Wheat	20	0.3	3.7	1.2	5.0	0.1	1.4	0.8	41	5	29	20	0.3	0.02	0.2	0.14
1005	Barley, naked	25	0.3	5.5	1.5	6.0	..	..	..	80	8	57	23	..	..	..	..
1015	Oats, hulless or dehulled	22	0.6	5.2	1.5	5.0	0.1	1.8	0.8	68	5	42	50	..	0.01	0.2	0.12
1021	Mixed grain (barley and oats, 1:1)	34	0.4	3.6	1.2	5.0	0.3	1.3	1.2	63	4	29	20	0.2	0.1	0.4	0.09
1041	Rye	22	0.4	3.9	1.2	6.0	0.2	1.3	0.7	63	5	35	27	0.1	0.05	0.8	0.06
1042	Triticale	22	0.6	3.7	1.2	5.0	0.2	1.2	0.7	37	6	41	42	0.1	0.01	0.5	0.03
1043	Maize grain	15	0.3	3.1	1.2	4.0	0.1	1.2	0.7	35	3	31	8	0.1	0.06	0.5	0.11
1051	Rice, grain	61	0.4	1.9	1.3	7.0	0.6	1.0	0.1	16	3	19	20	..	2	0.9	0.13
1052	Rice, grain, husked	12	0.1	2.3	..	..	..	..	..	..	..	..	..	..	..	..	..
1071	Pea, seed	31	0.7	4.0	1.3	13.0	0.0	1.6	6.0	51	9	27	4	0.2	0.18	1.7	0.02
1072	Faba bean, seed	36	1.0	5.7	1.3	12.0	0.0	1.9	0.9	57	15	52	10	..	0.2	0.5	0.02
1074	Soya bean, seed	55	2.7	6.2	2.8	19.0	0.2	2.8	0.3	203	22	44	32	..	0.08	4.5	0.15
1075	Lupin, seed	30	4.4	6.5	2.6	12.0	0.2	2.1	0.6	57	6	55	50	..	0.08	2.2	0.1
1081	Rapeseed (*Brassica napus*)	50	4.5	9.4	3.6	9.0	0.1	2.8	0.5	74	4	41	36	..	0.12	0.3	0.08
1082	Rapeseed (*Brassica rapa* subsp. Oleifera)	50	4.5	9.4	3.6	9.0	0.1	2.8	0.5	74	4	41	36	..	0.12	0.3	0.08
1083	Flax, seed	45	2.5	6.1	4.0	9.0	0.4	2.5	0.7	81	14	50	30	..	0.3	0.2	0.35
1084	Buckwheat, seed	35	0.2	4.7	2.4	5.0	..	1.7	..	35	7	36	17	0.1	0.06	0.2	0.14
1085	Sunflower, seed	35	2.6	6.0	3.4	9.0	0.4	2.2	1.0	144	23	55	35	..	..	1.8	0.62
1087	Hemp, seed	55	1.5	11.3	4.8	8.4	0.0	..	..	64	18	75	91	..	..	..	..
2001	Rapeseed expeller, heat treated	74	8.1	11.7	4.8	13.0	0.5	8.5	..	112	6	59	61	..	..	..	0.1
2002	Rapeseed meal	80	8.3	13.2	5.2	15.0	0.2	6.9	0.5	192	6	67	70	0.7	0.15	0.6	0.1
2003	Rapeseed expeller, cold pressed	63	7.4	11.0	4.6	13.0	0.7	6.1	0.5	114	6	54	54	..	..	..	0.1
2011	Soya bean expeller	64	2.3	6.1	3.1	23.0	0.1	..	..	206	14	50	35	..	..	..	..
2012	Soya bean meal	67	3.0	7.0	3.3	25.0	0.3	4.0	0.1	206	16	56	42	0.2	0.11	4.2	0.16
2013	Soya bean meal, CP > 50 %	68	3.0	7.0	3.3	25.0	0.3	4.0	0.1	206	16	56	42	0.2	0.11	4.2	0.16
2014	Soya protein	73	4.4	8.9	3.5	26.0	0.2	4.6	..	125	13	51	41	..	..	..	0.2
2016	Soya bean meal, CP 46 %	74	3.9	7.1	..	..	..	..	..	..	..	..	..	..	..	..	..
2021	Flax expeller	48	4.2	8.9	5.4	12.0	0.9	4.0	0.6	366	20	73	43	0.3	0.48	0.6	0.5
2023	Flax meal	65	4.5	8.9	5.1	11.0	1.0	4.2	0.7	328	21	68	49	1	0.42	1.1	0.74
2024	Hemp seed expeller, cold pressed	65	1.9	12.5	5.6	11.2	0.0	..	..	65	27	110	140	..	..	..	..
2031	Palm kernel expeller	50	3.0	6.4	3.2	8.0	0.2	2.3	0.9	656	24	43	220	0.1	0.15	0.4	0.18
2032	Palm kernel meal	54	2.1	6.5	3.1	8.0	0.1	2.8	2.0	370	36	80	270	..	0.14	..	0.12
2041	Sunflower expeller, dehulled seeds	70	4.0	12.1	6.3	17.0	0.2	..	..	..	..	..	..	..	..	..	..
2042	Sunflower meal, dehulled seeds, CF 18 %	70	4.2	12.1	6.3	17.0	0.2	4.0	0.8	221	43	84	50	0.2	0.14	1.2	0.3
2043	Groundnut expeller, dehulled seeds	60	2.1	7.4	3.4	16.0	0.5	3.6	1.1	342	18	53	39	0.5	0.31	1.9	0.11
2044	Groundnut meal. CF < 9 %	67	2.2	6.3	..	..	..	..	..	..	..	..	..	..	..	..	..
2045	Sunflower meal, not hulled	70	4.4	11.3	..	..	..	..	..	..	..	..	..	..	..	..	..

MINERALS		g/kg DM								mg/kg DM							
Feed code	Feed	Ash	Ca	P	Mg	K	Na	S	Cl	Fe	Cu	Zn	Mn	I	Co	Mo	Se
2046	Sunflower meal, dehulled, CF > 20 %	75	4.5	12.0	..	..	..	..	..	..	..	..	..	..	..	..	..
3001	Dehulled wheat, wheat flakes or meal	5	0.2	1.0	0.2	2.0	..	1.5	0.0	14	2	9	5	0.1	0.02	0.2	0.09
3002	Dehulled rye, rye flakes or meal	15	0.3	3.8	1.3	6.0	0.1	1.5	..	49	6	34	37	0.2	0.04	0.2	0.03
3003	Dehulled barley, barley flakes or meal	10	0.3	3.0	0.9	4.0	0.1	1.4	..	44	6	28	16	0.1	0.02	0.2	0.1
3004	Dehulled oats, oats flakes or meal	20	0.6	5.7	1.9	6.0	0.1	2.3	1.0	53	4	34	31	0.2	0.09	0.2	0.1
3007	Wheat germs	50	0.5	11.6	3.4	12.0	..	2.9	..	103	13	207	209	0.6	0.02	0.4	0.03
3009	Wheat germ feed	30	0.7	9.5	3.5	11.0	..	2.2	1.0	150	14	110	150	..	0.05	..	..
3011	Wheat bran	54	0.9	12.8	5.5	16.0	0.5	2.0	1.4	177	17	89	174	0.1	0.08	0.2	0.11
3012	Rye middlings	30	0.1	11.0	3.7	14.0	..	2.3	..	120	13	90	85	..	0.06	..	..
3013	Rye bran	50	0.5	8.7	3.5	10.0	0.1	..	..	110	..	93	..	0.1	..	..	..
3015	Barley hull bran	65	1.1	8.0	3.0	9.0	..	0.9	1.0	70	11	70	25	..	..	..	..
3018	Oat hull bran	50	2.0	7.7	..	..	..	..	..	106	3	22	..	..	..	..	..
3019	Oat hull flour	50	1.3	3.1	1.2	7.0	..	1.3	..	160	6	30	36	..	..	..	..
3022	Hemp bran	45	1.8	7.4	2.5	6.5	0.0	..	..	63	18	56	120	..	..	..	..
3031	Barley malt germs	60	2.5	8.3	1.6	22.0	0.7	..	5.0	130	15	90	45	..	0.07	..	..
3034	Brewers grain, moist	40	2.2	3.5	1.6	1.0	0.1	1.5	1.0	470	11	110	45	..	0.1	..	..
3035	Dried brewers grain	45	2.2	3.5	1.6	1.0	0.1	1.5	1.0	470	11	110	45	..	0.1	..	..
3036	Beer yeast liquid	39	2.4	7.2	1.3	11.0	..	..	..	52	14	22	5	..	..	..	0.1
3037	Barley fibre, moist	44	0.6	6.9	2.4	10.0	1.3	8.7	..	58	7	57	28	..	..	..	..
3041	Barley starch distillers grains, moist	77	1.3	15.4	4.7	20.0	3.4	14.4	7.0	125	17	96	50	..	0.12	..	0.09
3042	Barley distillers solubles	114	1.6	17.8	7.3	31.0	5.5	17.8	7.0	102	13	124	66	..	0.12	..	0.33
3043	Barley distillers solids	58	1.1	12.4	3.2	13.0	2.3	12.4	..	124	19	83	37	..	0.05	..	0.13
3045	Barley hulls	65	0.9	2.9	1.3	8.0	0.2	0.1	..	139	6	31	26	..	..	..	..
3047	Barley fibre, dried	31	0.4	3.5	0.9	4.0	0.6	4.0	..	74	8	32	13	..	..	..	0.19
3049	Barley protein	51	0.9	9.6	3.4	14.0	1.5	10.1	..	82	11	72	37	..	0.04	..	..
3071	White sugar	0	..	..	..	..	..	0.1	..	1	..	1	..	0.1	0.02	0.2	0.01
3072	Sugar beet molasses	120	3.0	0.3	0.3	43.0	9.8	2.5	9.0	170	9	30	30	..	0.7	..	..
3073	Sugar cane molasses	95	10.0	0.9	4.5	46.0	2.0	..	..	350	15	20	50	..	..	..	..
3074	Process molasses	70	10.0	0.4	2.5	12.0	0.9	..	..	450	15	20	40	..	4	..	..
3075	Beet molasses and vinasses separation mixture	200	7.0	1.0	4.0	49.0	49.0	..	..	600	35	150	60	..	16	..	..
3080	Sugar beet pulp, pressed	70	8.8	0.8	1.7	14.0	1.4	..	..	..	..	..	..	..	..	..	..
3081	Sugar beet pulp, dried	62	7.0	1.0	1.4	6.0	0.8	2.4	4.0	1800	26	45	40	..	2	..	..
3082	Molassed sugar beet pulp	70	9.5	0.7	1.3	21.0	5.5	..	..	500	10	30	50	..	..	..	..
3084	Wheat gluten	5	0.6	1.8	..	..	..	..	..	..	..	..	..	..	..	..	..
3086	Maize gluten	21	0.8	5.4	..	..	..	..	..	..	..	..	..	..	..	..	..
3087	Maize gluten feed	70	1.8	10.1	..	..	..	..	..	..	..	..	..	..	..	..	..
3101	Potato feed, moist	40	1.4	0.8	0.9	20.0	..	..	..	..	..	..	..	..	..	..	..
3103	Potato pulp, pressed	140	2.0	2.9	2.4	5.0	0.3	..	..	..	..	..	..	..	..	..	..
3109	Potato protein	28	3.1	4.4	..	..	..	..	..	..	..	..	..	..	..	..	..
4001	Full milk	54	9.5	6.9	0.8	12.0	3.4	2.5	8.1	8	1	31	1	1.3	0.04	0.4	0.13
4002	Full fat milk powder	60	8.6	7.2	0.9	11.0	3.2	3.3	..	4	1	41	1	..	..	..	0.3
4004	Feed milk powder	93	13.1	10.4	1.4	15.0	5.3	4.0	8.8	14	4	46	3	..	0.01	..	0.12
4011	Whey	80	7.2	7.9	1.4	24.0	10.6			92	22	17	3	..	0.04	..	0.05

