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CHEMICAL COMPOSITION AND NUTRITIONAL VALUES OF FEED RESOURCES FOR RUMINANTS

Eastern and Central Africa (ECA) feedstuff table for ruminants 2013

Editors: Germana H. Laswai, Dyness M. Mgheni, Louis A. Mtenga, Jean Ndikumana, Emmanuel Zziwa

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This Feed Table is a collective work of researchers from various universities, research institutions and centres from Burundi, Kenya, Rwanda, Tanzania and Uganda in Eastern and Central Africa, Áarhus and Copenhagen Universities in Denmark. For additional and detailed information on place of origin, references, physical and chemical characteristics including chemical composition and nutritional values of individual feedstuffs, visit the website of the Feed Database for Ruminants 2013 in the Eastern and Central Africa (ECA)

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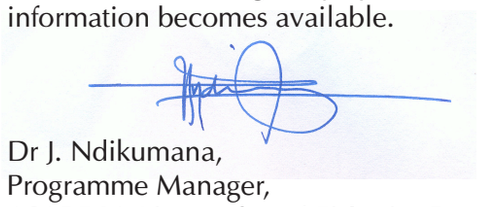
PREFACE

Information on chemical characteristics and nutritional values of feeds is essential for diet formulation and for developing optimum and economic feeding strategies of various classes of farm animals at different physiological stages of production. It is particularly important to use such values to quantify the energy and protein values of feeds, mineral and vitamin contents. The presence of anti nutritional factors and/or toxic substances is also important in setting a limit of inclusion in the diet. The values are also useful in the classification of various feedstuffs.

In Eastern and Central Africa (ECA) there is a colossal amount of data on chemical composition and digestibility values of tropical feeds which are scattered in local and international papers, research and students reports, dissertations and theses. In addition, such information is also available in laboratory ledgers of various institutions, such as universities and research institutions and centres. As such, the data are not user-friendly by key livestock stakeholders under practical situations. Thus, awareness of available feed resources and knowledge on the chemical composition and nutritional values is as essential to livestock keepers as the knowledge of the genetic potential and management of the animals for increased livestock productivity.

This Feed Table, which is generated from the feed resources data base established through the implementation of the project on "Establishment of feed resources data base in Eastern and Central Africa" implemented in Burundi, Kenya, Rwanda, Tanzania and Uganda from January 2010 to December 2011. The feed table summarizes available information on chemical composition, digestibility and energy values of locally available feed-stuff resources in the region. Perusing through this Feed Table, it is clear that there are some gaps and these calls for further research by National Agricultural Research Systems (NARS) in the region to fill the gaps. However, this Feed Table acts as a guide to proper feeding of animals and is therefore very useful to livestock advisors and progressive farmers. Furthermore, the Feed Table will provide quick access to information on feedstuffs to researchers and students in agriculture, animal science, veterinary and allied sciences. Feed manufacturers and policy makers will also benefit from the information in this Feed Table. It is hoped that farmers will be given training on how to use the Feed Table to enable them understand available feed resources and their quality, planting or purchasing of quality feedstuffs and of required standards. In addition, the farmers will be able to make proper feed formulation and feeding strategies for various classes of animals at different production stages. For effective use of this Feed Table, livestock advisors, feed manufacturers and farmers must be taught on how to make use of such data for day to day decision making on feeding livestock economically for increased livestock products of good quality and hence optimise profitability of livestock enterprises.

It is with gratification to acknowledge the authors tireless and determined efforts to produce this long overdue Feed Table. It is my hope that the authors will use the determined efforts to develop Feeding Standards and feeding guidelines for farmers based on the information in this Feed Table of chemical composition and nutritional values. For sustainability, it is important that the existing Eastern Africa feed data base be regularly updated so that this feed table is also updated from time to time as more information becomes available.