MINERALS		g/kg DM								mg/kg DM							
Feed code	Feed	Ash	Ca	P	Mg	K	Na	S	Cl	Fe	Cu	Zn	Mn	I	Co	Mo	Se
4013	Whey meal	73	5.5	6.0	1.3	22.0	5.5	2.2	15.0	2	4	2	3	..	..	..	1
4015	Low lactose whey meal	175	8.3	10.3	2.1	57.0	14.4	..	..	6	6	1	3	..	..	..	..
4017	Whey protein meal, 35 % CP	21	2.6	2.4	0.5	7.0	1.6	..	..	3	9	2	5	..	..	..	..
4018	Whey protein meal, 75 % CP	18	3.8	3.6	0.8	10.0	2.3	..	..	4	13	3	8	..	..	..	..
4020	Casein	40	29.0	19.0	0.1		0.2	..	..	110	1	74	..	..	..	..	0.4
4031	Sow milk	45	8.7	6.3	0.5	3.0	2.1	0.2	..	11	11	37	..	..	..	..	..
4101	Fish meal, high fat	128	33.0	21.0	1.5	9.0	6.0	5.0	10.0	320	5	115	8	..	0.14	..	..
4102	Fish meal, medium fat	232	56.0	34.0	2.4	10.0	7.0	7.0	12.0	..	7	105	21	..	0.14	..	..
4103	Fish waste meal, high fat	290	95.0	35.0	..	..	..	..	..	..	..	..	..	..		..	..
4106	Fish meal, extracted	130	43.0	27.0	2.3	9.0	8.0	5.0	12.0	..	7	105	12	..	0.12	..	..
5001	Potato, raw	55	0.3	2.3	1.4	22.0	0.6	1.7	2.8	41	5	24	7	0.2	0.09	0.2	0.03
5011	Tapioca flour	30	1.5	1.1	0.6	9.0	0.2	0.6	1.0	10	3	10	2	..	0.05	..	..
5012	Sugar beet	70	1.1	1.8	1.5	11.0	0.4	0.8	4.0	44	4	25	91	..	0.09	0.1	..
5014	Feed sugar beet	100	2.3	1.6	1.3	15.0	1.5	..	..	..	..	..	..	..	..	..	..
5015	Swede	70	3.3	3.5	1.5	23.0	0.7	4.1	..	45	3	19	19	0.1	0.05	0.1	0.03
5017	Turnip (*Brassica rapa ssp. rapa)*	110	4.6	4.3	1.8	34.0	2.1	5.1	..	44	5	29	19	0.1	0.06	1	0.03
5018	Carrot	80	2.6	2.4	1.2	26.0	2.0	1.4	..	66	5	20	27	0.1	0.05	0.1	0.03
5019	Red beet	110	1.4	3.3	1.9	27.0	1.8	1.6	..	72	9	60	50	0.1	0.08	0.1	0.03
5031	Apple	20	0.3	0.6	0.3	7.0	0.1	0.3	..	7	3	7	6	0.1	..	0.7	0.02
5041	Sugar beet tops	195	14.0	2.4	7.3	48.0	12.3	5.0	15.0	650	16	200	250	..	0.25	..	..
5042	Kale, late cut	115	14.0	3.7	2.0	28.0	1.8	8.0	13.0	120	5	30	40	..	0.2	..	..
5043	Forage rape, late cut	130	20.0	4.2	2.9	33.0	2.6	7.0	12.0	160	8	20	95	..	..	..	..
6001	Pasture grass	100	3.8	3.5	1.8	31.0	1.1	2.0	11.0	180	7	31	61	..	0.3	..	0.31
6002	Pasture grass, maturing	95	3.8	3.0	1.7	30.0	0.2	2.0	11.0	180	7	35	61	..	0.3	..	0.31
6003	Grass, early 1st cut	85	3.8	3.7	1.8	31.0	0.2	2.0	11.0	180	7	31	61	..	0.3	..	0.31
6004	Grass, average 1st cut	80	3.8	3.3	1.8	31.0	0.2	2.0	11.0	180	7	31	61	..	0.3	..	0.31
6005	Grass, late 1st cut	75	3.8	3.0	1.7	30.0	0.2	2.0	11.0	180	7	31	61	..	0.3	..	0.31
6006	Grass, very late 1st cut	70	3.8	2.6	1.6	27.0	0.2	2.0	11.0	180	7	31	61	..	0.3	..	0.31
6007	Grass, high digestibility regrowth	100	4.2	3.5	2.2	31.0	0.2	2.0	11.0	165	7	28	66	..	0.3	..	0.2
6008	Grass, average digestibility regrowth	95	4.2	3.0	2.1	30.0	0.2	2.0	11.0	165	7	28	66	..	0.3	..	0.2
6009	Grass, low digestibility regrowth	95	4.2	2.5	2.0	26.0	0.2	2.0	11.0	165	7	28	66	..	0.3	..	0.2
6010	Italian ryegrass	110	5.0	4.0	1.6	35.0	0.1	0.4		140	14	35	50	..	0.7	..	0
6011	Grass from permanent meadows	70	3.8	2.6	1.6	27.0	0.2	2.0	11.0	180	7	31	61	..	0.3	..	0.31
6021	Red clover, 1st & 2nd cut, early cut	115	16.7	2.7	3.1	33.0	0.2	4.0	6.0	150	15	40	35	..	0.15	..	..
6022	Red clover, 1st & 2nd cut, average cut	115	14.7	2.3	2.8	28.0	0.2	3.0	6.0	200	15	35	35	..	0.15	..	..
6023	Red clover, 1st & 2nd cut, late cut	110	12.6	2.0	2.5	22.0	0.2	3.0	5.0	200	15	35	35	..	0.15	..	..
6024	Lucerne, 1st cut, vegetative state	110	15.0	2.8	2.0	28.0	1.2	3.0	8.0	190	7	30	30	..	0.2	..	..
6025	Lucerne, 1st cut, bud state	100	15.0	2.8	2.1	28.0	1.2	3.0	8.0	190	7	30	30	..	0.2	..	..
6026	Lucerne, 1st cut, beginning of bloom-ing	100	15.0	2.8	2.1	28.0	1.2	3.0	8.0	190	7	30	30	..	0.2	..	..
6027	Lucerne, 1st cut, full blooming	95	15.0	2.8	2.2	26.0	1.0	3.0	8.0	190	7	30	30	..	0.2	..	..
6041	Pea stand, early pods, partly filled	110	9.7	3.8	2.2	32.0	0.6	..	..	164	8	66	18	..	..	..	..
6042	Pea stand, pods filled, partly yellow	95	9.2	3.2	2.0	27.0	0.6	2.0	3.0	200	10	45	18	..	0.15	..	..

MINERALS		g/kg DM								mg/kg DM							
Feed code	Feed	Ash	Ca	P	Mg	K	Na	S	Cl	Fe	Cu	Zn	Mn	I	Co	Mo	Se
6043	Faba bean stand, blooming	140	15.0	3.3	3.5	23.0	0.4	2.0	3.0	170	10	35	35	..	0.15	..	..
6044	Faba bean forage, early pods	120	15.0	3.3	3.5	23.0	0.4	2.0	3.0	170	10	35	35	..	0.2	..	..
6045	Faba bean forage, pods filled, green	140	15.0	3.3	3.5	23.0	0.4	2.0	3.0	170	10	35	35	..	0.2	..	..
6061	Oats stand, early heading	90	4.0	2.6	1.3	20.0	0.2	3.0	7.0	110	7	25	33	..	..	..	..
6062	Oats stand, early blooming	80	4.0	2.6	1.3	20.0	0.2	3.0	7.0	110	7	25	33	..	..	..	..
6063	Oats-pea-vetch-stand	87	6.0	3.0	2.5	25.0	0.5	..	..	..	..	..	..	..	..	..	..
6064	Barley stand, green	100	5.5	3.4	1.4	30.0	1.5	..	..	..	..	..	..	..	..	..	..
6065	Oats stand, yellow	80	4.0	2.6	1.3	20.0	0.2	3.0	7.0	110	7	25	33	..	..	..	..
6066	Barley stand, yellow	61	3.2	2.5	1.2	14.0	1.1	1.5	5.8	120	4	25	25	..	0.08	..	0.04
6067	Maize stand, early stage	50	3.0	3.0	1.5	16.0	0.2	1.0	2.3	60	4	30	25	..	0.02	..	0.03
7001	Grass silage, early 1st cut, DM 200–500 g/kg	85	3.8	3.6	1.8	31.0	0.2	2.0	11.0	180	7	31	61	..	0.26	..	0.31
7002	Grass silage, average/early 1st cut, DM 200–500 g/kg	80	3.8	3.2	1.7	31.0	0.2	2.0	11.0	180	7	31	61	..	0.26	..	0.31
7003	Grass silage, average/late 1st cut, DM 200–500 g/kg	75	3.8	2.9	1.7	29.0	0.2	2.0	11.0	180	7	31	61	..	0.26	..	0.31
7004	Grass silage, late 1st cut, DM 200–500 g/kg	75	3.8	2.5	1.6	26.0	0.2	2.0	11.0	180	7	31	61	..	0.26	..	0.31
7005	Grass silage, very late 1st cut, DM 200–500 g/kg	70	3.8	2.2	1.5	22.0	0.2	2.0	11.0	180	7	31	61	..	0.26	..	0.31
7006	Grass silage, high digestibility 2nd cut, DM 200–500 g/kg	95	4.2	3.1	2.2	30.0	0.2	2.0	11.0	165	7	28	66	..	0.26	..	0.2
7007	Grass silage, average digestibility 2nd cut, DM 200–500 g/kg	95	4.2	2.8	2.1	28.0	0.2	2.0	11.0	165	7	28	66	..	0.26	..	0.2
7008	Grass silage, low digestibility 2nd cut, DM 200–500 g/kg	90	4.2	2.4	2.0	25.0	0.2	2.0	11.0	165	7	28	66	..	0.26	..	0.2
7009	Grass silage, 3rd cut, DM 200–500 g/kg	95	4.5	3.3	2.2	31.0	0.2	2.0	11.0	200	7	31	80	..	0.26	..	0.2
7010	Italian ryegrass silage	113	6.3	4.3	1.9	35.0	2.3	3.2	..	230	11	50	50	..	0.7	..	0.04
7021	Red clover silage, early 1st & 2nd cut, DM 200–500 g/kg	115	16.0	2.6	3.0	32.0	0.3	1.9	5.0	150	11	30	30	..	0.15	..	..
7022	Red clover silage, average 1st & 2nd cut, DM 200–500 g/kg	110	14.0	2.3	2.7	27.0	0.3	1.9	5.0	150	11	30	30	..	0.15	..	..
7023	Red clover silage, late 1st & 2nd cut, DM 200–500 g/kg	110	12.0	1.9	2.5	20.0	0.3	1.9	5.0	200	11	30	30	..	0.15	..	..
7027	Red clover (25 %) silage, early 1st cut, DM 200–500 g/kg	85	6.9	2.8	2.0	29.8	0.2	2.0	9.5	172.5	8.0	30.8	53.3	..	0.2	..	..
7028	Red clover (25 %) silage, normal 1st cut, DM 200–500 g/kg	85	6.4	2.5	1.9	26.3	0.2	2.0	9.5	172.5	8.0	30.8	53.3	..	0.2	..	..
7029	Red clover (25 %) silage, late 1st cut, DM 200–500 g/kg	80	5.9	2.1	1.8	21.5	0.2	2.0	9.5	185.0	8.0	30.8	53.3	..	0.2	..	..
7030	Red clover (50 %) silage, early 1st cut, DM 200–500 g/kg	95	5.5	3.0	2.1	29.9	0.2	2.0	10.3	168.8	7.5	29.4	59.6	..	0.2	..	..

MINERALS		g/kg DM								mg/kg DM							
Feed code	Feed	Ash	Ca	P	Mg	K	Na	S	Cl	Fe	Cu	Zn	Mn	I	Co	Mo	Se
7031	Red clover (50 %) silage, normal 1st cut, DM 200–500 g/kg	95	5.3	2.6	2.0	27.1	0.2	2.0	10.3	168.8	7.5	29.4	59.6	..	0.2	..	..
7032	Red clover (50 %) silage, late 1st cut, DM 200–500 g/kg	90	5.0	2.3	1.9	23.3	0.2	2.0	10.3	175.0	7.5	29.4	59.6	..	0.2	..	..
7033	Red clover (75 %) silage, early 1st cut, DM 200–500 g/kg	105	5.3	3.0	2.1	30.2	0.2	2.0	10.4	176.6	7.4	29.8	64.7	..	0.2	..	..
7034	Red clover (75 %) silage, normal 1st cut, DM 200–500 g/kg	100	5.5	3.0	2.0	29.1	0.7	2.3	7.7	184.1	8.4	34.5	57.2	..	0.4	..	..
7035	Red clover (75 %) silage, late 1st cut, DM 200–500 g/kg	100	7.8	2.3	2.2	25.4	0.2	2.0	8.9	168.8	8.4	29.5	52.2	..	0.2	..	..
7036	Lucerne silage, 1st cut, vegetative	115	14.0	3.0	2.2	31.0	0.6	2.0	8.0	190	7	63	38	..	0.1	..	..
7037	Lucerne silage, 1st cut, bud stage	110	14.0	3.0	2.2	31.0	0.6	2.0	8.0	190	7	63	38	..	0.1	..	..
7038	Lucerne silage, 1st cut, beginning of blooming	105	14.0	3.0	2.2	31.0	0.6	2.0	8.0	190	7	63	38	..	0.1	..	..
7039	Lucerne (50 %) silage, early cut	95	8.9	3.0	2.0	30.0	0.4	2.0	9.5	185	7	47	49.5	..	0.18	..	..
7040	Lucerne (50 %) silage, average cut	92.5	8.9	2.8	1.9	28.5	0.4	2.0	9.5	185	7	47	49.5	..	0.18	..	..
7041	Lucerne (50 %) silage, late cut	87.5	8.9	2.6	1.9	26.5	0.4	2.0	9.5	185	7	47	49.5	..	0.18	..	..
8001	Whole crop silage, barley, NDF 45 %	70	2.0	2.5	1.3	14.0	0.4	1.0	..	..	5	28	43	..	..	..	..
8002	Whole crop silage, barley, NDF 50 %	70	2.0	2.5	1.3	14.0	0.4	1.0	..	..	5	28	43	..	..	..	..
8003	Whole crop silage, barley, NDF 55 %	70	2.0	2.5	1.3	14.0	0.4	1.0	..	..	5	28	43	..	..	..	..
8005	Whole crop silage, oats	90	4.8	3.2	1.5	26.0	1.5	1.6	..	..	5	67	81	..	..	..	..
8010	Whole crop silage, wheat	48	2.4	2.4	1.1	13.0	0.5	1.1	6.3	70	5	49	29	..	0.05	..	0.03
8017	Maize silage, late stage	48	2.8	2.3	1.4	14	0.4	0.7	2.3	60	5	31	39		0.02		0.05
8020	Whole crop silage, green barley	105	5.6	3.5	1.6	30.0	1.1	2.0	..	..	7	60	41	..	..	..	0.03
8021	Whole crop silage, early heading oats	100	4.8	3.2	1.5	26.0	1.5	1.6	..	..	5	67	81	..	..	..	..
8022	Whole crop silage, early blooming oats	90	4.8	3.2	1.5	26.0	1.5	1.6	..	..	5	67	81	..	..	..	..
8023	Oats-pea-vetch silage	81	7.0	3.4	1.9	23.0	0.5	1.6	..	..	5	75	51	..	..	..	..
8041	Sugar beet top silage	180	17.0	2.1	7.3	40.0	9.0	..	15.0	840	18	250	300	..	..	..	..
8042	Pea silage	130	9.7	3.8	2.2	32.0	0.6	..	..	164	8	66	18	..	..	..	..
8043	Faba bean silage	95	6.9	2.9	1.8	31.0	0.6	..	..	165	18	62	18	..	..	..	..
8044	Goats rue silage, 1st cut	85	8.0	3.0	2.2	30.0	..	..	..	100	12	30	40	..	..	..	..
9001	Hay and haylage, very early 1st cut, DM 500–860 g/kg	90	3.0	3.6	1.3	31.0	0.2	2.0	7.0	150	5	30	60	..	0.1	..	..
9002	Hay and haylage, early 1st cut, DM 500–860 g/kg	85	3.0	3.6	1.3	30.0	0.2	2.0	7.0	150	5	30	60	..	0.1	..	..
9003	Hay and haylage, average/early 1st cut, DM 500–860 g/kg	80	3.0	3.6	1.2	28.0	0.2	2.0	7.0	150	5	30	60	..	0.1	..	..
9004	Hay and haylage, average/late 1st cut, DM 500–860 g/kg	75	3.0	3.0	1.2	25.0	0.2	2.0	7.0	150	5	30	60	..	0.1	..	..
9005	Hay and haylage, late 1st cut, DM 500–860 g/kg	70	2.5	2.5	1.1	20.0	0.2	2.0	7.0	150	5	30	60	..	0.1	..	..
9006	Hay and haylage, very late 1st cut, DM 500–860 g/kg	65	2.5	1.9	1.0	20.0	0.2	2.0	7.0	150	5	30	60	..	0.1	..	..