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ABBREVIATIONS/ACRONYMS

ADF	=	Acid detergent fiber
ADL	=	Acid detergent lignin
ASARECA	=	Association for Strengthening Agricultural Research in Eastern and Central Africa
Ca	=	Calcium
CP	=	Crude protein
CV	=	Coefficient of variation
DANIDA	=	Danish International Development Agency
DCHO	=	Digestible carbohydrates
DCP	=	Dgestible crude protein
DE	=	Digestible energy
DEE	=	Digestible ether extract
DGDM	=	Degradability of dry matter
DGOM	=	Degradability of organic matter
DM	=	Dry matter
DMD	=	Dry matter digestibility
DOM	=	Digestible organic matter
ECA	=	Eastern and Central Africa
EE	=	Ether extract
EU	=	European Union
FAO	=	Food and Agriculture Organization
g	=	gram
h	=	hour
IGMAFU	=	Income Generation and Market Access through Feed Utilisation
kg	=	kilogram
LFP	=	Livestock and Fisheries Program
MAFF	=	Ministry of Agriculture Fisheries and Food
max.	=	Maximum
ME	=	Metabolisable energy
min.	=	Minimum
MJ	=	Mega Joules
MPTs	=	Multi-purpose trees
MSc	=	Master of Science
NARS	=	National Agricultural Research Systems
NLRI	=	National Livestock Research Institute
NDF	=	Neutral detergent fiber
NorFor	=	The Nordic Feed Evaluation System
NPN	=	Non-protein nitrogen
OM	=	Organic matter
OMD	=	Organic matter digestibility
P	=	Phosphorus
PhD	=	Doctor of Philosophy
RAB	=	Rwanda Agricultural Board
SD	=	Standard deviation
SSA	=	Sub - Saharan Africa
SUA	=	Sokoine University of Agriculture

4.0 FEED TABLE (10)

1.0 Introduction

Feedstuff is any material that after being consumed by the animal is capable of being digested, absorbed and utilized, with tolerable degree for anti-nutritional factors and/or toxic substances. In ruminants, however, grass and hay for example are described as feedstuffs, but not all of their components are digestible and thus utilized. In animal nutrition the fraction of feedstuff that is capable of being utilized by animals with nutritional value is described as nutrients. It is therefore, evident that this fraction must be quantified. Various methods have been used to describe feedstuffs in terms of nutrient concentration and the amount of that is available to support animal production. The most common methods to determine nutrients concentration and/or availability are laboratory analysis and animal experiments mostly in vivo and in vitro digestibility trials.

Feed values are needed by farmers who wants to improve livestock productivity, feed manufacturers who are geared towards production of best and cheapest feeds, agronomist who wants to choose the best plants for fodder production, plant breeders who aim at selection of the most nutritious plants, regulatory bodies who wants to set standards, researchers and students during the setup of experiments and in evaluation and interpretation of research findings. It is therefore, well documented that there are enormous data of feed-stuff values in ECA countries scattered in different learning and research institutions in form of journal papers, proceedings, project reports, MSc. dissertations and PhD theses making the data not user friendly by the stakeholders. Instead there has been a tendency to use feed-stuff table values developed elsewhere leading to errors in balancing compounded rations. It is well documented that chemical composition and hence nutrient availability vary tremendously depending on species, ecological zones and processing techniques, let alone the variations that occur between laboratories during analysis. This calls for regional feed table values to be made easily available to farmers, researchers and feed manufactures so as to help them to choose correct feed nutrients and quantities for ruminant livestock.

The earlier effort to address this problem was attempted in Tanzania and a Feedstuffs Table for Ruminants was published by Doto et al. (2004). Despite the feed values published in that publication confined to Tanzania only, a lot of gaps existed and necessitated publication of the current Feed Table for the ECA countries. It is not the intention of this Feed Table to give the variations expected for ruminant feedstuffs in ECA countries, nor to describe the different methods used, or even comment on their accuracy and precision and/or shortcoming in measuring these nutrients. The major aim was to collect the already existing values from various institutions in Burundi, Kenya, Rwanda, Tanzania and Uganda, compile and collate the data, harmonise and document the information into a Feed Database, from which this Feed Table was generated. This Feed Table will be a useful tool for efficient feed budgeting and formulation of cost-effective feed packages towards increased livestock productivity.

2.0 Methodology

2.1 Data collection and entry

Chemical characteristics and nutritive values published in this Feed Table was obtained mainly from universities, research institutions and centres, public and private companies and government ministries either published or in grey literature and laboratory ledgers from 2005 to 2011. The countries involved were Burundi, Kenya, Rwanda, Tanzania and Uganda. In countries and areas where the information was minimal, efforts were made to collect samples of the most commonly used feedstuffs and analysed for the missing chemical composition and nutritive values. In addition, some information from Burundi was translated from a French Feed Table on Composition and Nutritive values of Animal Feeds in Burundi (Pozy and Dehareng, 1996) and included in this Feed Table. A common format for data collection was developed by the scientific team and used in all countries. Data entry from the different countries was compiled and recorded into a feed database using Microsoft Excel. The data was then organised into to chemical components, digestibility and energy values of the feeds. The chemical components (g/kg) were dry matter (DM), ash, crude protein (CP), and ether extracts (EE). Based on DM, the OM plus ash are supposed to add to 1000 g/kg DM, but this was not the case for most feedstuff values. To avoid further errors, OM (g/kg) was calculated from ash (1000g – ash) for all feedstuffs. The fibre component included crude fibre (CF), neutral detergent fibre (NDF), acid detergent fibre (ADF) and acid detergent lignin (ADL). Only two major minerals were included in this Feed Table, that is calcium (Ca) and phosphorus (P). The digestibility values of feeds (g/kg) included both in vivo and in vitro dry matter (DMD) and organic matter (OMD) components. Due to lack of digestibility values in most feedstuffs, in situ rumen degradability values at 48 h for dry matter (DGDM) and organic matter (DGOM) were also used as values for digestible organic matter.During data collection, energy values (MJ/kg DM) as metabolisable energy (ME) were also included whenever available.