MINERALS		g/kg DM								mg/kg DM							
Feed code	Feed	Ash	Ca	P	Mg	K	Na	S	Cl	Fe	Cu	Zn	Mn	I	Co	Mo	Se
9022	Grass meal	90	6.0	3.1	1.9	23.0	4.0	1.0	9.0	586	8	36	55	..	0.6	..	0.22
10001	Straw of oats and barley	65	2.8	1.0	1.0	15.0	0.2	2.0	9.0	70	4	20	60	..	0.1	..	..
10002	Straw of wheat and rye	65	2.3	1.0	1.0	12.0	0.2	..	..	70	4	25	70	..	0.1	..	..
10003	Grass straw from seed production	52	3.4	1.1	0.8	15.0	0.8	0.8	3.2	..	5	70	60	..	0.05	..	..
11001	Calcium carbonate	1000	380	..	..	..	..	..	..	..	..	..	..	..	..	..	..
11002	Monocalcium phosphate	1000	180	220	..	..	..	..	..	..	..	..	..	..	..	..	..
11003	Monosodium phosphate	1000	..	240	..	..	200	..	..	..	..	..	..	..	..	..	..
11004	Magnesium oxide	1000	..	..	510	..	..	..	..	..	..	..	..	..	..	..	..
11005	Magnesium carbonate	1000	..	..	200	..	..	..	..	..	..	..	..	..	..	..	..
11006	Magnesium phosphate	1000	..	140	260	..	..	..	..	..	..	..	..	..	..	..	..
11007	Salt (sodium chloride)	1000	..	..	..	..	380	..	620	..	..	..	..	..	..	..	..
11008	Dicalcium phosphate, anhydrous	1000	260	190	..	..	..	..	..	..	..	..	..	..	..	..	..
11009	Dicalcium phosphate, dihydrous	1000	240	170	..	..	..	..	..	..	..	..	..	..	..	..	..
11010	Phosphoric acid	1000	..	332	..	..	..	..	..	..	..	..	..	..	..	..	..
11011	Calcium formate	1000	330	..	..	..	..	..	..	..	..	..	..	..	..	..	..
11012	Sodium bicarbonate	1000	..	..	..	..	274	..	..	..	..	..	..	..	..	..	..
11014	Sodium sulfate	1000	..	..	..	..	144	100	..	..	..	..	..	..	..	..	..
90010	Feed yeast	70	1.4	13	2.8	16	9.2	3.6	..	106	18	94	23	..	..	..	0.5
90011	Brewers yeast	70	2.2	15.6	2.6	24	2.4	..	..	560	64	92	59	..	0.4	1.3	..
90023	Protected fat (Ca salt of fatty acids)	150	84	0	..	..	..	..	..	..	..	..	..	..	..	..	..

5.5. Amino acids

AMINO ACIDS		g / 100 g crude protein (except pure amino acids, g/kg DM)																
Feed code	Feed	Arginine	Phenyl-alanine	Histi-dine	Isoleu-cine	Leucine	Lysine	Me-thio-nine	Threo-nine	Trypto-phan	Valine	Ala-nine	Aspartic acid	Glutamic acid	Glycine	Cysteine	Proline	Serine	Tyrosine
	Barley	5.0	5.0	2.4	3.2	6.8	3.4	1.7	3.3	1.2	5.1	4.0	5.6	23.4	4.0	2.5	10.8	4.2	3.3
	Oats	6.0	5.0	2.2	3.8	7.1	4.2	1.7	3.5	1.1	5.4	4.8	8.0	22.0	5.0	2.8	5.2	4.8	3.3
	Wheat	4.5	4.5	2.3	3.5	6.6	2.8	1.6	3.0	1.1	4.5	3.7	5.2	29.4	4.1	2.2	10.3	4.7	2.8
1005	Barley, naked	5.0	5.1	2.4	3.7	7.2	3.5	1.9	3.1	1.2	5.6	4.0	5.6	23.4	4.0	2.4	10.8	4.2	3.5
1021	Mixed grain (barley and oats 1:1)	5.5	5.0	2.3	3.5	7.0	3.8	1.7	3.4	1.2	5.3	4.4	6.8	22.7	4.5	2.7	8.0	4.5	3.3
1041	Rye	5.0	4.4	2.3	3.3	6.0	3.7	1.6	3.2	1.1	4.6	4.5	7.4	23.1	4.5	2.0	9.7	4.3	2.5
1042	Triticale	5.1	4.8	2.6	3.4	6.7	3.6	1.7	3.3	1.2	5.0	4.1	6.2	27.0	4.3	2.8	8.9	4.6	2.8
1043	Maize grain	4.5	4.5	2.6	3.7	11.5	2.8	2.3	3.8	0.7	5.0	7.6	7.0	18.3	4.0	2.1	8.8	4.8	3.5
1051	Rice, grain	7.6	4.7	2.2	4.5	7.5	3.5	2.0	3.5	1.0	5.7	5.5	8.2	17.6	5.0	1.3	4.6	4.7	3.8
1052	Rice, grain, husked	8.3	5.0	2.3	4.0	7.9	3.7	2.4	3.5	1.1	5.9	5.3	8.6	16.7	4.5	2.4	4.3	4.9	4.6
1071	Pea, seed	8.0	4.7	2.6	3.9	7.0	7.1	0.9	3.6	0.9	4.6	4.6	10.9	16.9	4.5	1.7	4.4	5.4	3.3
1072	Faba bean, seed	8.9	4.1	2.6	3.6	6.8	5.9	0.6	3.1	0.9	4.1	4.0	9.2	15.6	3.9	1.2	4.2	4.3	3.2
1074	Soya bean, seed	7.2	5.0	2.6	4.8	7.6	6.0	1.5	4.0	1.3	5.0	4.2	11.2	18.5	4.2	1.5	5.2	5.0	3.0
1075	Lupin, seed	10.8	3.7	2.7	4.2	7.0	4.7	0.7	3.4	0.8	4.1	3.3	9.3	19.5	4.0	1.5	3.9	5.3	3.3
1083	Flax, seed	8.8	4.6	2.1	4.3	5.9	3.5	1.5	3.6	1.2	5.0	4.3	9.1	19.2	5.6	1.6	3.7	4.5	2.6
1085	Sunflower, seed	8.2	4.8	2.5	4.5	6.4	3.5	2.3	3.8	1.2	5.1	4.4	9.8	19.5	5.7	1.6	4.3	4.4	2.7
2002	Rapeseed meal	5.8	4.1	2.8	3.9	7.0	5.8	1.8	4.4	1.2	4.9	4.5	7.1	17.3	5.0	1.5	6.2	4.3	2.7
2013	Soya bean meal, CP > 50 %	7.7	5.4	2.9	4.7	8.3	6.2	1.4	4.0	1.3	4.9	4.6	12.4	18.9	4.3	1.3	6.1	5.2	3.8
2014	Soya protein	..	5.0	..	..	..	6.2	1.4	4.0	1.3	5.2	..	..	..	..	1.5	..	..	3.7
2016	Soya bean meal, CP 46 %	7.4	5.0	2.7	4.6	7.4	6.1	1.4	3.9	1.3	4.8	4.4	11.3	17.8	4.2	1.5	5.0	5.0	3.3
2027	Faba bean meal, decorticated, heat treated	9.3	4.0	2.3	3.9	6.9	5.6	0.8	3.4	0.8	4.2	3.8	10.1	15.9	4.0	1.3	4.0	4.6	3.2
2031	Palm kernel expeller	14.0	4.1	1.7	3.7	6.3	3.4	2.2	3.3	0.7	5.6	4.0	8.2	18.3	4.7	1.8	3.4	5.0	2.9
2043	Groundnut expeller, dehulled seeds	10.0	4.9	2.2	3.5	6.4	3.2	1.1	2.7	1.0	4.2	3.9	11.5	18.7	5.7	1.3	4.3	4.7	3.5
2044	Groundnut meal, CP < 9 %	11.5	4.7	2.3	3.3	6.2	3.3	1.0	2.7	1.2	3.9	4.0	11.4	18.8	5.6	1.0	3.0	4.7	3.7
2045	Sunflower meal, not dehulled	8.1	4.4	2.4	4.1	6.1	3.6	2.3	3.6	1.3	4.9	4.4	8.8	19.0	5.7	1.7	4.4	4.3	2.3
2046	Sunflower meal, dehulled, CP > 20%	8.2	4.4	2.4	4.1	6.2	3.5	2.3	3.6	1.2	4.9	4.4	8.9	19.7	5.7	1.7	4.4	4.3	2.3
3001	Dehulled wheat, wheat flakes or meal	4.3	5.0	2.2	3.7	6.8	2.5	1.8	2.8	1.7	4.5	3.3	4.7	31.8	3.7	2.5	10.5	4.5	3.3
3004	Dehulled oats, oats flakes or meal	7.2	5.2	2.4	4.0	7.6	4.3	2.8	3.4	1.6	5.4	4.9	8.2	20.2	5.2	2.9	5.2	5.2	4.1
3007	Wheat germs	6.8	3.5	2.3	3.3	6.0	5.7	1.5	3.5	1.1	5.0	4.6	6.9	13.6	5.2	1.8	4.8	4.0	3.0
3008	Wheat germ feed	6.5	3.8	2.4	3.4	6.0	4.2	1.6	3.4	1.0	4.9	4.7	6.8	13.6	4.9	2.0	4.8	4.6	2.9
3009	Wheat middlings	6.5	3.8	2.5	3.1	6.0	3.5	1.6	3.4	1.3	4.9	4.8	7.0	20.2	5.0	1.9	6.4	4.3	2.7
3011	Wheat bran	6.6	3.8	2.6	3.0	5.9	4.0	1.4	3.3	1.3	4.8	4.7	7.0	20.2	5.2	2.0	5.9	4.2	2.8

AMINO ACIDS		g / 100 g crude protein (except pure amino acids, g/kg DM)																
Feed code	Feed	Arginine	Phenyl-alanine	Histi-dine	Isoleu-cine	Leucine	Lysine	Me-thio-nine	Threo-nine	Trypto-phan	Valine	Ala-nine	Aspartic acid	Glutamic acid	Glycine	Cysteine	Proline	Serine	Tyrosine
3015	Barley hull bran	5.5	4.4	2.3	3.4	6.8	4.4	2.0	3.2	0.7	5.0	5.0	6.2	17.4	4.8	2.2	7.6	4.0	2.9
3019	Oat hull flour	6.0	4.6	2.0	3.6	7.0	4.1	1.7	3.5	1.0	5.0	4.9	7.9	18.4	4.9	2.4	5.1	4.6	3.0
3020	Rice middlings	7.8	4.4	2.3	3.6	7.0	4.5	1.8	3.3	1.0	6.0	6.0	9.0	14.0	5.2	1.3		5.0	4.0
3031	Barley malt germs	4.0	2.7	1.8	4.9	5.2	4.6	1.3	3.2	0.8	5.1	4.4	10.6	11.5	3.6	0.9	4.9	3.4	1.7
3035	Dried brewers grain	4.5	5.0	1.7	5.2	9.5	3.5	1.6	3.5	1.1	5.3	5.5	6.6	20.0	4.3	1.3	9.5	4.5	2.1
3037	Barley fibre, moist	5.9	4.6	2.1	4.0	7.1	4.3	1.9	3.7	1.1	5.2	4.6	6.4	20.3	4.6	2.4	8.3	4.3	2.8
3041	Barley starch distillers grain, moist	4.3	4.5	2.0	3.8	6.1	3.8	1.4	3.4	1.0	4.7	3.8	5.4	24.0	4.0	2.2	11.7	4.3	3.4
3042	Barley distillers solubles	5.0	3.0	2.6	3.2	5.1	4.2	1.4	3.8	0.9	5.1	5.3	6.8	19.8	6.2	2.9	8.9	4.9	2.9
3043	Barley distillers solids	4.1	5.1	2.0	4.1	6.5	3.5	1.5	3.2	1.1	4.7	3.5	5.0	25.9	3.5	2.1	11.9	4.4	3.4
3045	Barley hulls	5.5	4.2	2.6	3.3	6.7	4.4	2.3	3.6		5.0	5.0	6.2	17.4	4.8	2.4	7.6	4.0	2.3
3047	Barley fibre, dried	5.7	4.5	2.1	3.8	6.4	2.9	1.6	3.3	1.0	2.6	4.4	6.4	19.1	4.6	1.9	0.1	4.2	2.6
3049	Barley protein	5.0	4.7	2.3	3.8	6.9	3.8	1.7	3.6	1.1	5.2	4.3	5.7	23.9	4.1	2.4	10.7	4.7	2.8
3082	Molassed sugar beet pulp	3.5	3.9	2.5	3.4	6.0	5.4	1.4	4.5	1.0	5.0	5.5	6.0	17.5	4.0	1.1	3.4	3.7	3.4
3084	Wheat gluten	3.8	4.8	2.1	3.4	6.3	1.6	1.6	2.5	1.0	3.5	3.5	2.8	27.8	2.9	1.6	13.5	4.8	3.1
3085	Wheat syrup	..	..	..	..	..	4.5	2.0	3.5	3.5	..	..	..	..	..	2.5	..	..	..
3086	Maize gluten	3.2	6.2	2.1	4.1	16.0	1.8	2.4	3.4	0.5	4.6	8.7	6.0	20.7	2.7	1.8	8.8	5.1	5.0
3087	Maize gluten feed	4.6	3.5	2.9	3.1	8.1	3.0	1.7	3.4	0.6	4.6	6.4	5.6	14.2	4.2	2.0	8.4	4.2	2.4
3109	Potato protein	5.2	6.2	2.2	5.7	9.8	7.6	2.2	5.6	1.2	6.6	4.8	12.5	10.6	4.7	1.3	5.1	5.1	5.2
4001	Full milk	3.4	5.8	2.7	5.5	9.3	8.1	2.6	4.7	1.4	5.9	3.1	7.7	21.7	1.8	0.7		5.2	6.3
4002	Full fat milk powder	3.5	4.8	3.3	5.6	10.0	7.9	2.3	4.6	1.4	6.5	3.4	7.9	21.7	2.0	0.8	9.8	6.0	5.0
4013	Whey meal	2.2	3.3	1.7	5.6	8.8	7.8	2.1	6.4	1.1	5.4	4.0	9.5	16.5	1.7	2.0	5.6	4.5	2.4
4015	Low lactose whey meal	2.2	3.3	1.7	5.6	8.8	7.8	2.1	6.4	1.1	5.4	4.0	9.5	16.5	1.7	2.0	5.6	4.5	2.4
4017	Whey protein meal, 35 % CP	2.5	3.6	2.0	6.3	10.9	9.0	2.1	7.2	..	7.6	5.0	10.3	14.5	1.9	2.3	7.1	5.2	3.0
4020	Casein	4.0	5.4	3.2	5.6	10.5	8.4	3.3	4.3	1.5	6.9	3.2	7.5	20.1	2.0	0.5	10.2	6.0	5.5
4101	Fish meal, high fat	5.8	4.2	2.3	4.7	7.8	7.8	3.0	4.5	1.2	5.3	6.4	9.5	13.1	6.2	1.0	4.4	4.2	3.2
4103	Fish waste meal, high fat	6.4	3.6	1.7	3.8	6.0	6.5	2.5	4.0	1.0	4.3	6.6	8.6	13.1	10.0	0.8	..	4.5	2.0
5001	Potato, raw	4.3	4.0	1.5	3.5	5.5	5.0	1.3	3.2	1.0	4.8	3.4	15.5	14.8	3.0	1.4	..	3.4	3.4
5011	Tapioca flour	5.1	2.9	1.3	3.3	5.2	3.5	1.3	3.3	1.0	4.5	4.9	7.6	14.3	3.6	1.0	3.5	4.4	2.4
5012	Sugar beet	3.3	2.0	1.7	2.2	3.4	3.3	1.0	2.7	0.6	3.2	2.7	7.5	16.3	2.4	1.0	2.2	3.4	2.1
5015	Swede	11.2	2.6	2.6	2.6	3.3	3.5	0.8	3.7	0.9	3.9	2.7	7.3	10.9	2.3	0.9	3.0	2.9	1.9
5041	Sugar beet tops	4.0	4.6	2.4	4.1	7.2	5.0	1.6	4.3	0.8	4.9	5.4	8.4	7.8	5.3	0.8	4.3	4.2	3.3
	All grasses	4.7	5.0	2.0	4.3	7.4	4.6	1.7	4.4	1.3	5.5	5.9	10.9	7.4	4.9	1.1	6.3	4.1	3.2
90010	Feed yeast	5.0	4.2	2.1	4.8	7.0	6.7	1.6	4.8	1.1	5.0	6.2	9.0	13.2	4.5	0.9	4.0	4.8	3.5
90011	Brewers yeast	5.3	3.9	2.0	4.3	6.5	7.0	1.1	4.6	..	5.3	7.7	8.3	13.2	4.8	0.7	4.6	5.1	3.9
90040	L-Lysine HCL	..	..	..	..	..	802	..	..	..	..	..	..	..	..	..	..	..	..
90041	L-Threonine	..	..	..	..	..	..	..	995	..	..	..	..	..	..	..	..	..	..

6. Feed names English – Finnish - Swedish

Code	EN	FI	SV
1000	Barley, over 69 kg/hl	Ohra, yli 69 kg/hl	Korn, över 69 kg/hl
1001	Barley, 64–69 kg/hl	Ohra, 64–69 kg/hl	Korn, 64–69 kg/hl
1002	Barley, 60–64 kg/hl	Ohra, 60–64 kg/hl	Korn, 60–64 kg/hl
1003	Barley, 57–60 kg/hl	Ohra, 57–60 kg/hl	Korn, 57–60 kg/hl
1004	Barley, under 57 kg/hl	Ohra, alle 57 kg/hl	Korn, under 57 kg/hl
1005	Barley, naked	Ohra, paljassiemeninen	Korn, naket
1011	Oats, over 58 kg/hl	Kaura, yli 58 kg/hl	Havre, över 58 kg/hl
1012	Oats, 54–58 kg/hl	Kaura, 54–58 kg/hl	Havre, 54–58 kg/hl
1013	Oats, 45–54 kg/hl	Kaura, 45–54 kg/hl	Havre, 45–54 kg/hl
1014	Oats, 35–45 kg/hl	Kaura, 35–45 kg/hl	Havre, 35–45 kg/hl
1015	Oats, hulless or dehulled	Kaura, paljassiemeninen tai kuorittu	Havre, naken eller skalad
1021	Mixed grain (barley and oats, 1:1)	Seosvilja, jyvät (ohra ja kaura, 1:1)	Blandsäd (korn och havre, 1:1)
1030	Wheat, over 80 kg/hl	Vehnä, yli 80 kg/hl	Vete, över 80 kg/hl
1031	Wheat, 76–80 kg/hl	Vehnä, 76–80 kg/hl	Vete, 76–80 kg/hl
1032	Wheat, 72–76 kg/hl	Vehnä, 72–76 kg/hl	Vete, 72–76 kg/hl
1033	Wheat, under 72 kg/hl	Vehnä, alle 72 kg/hl	Vete, under 72 kg/hl
1041	Rye	Ruis	Råg
1042	Triticale	Ruisvehnä (Triticale)	Rågvete
1043	Maize grain	Maissi, jyvä	Majskorn
1051	Rice, grain	Riisi, jyvä	Risfrö
1052	Rice, grain, husked	Riisi, jyvä, esikuorittu	Risfrö, skalat
1071	Pea, seed	Herne, siemen	Ärt, frö
1072	Faba bean, seed	Härkäpapu, siemen	Åkerböna, frö
1073	Vetch, seed	Virna, siemen	Vickerfrö
1074	Soya bean, seed	Soijapapu, siemen	Sojaböna
1075	Lupin, seed	Lupiini, siemen	Lupinfrö
1081	Rapeseed (*Brassica napus*)	Rapsi, siemen	Rapsfrö
1082	Rapeseed (*Brassica rapa* subsp. Oleifera)	Rypsi, siemen	Rybsfrö
1083	Flax, seed	Pellava, siemen	Linfrö
1084	Buckwheat, seed	Tattari, siemen	Bovetefrö
1085	Sunflower, seed	Auringonkukka, siemen	Solrosfrö
1086	Hemp, seed	Hamppu, siemen	Hampfrö
2001	Rapeseed expeller, heat treated	Rypsi- ja rapsipuriste, lämpökäsitelty	Rybs- och rapsexpeller, värmebehandlad
2002	Rapeseed meal	Rypsi- ja rapsirouhe	Rybs- och rapsmjöl
2003	Rapeseed expeller, cold pressed	Rypsipuriste, kylmäpuristettu	Rybsexpeller, kallpressad
2011	Soya bean expeller	Soijapuriste	Sojaexpeller
2012	Soya bean meal	Soijarouhe ja soijajauho	Sojamjöl
2013	Soya bean meal, CP > 50 %	Soijarouhe, rv > 50 %	Sojamjöl, rp > 50 %
2014	Soya protein	Soijaproteiini	Sojaprotein
2016	Soya bean meal, CP 46 %	Soijarouhe, rv 46 %	Sojamjöl, rp 46 %
2021	Flax expeller	Pellavapuriste	Linfröexpeller
2022	Flax expeller, cold pressed	Pellavapuriste, kylmäpuristettu	Linfröexpeller, kallpressad
2023	Flax meal	Pellavarouhe	Linfrömjöl
2024	Hemp seed expeller, cold pressed	Hamppupuriste, kylmäpuristettu	Hampfröexpeller, kallpressad