2.2 Feed classification

The feedstuffs were classified into different categories using criteria based on the literature information and explanation given by the participating team. The scientific names for species were used as a basis to ensure that the feedstuffs described fall into the right category according to international nomenclature. Feedstuffs with only genera/genus name were not included in this Feed Table unless additional description of the feedstuff was available. The common names of feedstuffs, though very localised were included to make it more user friendly in practice. Some feedstuffs were clearly described to indicate how the samples were collected and methods used for processing and conservation. However, where such description was lacking literature descriptions or crude protein values were used to classify the feedstuff. Finally the feedstuffs were grouped into major groups and sub-groups at levels 1 and 2.

2.2.1 Roughages

2.2.1.1 Green forage and fodder crops (at different stage of maturity/cut, variety, rate of fertilizer application and season)

i. Grasses (e.g. Pennisetum purpureum)
ii. Forage crops [e.g. Maize crop (Zea mays)]
iii. Herbaceous legumes (e.g. Medicago sativa)
iv. Forbs/Herbs (e.g. Amaranthus hybridus) with high water content > 900 g/kg.

2.2.1.2 Tree and shrubs (for different botanical parts, frequency of cut, season)

i. Multi-purpose trees (MPTs) [(e.g. Avocado tree (Persea americana)]
ii. Leguminous MPTs [e. g. Apple-ring acacia (Acacia albida)]
iii. Shrubs [e.g. Indigofera (e.g. Indigofera spinosa)]
iv. Leguminous shrubs (e.g. Leucaena leucocephala)

2.2.1.3 Conserved forages and fodder crops

i. Hay (e.g. Grass and legume hay)
ii. Silages (e.g. Maize and grass silage)
iii. Dried leaf meal from trees and shrubs (e.g. leaf meals)

2.2.1.4 Crop residues

i. Stovers (e.g. maize and sorghum)
ii. Straws (e.g. cereal and legume straws)
iii. Alkali treated stovers and straws (e. g. urea maize stover and rice straw)
iv. Other crop residues [e.g. banana pseudostem and leaves, sugarcane tops and baggase, sweet potato vines, dried cassava leaves and chaff (which includes residues of cereals and legumes grains during threshing or winnowing)]

2.2.1.5 Kitchen westes

i. Banana peels (e.g. fresh and ripe banana peels)
ii. Potato peel s (e.g. Irish and sweet potatoes)
iii. Cassava peels (e.g. cassava peels from sweet variety)
iv. Vegetable wastes [e.g. common pea peels (e.g.Glycine max]
v. Fruits peels (e.g. orange peels)

2.2.1.6 Agro-industrial by-products (Roughages)

i. Sugar cane bagasse
ii. Pulps (e.g. Fruits and coffee pulps)
iii. Husks (e.g Phaseolus vulgaris or common bean husks)

2.2.2 Concentrates

2.2.2.1 Energy concentrates

i. Cereal grains and related by-products (e.g. maize and maize brans).
ii. Roots, tubers and related by-products (e.g. cassava and sweet potatoes).
iii. Agro-industrial by-products (e.g. molasses and broken grains)
iv. By-products from brewing industry (e.g. brewer's waste and malt culms) as energy concentrate.