Code	EN	FI	SV
2027	Faba bean meal, decorticated, heat treated	Härkäpapurouhe, kuorittu, lämpökäsitelty	Åkerböna, skalad och krossad, värmebehandlad
2031	Palm kernel expeller	Palmuydinpuriste	Palmkärnexpeller
2032	Palm kernel meal	Palmuydinrouhe	Palmkärnmjöl
2041	Sunflower expeller, dehulled seeds	Auringonkukkapuriste kuorituista siemenistä	Solrosfröexpeller av skalade frön
2042	Sunflower meal, dehulled seeds, CF 18 %	Auringonkukkarouhe kuorituista siemenistä, rk 18 %	Solrosfrömjöl av skalade frön, vt 18 %
2043	Groundnut expeller, dehulled seeds	Maapähkinäpuriste kuorituista siemenistä	Jordnötsexpeller av skalade frön
2044	Groundnut meal, CF < 9 %	Maapähkinärouhe, rk < 9 %	Jordnötsmjöl, vt < 9 %
2045	Sunflower meal, not dehulled	Auringonkukkarouhe kuorimattomista siemenistä	Solrosfrömjöl av oskalade frön
2046	Sunflower meal, dehulled, CF >20 %	Auringonkukkarouhe kuorituista siemenistä, rk > 20 %	Solrosfrömjöl av skalade frön, vt >20 %
3001	Dehulled wheat, wheat flakes or meal	Kuorittu vehnä, vehnähiutaleet/-jauho	Skalat vete, veteflingor eller vetemjöl
3002	Dehulled rye, rye flakes or meal	Kuorittu ruis, ruishiutaleet/-jauho	Skalad råg, rågflingor eller rågmjöl
3003	Dehulled barley, barley flakes or meal	Kuorittu ohra, ohrahiutaleet/-jauho	Skalat korn, kornflingor eller kornmjöl
3004	Dehulled oats, oats flakes or meal	Kuorittu kaura, kaurahiutaleet/-jauho	Skalad havre, havreflingor eller havremjöl
3005	Dehulled rice, rice grits	Kuorittu riisi, riisisuurimot	Skalat ris, risgryn
3007	Wheat germs	Vehnänalkiot	Vetegroddar
3008	Wheat germ feed	Vehnänalkiorehu	Vetegroddfoder
3009	Wheat middlings	Vehnärehujauho	Veteklifoder (vetefodermjöl)
3010	Wheat middlings, rich in germs	Vehnärehujauho, alkiopitoinen	Veteklifoder (vetefodermjöl), groddhaltig
3011	Wheat bran	Vehnälese	Vetekli
3012	Rye middlings	Ruisrehujauho	Rågklifoder
3013	Rye bran	Ruislese	Rågkli
3014	Barley middlings	Ohrarehujauho	Kornklimjöl
3015	Barley hull bran	Ohrankuorilese	Kornskalkli
3016	Oat middlings	Kaurarehujauho	Havreklifoder
3017	Oat bran	Kauralese	Havrekli
3018	Oat hull bran	Kaurankuorilese	Havreskalkli
3019	Oat hull flour	Kaurankuorijauho	Havreskalmjöl
3020	Rice middlings	Riisirehujauho	Risklimjöl
3021	Cereal waste granules	Viljanjäännösrae	Spannmålsrest, granulerad
3022	Hemp bran	Hamppulese	Hampkli
3031	Barley malt germs	Ohramallasidut	Kornmaltgroddar
3032	Barley germ feed	Ohraiturehu	Korngroddsfoder
3033	Barley malt feed	Ohramallasrehu	Kornmaltfoder
3034	Brewers grain, moist	Mäski, märkä	Mäsk, blöt
3035	Dried brewers grain	Mäskijauho	Mäskmjöl
3036	Beer yeast liquid	Oluthiivaliemi	Öljäst, vätska
3037	Barley fibre, moist	Ohrakuitu, märkä	Kornfibre, blöt
3038	Wheat distillers grain, moist	Vehnärankki, märkä	Vetedrank, blöt
3039	Wheat distillers grain feed	Vehnärankkirehu	Vetedrankfoder
3040	Wheat distillers grain mix	Vehnärankkiseos	Vetedrankblandning
3041	Barley starch distillers grains, moist	Rankki, tuore	Stärkelsedrank (korn), blöt
3042	Barley distillers solubles	Ohrarankin liukoinen osa	Vattenlösliga restprodukter av korn från destillering
3043	Barley distillers solids	Ohrarankin kiinteä osa	Fasta partiklar av korn från destillering

Code	EN	FI	SV
3044	Barley starch	Ohratärkkelys	Kornstärkelse
3045	Barley hulls	Ohrankuoret	Kornskal
3046	Barley hull bran (from starch process)	Ohrankuorilese (tärkkelysteollisuus)	Kornskalkli (från stärkelseindustri)
3047	Barley fibre, dried	Ohrakuitu, kuivattu	Kornfibre, torkad
3049	Barley protein	Ohravalkuainen	Kornprotein
3053	Barley protein feed, A-Rehu OVR	Ohravalkuaisrehu, A-Rehu OVR	Kornproteinfoder, A-Rehu OVR
3071	White sugar	Taloussokeri	Hushållssocker
3072	Sugar beet molasses	Sokerijuurikasmelassi	Sockerbetsmelass
3073	Sugar cane molasses	Sokeriruokomelassi	Sockerrörsmelass
3074	Process molasses	Prosessimelassi	Prosessmelass
3075	Beet molasses and vinasses separation mixture	Erotusmelassi ja -vinassiseos	Separationsmelass och -vinass bland
3076	Molasses mix, beet and process molasses	Seosmelassi, juurikas- ja prosessimelassi	Blandmelass, bet- och processmelass baserad
3078	Molasses mix, beet based	Seosmelassi, juurikasmelassipohjainen	Blandmelass, betmelassbaserad
3079	Glucose, fructose	Glukoosi, fruktoosi	Glukos, fruktos
3080	Sugar beet pulp, pressed	Sokerijuurikasleike, puristettu	Betsnitsel, omelasserad, pressad
3081	Sugar beet pulp, dried	Sokerijuurikasleike, kuivattu	Betsnitsel, omelasserad, torkad
3082	Molassed sugar beet pulp	Melassileike	Betsnitsel, melasserad
3083	Wheat starch, cooked	Vehnätärkkelys, kypsytetty	Vetestärkelse, kokad
3084	Wheat gluten	Vehnägluteeni	Vetegluten
3085	Wheat syrup	Vehnäsiirappi	Vetesirap
3086	Maize gluten	Maissigluteeni	Majsgluten
3087	Maize gluten feed	Maissigluteenirehu	Majsglutenfoder
3088	Sugar ethanol mix	Sokerialkoholiseos	Sockeralkoholblandning
3089	Glucose molasses	Glukoosimelassi	Glukosmelass
3101	Potato feed, moist	Perunarehu, märkä	Potatisfoder, blött
3102	Potato feed with cell solubles, moist	Perunarehu, solunestepitoinen, märkä	Potatisfoder med cellsaft, blött
3103	Potato pulp, pressed	Perunapulppa, puristettu	Potatispulpa, pressad
3104	Potato pulp, dry	Perunapulppa, kuivattu	Potatispulpa, torkad
3109	Potato protein	Perunavalkuainen	Potatisprotein
3110	Soybean hulls	Soijan kuoret	Sojaskal
4001	Full milk	Täysmaito	Helmjölk
4002	Full fat milk powder	Rasvainen maitojauhe	Mjölkpulver från helmjölk
4004	Feed milk powder	Rehumaitojauhe (vasikat, yksimahaiset)	Fodermjölkpulver (kalvar och enmagade)
4005	Feed milk powder	Rehumaitojauhe (märehtijät)	Fodermjölkpulver (idisslare)
4011	Whey	Hera (vasikat)	Vassle (kalvar)
4012	Whey (ruminants)	Hera (märehtijät)	Vassle (idisslare)
4013	Whey meal (calves)	Herajauhe (vasikat, yksimahaiset)	Vasslepulver (kalvar och enmagade)
4014	Whey meal (ruminants)	Herajauhe (märehtijät)	Vasslepulver (idisslare)
4015	Low lactose whey meal (calves)	Vähälaktoosinen herajauhe (vasikat, yksimahaiset)	Vasslepulver, låg laktoshalt (kalvar och enmagade)
4016	Low lactose whey meal (ruminants)	Vähälaktoosinen herajauhe (märehtijät)	Vasslepulver, låg laktoshalt (idisslare)
4017	Whey protein meal, 35 % CP	Heravalkuaisjauhe, rv 35 %	Vassleproteinpulver, rp 35%
4018	Whey protein meal, 75 % CP	Heravalkuaisjauhe, rv 75 %	Vassleproteinpulver, rp 75%
4019	Lactose	Laktoosi	Laktos
4020	Casein	Kaseiini	Kasein
4031	Sow milk	Emakon maito	Suggmjölk

Code	EN	FI	SV
4101	Fish meal, high fat	Kalajauho, rasvainen	Fiskmjöl, fett
4102	Fish meal, medium fat	Kalajauho, keskirasvainen	Fiskmjöl, medelfett
4121	Freshwater fish, fresh	Sisävesikala, tuore	Insjöfisk, färsk
4221	Animal fat	Eläinrasva	Animaliskt fett
4222	Tallow	Tali	Talg
4224	Pork fat	Ihra	Ister
5001	Potato, raw	Peruna, raaka	Potatis, rå
5003	Potato, dried	Peruna, kuivattu	Potatis, torkad
5011	Tapioca flour	Tapiokajauho (maniokki)	Tapiocamjöl (maniok)
5012	Sugar beet	Sokerijuurikas	Sockerbeta
5013	Feed sugar beet	Rehusokerijuurikas	Fodersockerbeta
5014	Feed beet / mangel	Rehujuurikas	Foderbeta
5015	Swede	Lanttu	Kålrot
5016	Turnip *(Brassica campestris ssp. rapa*)	Turnipsi	Foderrova
5017	Turnip (*Brassica rapa ssp. rapa*)	Nauris	Rova
5018	Carrot	Porkkana	Morot
5019	Red beet	Punajuuri	Rödbeta
5031	Apple	Omena	Äpple
5032	Apple residue (from juice press)	Omenamäski (tuoremehuasemien)	Äppelmäsk (från äppelmusterier)
5033	Citrus pulp	Sitruspulppa	Citruspulpa
5041	Sugar beet tops	Sokerijuurikkaan naatit	Sockerbetsblast
5042	Kale, late cut	Rehukaali, myöhäinen korjuu	Foderkål, sen skörd
5043	Forage rape, late cut	Rehurapsi, myöhäinen korjuu	Foderraps, sen skörd
6001	Pasture grass	Laidunkasvusto	Bete
6002	Pasture grass, maturing	Laidunkasvusto, vanheneva	Bete, äldre
6003	Grass, early 1st cut	Nurmiheinäkasvusto, 1. sato, aikainen korjuu	Gräsväxter, skörd 1, tidig skörd
6004	Grass, average 1st cut	Nurmiheinäkasvusto, 1. sato, normaali korjuu	Gräsväxter, skörd 1, normal skörd
6005	Grass, late 1st cut	Nurmiheinäkasvusto, 1. sato, myöhäinen korjuu	Gräsväxter, skörd 1, sen skörd
6006	Grass, very late 1st cut	Nurmiheinäkasvusto, 1.sato, erit. myöh. korjuu	Gräsväxter, skörd 1, mycket sen skörd
6007	Grass, high digestibility regrowth	Nurmiheinäkasvusto, jälkikasvu, korkea sulavuus	Gräsväxter, återväxt, hög smältbarhet
6008	Grass, average digestibility regrowth	Nurmiheinäkasvusto, jälkikasvu, keskim. sulav.	Gräsväxter, återväxt, normal smältbarhet
6009	Grass, low digestibility regrowth	Nurmiheinäkasvusto, jälkikasvu, matala sulavuus	Gräsväxter, återväxt, låg smältbarhet
6010	Italian ryegrass	Italianraiheinäkasvusto	Italienskt rajgräs
6011	Grass from permanent meadows	Luonnonheinäkasvusto	Naturängsgräs
6021	Red clover, 1st & 2nd cut, early cut	Puna-apilakasvusto, 1. ja 2. sato, aik. korjuu	Rödklöver, skörd 1 & 2, tidig skörd
6022	Red clover, 1st & 2nd cut, average cut	Puna-apilakasvusto, 1. ja 2. sato, norm. korjuu	Rödklöver, skörd 1 & 2, normal skörd
6023	Red clover, 1st & 2nd cut, late cut	Puna-apilakasvusto, 1. ja 2. sato, myöh. korjuu	Rödklöver, skörd 1 & 2, sen skörd
6024	Lucerne, 1st cut, vegetative stage	Sinimailaskasvusto, 1. sato, lehtiaste	Blålucern, skörd 1, bladstadium
6025	Lucerne, 1st cut, bud stage	Sinimailaskasvusto, 1. sato, nuppuaste	Blålucern, skörd 1, knoppstadium
6026	Lucerne, 1st cut, beginning of blooming	Sinimailaskasvusto, 1. sato, kukinnan alku	Blålucern, skörd 1, begynnande blomning
6027	Lucerne, 1st cut, full blooming	Sinimailaskasvusto, 1. sato, täysi kukinta	Blålucern, skörd 1, full blomning
6040	Pea stand, blooming, pods emerging	Hernekasvusto, kukinta, palot litteitä	Ärtbestånd, blomning, baljorna platta

Code	EN	FI	SV
6041	Pea stand, early pods, partly filled	Hernekasvusto, palot osittain täyttyneet	Ärtbestånd, baljorna delvis uppfyllda
6042	Pea stand, pods filled, partly yellow	Hernekasvusto, palot täyttyneet, osa keltaisia	Ärtbestånd, baljorna fylda, delvis gula
6043	Faba bean stand, blooming	Härkäpapukasvusto, kukinta	Åkerbönsbestånd, blomning
6044	Faba bean forage, early pods	Härkäpapukasvusto, palot litteitä	Åkerbönsbestånd, begynnande baljbildning
6045	Faba bean forage, pods filled, green	Härkäpapukasvusto, palot täyttyneet, vihreitä	Åkerbönsbestånd, baljorna fylda, gröna
6061	Oats stand, early heading	Vihantakaurakasvusto, tähkälle tulo	Havre, grönbestånd, axgång
6062	Oats, green, early blooming	Vihantakaurakasvusto, kukinnan alku	Havre, grönbestånd, begynnande blomning
6063	Oats-pea-vetch stand	Kaura-herne-virnakasvusto	Havre-ärt-vickerbestånd
6064	Barley stand, green	Vihantaohrakasvusto, tähkälle tulo	Korn, grönbestånd
6065	Oats stand, yellow	Kaurakokoviljakasvusto, keltainen	Havre, gulbestånd
6066	Barley stand, yellow	Ohrakokoviljakasvusto, keltainen	Korn, gulbestånd
6070	Spring triticale, whole crop stand, dough stage	Kevätruisvehnä, kokoviljakasvusto, taikina-aste	Vårrågvete, deg fas
7001	Grass silage, early 1st cut, DM 200-500 g/kg	Nurmisäilörehu, 1.sato, aik. korjuu, ka 200–500 g/kg	Ensilage, skörd 1, tidig skörd, ts 200–500 g/kg
7002	Grass silage, average/early 1st cut, DM 200-500 g/kg	Nurmisäilörehu, 1.sato, aik/norm korjuu, ka 200–500 g/kg	Ensilage, skörd 1, normal/tidig skörd, ts 200–500 g/kg
7003	Grass silage, average/late 1st cut, DM 200-500 g/kg	Nurmisäilörehu, 1.sato, myöh/norm korjuu, ka 200–500 g/kg	Ensilage, skörd 1, normal/sen skörd, ts 200–500 g/kg
7004	Grass silage, late 1st cut, DM 200-500 g/kg	Nurmisäilörehu, 1.sato, myöhäinen korjuu, ka 200–500 g/kg	Ensilage, skörd 1, sen skörd, ts 200–500 g/kg
7005	Grass silage, very late 1st cut, DM 200-500 g/kg	Nurmisäilörehu, 1.sato, erit.myöh. korj., ka 200–500 g/kg	Ensilage, skörd 1, mycket sen skörd, ts 200–500 g/kg
7006	Grass silage, high digestibility 2nd cut, DM 200-500 g/kg	Nurmisäilörehu, 2.sato, korkea sulavuus, ka 200–500 g/kg	Ensilage, skörd 2, hög smältbarhet, ts 200–500 g/kg
7007	Grass silage, average digestibility 2nd cut, DM 200-500 g/kg	Nurmisäilörehu, 2.sato, keskim. sulavuus, ka 200–500 g/kg	Ensilage, skörd 2, normal smältbarhet, ts 200–500 g/kg
7008	Grass silage, low digestibility 2nd cut, DM 200-500 g/kg	Nurmisäilörehu, 2.sato, matala sulavuus, ka 200–500 g/kg	Ensilage, skörd 2, låg smältbarhet, ts 200–500 g/kg
7009	Grass silage, 3rd cut, DM 200-500 g/kg	Nurmisäilörehu, 3.sato, ka 200–500 g/kg	Ensilage, skörd 3, ts 200–500 g/kg
7010	Italian ryegrass silage	Italianraiheinäsäilörehu	Ensilage av italienskt rajgräs
7021	Red clover silage, early 1st & 2nd cut, DM 200-500 g/kg	Puna-apilasäilörehu, 1. ja 2. sato, aik. korjuu	Rödklöverensilage, skörd 1 & 2, tidig, tidig, ts 200–500 g/kg
7022	Red clover silage, average 1st & 2nd cut, DM 200-500 g/kg	Puna-apilasäilörehu, 1. ja 2. sato, norm. korjuu	Rödklöverensilage, skörd 1 & 2, normal, ts 200–500 g/kg
7023	Red clover silage, late 1st & 2nd cut, DM 200-500 g/kg	Puna-apilasäilörehu, 1. ja 2. sato, myöh. korjuu	Rödklöverensilage, skörd 1 & 2, sen, ts 200–500 g/kg
7027	Red clover (25 %) silage, early 1st cut, DM 200-500 g/kg	Apilapitoinen säilörehu (apilaa 25 %), 1.sato, aik., ka 200–500 g/kg	Rödklöverensilage (25%), skörd 1, tidig, ts 200–500 g/kg
7028	Red clover (25 %) silage, normal 1st cut, DM 200-500 g/kg	Apilapitoinen säilörehu (apilaa 25 %), 1.sato, norm., ka 200–500 g/kg	Rödklöverensilage (25%), skörd 1, normal, ts 200–500 g/kg
7029	Red clover (25 %) silage, late 1st cut, DM 200-500 g/kg	Apilapitoinen säilörehu (apilaa 25 %), 1.sato, myöh., ka 200–500 g/kg	Rödklöverensilage (25%), skörd 1, sen, ts 200–500 g/kg
7030	Red clover (50 %) silage, early 1st cut, DM 200-500 g/kg	Apilapitoinen säilörehu (apilaa 50 %), 1.sato, aik., ka 200–500 g/kg	Rödklöverensilage (50%), skörd 1, tidig, ts 200–500 g/kg
7031	Red clover (50 %) silage, normal 1st cut, DM 200-500 g/kg	Apilapitoinen säilörehu (apilaa 50 %), 1.sato, norm., ka 200–500 g/kg	Rödklöverensilage (50%), skörd 1, normal, ts 200–500 g/kg
7032	Red clover (50 %) silage, late 1st cut, DM 200-500 g/kg	Apilapitoinen säilörehu (apilaa 50 %), 1.sato, myöh., ka 200–500 g/kg	Rödklöverensilage (50%), skörd 1, sen, ts 200–500 g/kg
7033	Red clover (75 %) silage, early 1st cut, DM 200-500 g/kg	Apilapitoinen säilörehu (apilaa 75 %), 1.sato, aik., ka 200–500 g/kg	Rödklöverensilage (75%), skörd 1, tidig, ts 200–500 g/kg
7034	Red clover (75 %) silage, normal 1st cut, DM 200-500 g/kg	Apilapitoinen säilörehu (apilaa 75 %), 1.sato, norm., ka 200–500 g/kg	Rödklöverensilage (75%), skörd 1, normal, ts 200–500 g/kg
7035	Red clover (75 %) silage, late 1st cut, DM 200-500 g/kg	Apilapitoinen säilörehu (apilaa 75 %), 1.sato, myöh., ka 200–500 g/kg	Rödklöverensilage (75%), skörd 1, sen, ts 200–500 g/kg
7036	Lucerne silage, 1st cut, vegetative	Sinimailassäilörehu, 1. sato, lehtiaste	Blålucernensilage, skörd 1, bladstadium

Code	EN	FI	SV
7037	Lucerne silage, 1st cut, bud stage	Sinimailassäilörehu, 1. sato, nuppuaste	Blålucernensilage, skörd 1, knoppstadium
7038	Lucerne silage, 1st cut, beginning of blooming	Sinimailassäilörehu, 1. sato, kuk. alku	Blålucernensilage, skörd 1, begynnande blomning
7039	Lucerne (50 %) silage, early cut	Sinimailaspitoinen (50 %) säilörehu, aik.	Blålucernensilage (50%), tidig
7040	Lucerne (50 %) silage, average cut	Sinimailaspitoinen (50 %) säilörehu, norm.	Blålucernensilage (50%), normal
7041	Lucerne (50 %) silage, late cut	Sinimailaspitoinen (50 %) säilörehu, myöh.	Blålucernensilage (50%), sen
8001	Whole crop silage, barley, NDF 45 %	Kokoviljasäilörehu, ohra, NDF 45 %	Helsädsensilage, korn, fiberhalt NDF 45%
8002	Whole crop silage, barley, NDF 50 %	Kokoviljasäilörehu, ohra, NDF 50 %	Helsädsensilage, korn, fiberhalt NDF 50%
8003	Whole crop silage, barley, NDF 55 %	Kokoviljasäilörehu, ohra, NDF 55 %	Helsädsensilage, korn, fiberhalt NDF 55%
8005	Whole crop silage, oats	Kokoviljasäilörehu, kaura	Helsädsensilage, havre
8010	Whole crop silage, wheat	Kokoviljasäilörehu, vehnä	Helsädsensilage, vete
8011	Spring triticale, whole crop silage, dough stage	Kokoviljasäilörehu, kevätruisvehnä, taikina-aste	Vårrågvete, helsädsensilage, deg fas
8015	Maize silage, early stage	Maissisäilörehu, aikainen kehitysaste	Majsensilage, tidig
8016	Maize silage, average stage	Maissisäilörehu, keskimääräinen kehitysaste	Majsensilage, genomsnittlig
8017	Maize silage, late stage	Maissisäilörehu, myöhäinen kehitysaste	Majsensilage, sen
8020	Whole crop silage, green barley	Vihantaohrasäilörehu	Helsädesensilage, korn, grönbestånd
8021	Whole crop silage, early heading oats	Vihantakaurasäilörehu, tähkälle tulo	Helsädsensilage, havre, axgång
8022	Whole crop silage, early blooming oats	Vihantakaurasäilörehu, kukinnan alku	Helsädsensilage, havre, begynnande blomning
8023	Oats-pea-vetch silage	Kaura-herne-virnasäilörehu	Havre-ärt-vickerensilage
8040	Kale silage, early cut	Rehukaalisäilörehu, aikainen korjuu	Foderkålsensilage, tidig skörd
8041	Sugar beet top silage	Sokerijuurikkaan naattisäilörehu	Sockerbetsblastensilage
8042	Pea silage	Hernesäilörehu	Ärtensilage
8043	Faba bean silage	Härkäpapusäilörehu	Åkerbönsensilage
8044	Goats rue silage, 1st cut	Vuohenhernesäilörehu, kevätsato	Getärtsensilage, skörd 1
8045	Goats rue silage, 2nd cut	Vuohenhernesäilörehu, syyssato	Getärtsensilage, skörd 2
9001	Hay and haylage, very early 1st cut, DM 500-860 g/kg	Kuivaheinä ja säilöheinä, 1.sato, eritt. aikainen korjuu, ka 500–860 g/kg	Hö och hösilage, skörd 1, mycket tidig skörd, ts 500–860 g/kg
9002	Hay and haylage, early 1st cut, DM 500-860 g/kg	Kuivaheinä ja säilöheinä, 1.sato, aik. korjuu, ka 500–860 g/kg	Hö och hösilage, skörd 1, tidig skörd, ts 500–860 g/kg
9003	Hay and haylage, average/early 1st cut, DM 500-860 g/kg	Kuivaheinä ja säilöheinä, 1.sato, norm.korjuu, aik., ka 500-860 g/kg	Hö och hösilage och hö, skörd 1, normal/tidig skörd, ts 500–860 g/kg
9004	Hay and haylage, average/late 1st cut, DM 500-860 g/kg	Kuivaheinä ja säilöheinä, 1.sato, norm.korjuu, myöh., ka 500-860 g/kg	Hö och hösilage och hö, skörd 1, normal/sen skörd, ts 500–860 g/kg
9005	Hay and haylage, late 1st cut, DM 500-860 g/kg	Kuivaheinä ja säilöheinä, 1.sato, myöh. korjuu, ka 500–860 g/kg	Hö och hösilage och hö, skörd 1, sen skörd, ts 500–860 g/kg
9006	Hay and haylage, very late 1st cut, DM 500-860 g/kg	Kuivaheinä ja säilöheinä, 1.sato, eritt. myöh. korjuu, ka 500–860 g/kg	Hö och hösilage, skörd 1, mycket sen skörd, ts 500–860 g/kg
9021	Grass leaf meal	Ruoholehtijauho	Gräsbladmjöl
9022	Grass meal	Ruohojauho	Gräsmjöl
9023	Hay meal	Heinäjauho	Hömjöl
9024	Clover leaf meal	Apilalehtijauho	Klöverbladsmjöl
9025	Clover meal	Apilajauho	Klövermjöl
9026	Clover hay meal	Apilaheinäjauho	Klöverhömjöl
10001	Straw of oats and barley	Kauran ja ohran olki	Havre- och kornhalm
10002	Straw of wheat and rye	Vehnän ja rukiin olki	Vete- och råghalm
10003	Grass straw from seed production	Heinänsiemenenolki	Halm av utsädeshö
10021	Ammonia treated straw	Ammonoitu olki	Ammoniakbehandlad halm
10022	NaOH treated straw	Kastolipeöity olki	Dopplutad halm

Code	EN	FI	SV
11001	Calcium carbonate	Ruokintakalkki (kalsiumkarbonaatti)	Foderkalk (kalciumkarbonat)
11002	Monocalcium phosphate	Monokalsiumfosfaatti	Monikalciumfosfat
11003	Monosodium phosphate	Mononatriumfosfaatti	Mononatriumfosfat
11004	Magnesium oxide	Magnesiumoksidi	Magnesiumoxid
11005	Magnesium carbonate	Magnesiumkarbonaatti	Magnesiumkarbonat
11006	Magnesium phosphate	Magnesiumfosfaatti	Magnesiumfosfat
11007	Salt (sodium chloride)	Ruokasuola (natriumkloridi)	Salt (natriumklorid)
11008	Dicalcium phosphate, anhydrous	Dikalsiumfosfaatti, anhydraatti	Dikalciumfosfat, anhydrat
11009	Dicalcium phosphate, dihydrous	Dikalsiumfosfaatti, dihydraatti	Dikalciumfosfat, dihydrat
11010	Phosphoric acid	Fosforihappo	Fosforsyra
11011	Calcium formate	Kalsiumformiaatti	Kalciumformiat
11012	Sodium bicarbonate	Natriumbikarbonaatti	Natriumbikarbonat
11014	Sodium sulphate	Glaubersuola (natriumsulfaatti)	Glaubersalt (natriumsulfat)
90001	Urea	Urea	Urea
90010	Feed yeast	Rehuhiiva	Foderjäst
90011	Brewers yeast	Panimohiiva	Bryggerijäst
90021	Vegetable oil	Kasviöljy	Vegetabilisk olja
90022	Fish oil	Kalaöljy	Fiskolja
90023	Protected fat (Ca salt of fatty acids)	Suojattu rasva (Ca-rasvahappojen suola)	Skyddat fett (kalciumsalt av fettsyror)
90040	L-Lysine HCl	L-Lysiini HCl	L-Lysin HCl
90041	L-Threonine	L-Treoniini	L-Treonin
90042	DL-Methionine	DL-Metioniini	DL-Metionin
90043	L-Tryptophan	L-Tryptofaani	L-Tryptofan
90044	L-Valine	L-Valiini	L-Valin

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