2.2.2.2 Protein concentrates

i. Plant proteins (e.g. seeds, seed cakes and hulls)
ii. Animal proteins (e.g. meat and fish meals)
iii. Non-protein nitrogen (NPN) compounds (e.g. urea)
iv. By-products from brewing industry (e.g. brewer's yeast)

2.2.3 Minerals

i. Naturally available (e.g. lime and other soils)
ii. Commercial mineral premixes

2.2.4 Vitamins

i. Naturally available (e.g. green forages and yellow corn)
i. Commercial mineral and vitamins premixes

2.2.5 Non-conventional compounds as feeds or feed supplements

i. Poultry droppings
ii. Poultry litter
iii. Slurry from biogas

2.3 Collation of the data

Collation of the data was undertaken at all stages during data collection, Feed Database development and Feed Table generation. However, more vigorous collation was done during feedstuff classification. Feedstuffs without CP values were removed from the Feed Database except where the feedstuff is known to be a source of minerals, for example limestone. Based on the literature values, outliers and dubious values were deleted. Units used were those agreed by the ECA Scientific Team, whereas if any other unit was used in the collected data it was corrected accordingly.

2.4 Calculations and statistical analysis

Descriptive statistic analysis was made to calculate means, standard deviations (SD), coefficient of variations (CV) and ranges (min. and max. values) of feed value with similar descriptions. These statistics were used for further collation of Feed Database. The coefficient of variation of CP values was used as a basis for re- grouping of the feedstuffs aiming at CV of less or equal to 15 percent. Forages with CP equal or less than 70 g/kg were considered to be mature, whereas those with CP greater than 70 g/kg were considered to be young and re-subjected to statistical analysis. However, where the feedstuff maintains a CV >15 %, the values were re-grouped as Low, Medium or High CP based on stepwise calculations made on the CP values.

Step 1: Using Sorghum vulgare from the Feed Database for ECA as an example, with CP (g/kg DM) max.value of 148.3, min. value of 38.3, the difference is 110.0. Such variation is too high and has to be re-grouped based on the CP content. To group the CP as Low, Medium and High, the difference between max. and min. values was divided by 3 (110/3 = 36.67), then minimum value was added (36.67 + 38.3) = 74.97 g/kg. This was assumed to be the cut off point for the Low values for Sorghum vulgare.

Step 2: From the Feed Database for ECA, the value that follows the obtained Low value in the Database is 78 g/kg and by adding the CP value obtained from dividing by 3 the difference between min. and max. value (36.67 + 78 g/kg) = 114.67 g/kg was obtained. This value was assumed to be the cut off point for the Medium values for Sorghum vulgare.

Step 3: Finally the rest of the CP values remained were grouped as High CP values for Sorghum vulgare. Thus re-grouping and re-calculating reduced CV to less or equal to 15% and qualified most of the feedstuff to be included in the Feed Table. At this point feedstuffs containing CP values with CV greater than 15% were not included in the Feed Table but were maintained in the Feed Database. However, if a feedstuff is known to be very important in the region and/or country of origin, the feedstuff was included to generate the Feed Table regardless to whether it meets the criteria given for other feedstuffs.

2.5 Generation of ECA Feed Table and gap filling of missing values

Mean values for different components of the feedstuffs calculated from the Feed Database for ECA were included to generate this Feed Table. However, the Feed Table was found to have a lot of gaps. In filling the gaps, some values were borrowed from other Feed Databases and Feed Tables (Bo Göhl, 1981; Doto et al., 2004; SSA, 2011 and FAO, 2011) for both forages and concentrate feedstuffs, whereas values were also borrowed from MAFF (1986), Givens et al. (1990), Laswai et al. (2002) and Sauvant et al. (2004) for concentrates only. However, only chemical composition values were borrowed from the feed tables developed for non ruminants.

2.5.1 Digestible organic matter (DOM)

Values for digestible organic matter (DOM) measured in vivo or in vitro were very few in the Database. Since DOM is an important variable in the calculation of energy values of feed all the digestibility values regardless of whether it was measured in vivo or in vitro were used according to the following order of priority (+1 to +8) in g/kg.

+1 DOM = In vivo organic matter digestibility
+2 DOM = In vivo dry matter digestibility
+3 DOM = In vitro organic matter digestibility
+4 DOM = In vitro dry matter digestibility
+5 DOM = OMD without specification in vivo or in vitro
+6 DOM = DMD without specification in vivo or in vitro
+7 DOM = 48 h in situ degradability of OM
+8 DOM = 48 h in situ degradability of DM

2.5.2 Digestible energy (DE)

The most limiting feed values in this Feed Table were the energy values. Digestible energy (DE) values were calculated according to Weisbjerg and Hvelplund (1993). This estimation requires information on chemical composition and digestibility of crude protein (DCP), crude fat (DEE) and carbohydrates (DCHO). However, as information on crude fat (EE) content is missing for many types of forages, a value of 20 g/kg and 30 g/kg crude fat in DM for grass and legume forages, respectively were applied for the calculations. Ash value was an important variable in the calculation of OM, and therefore where it was missing it was assumed to be 100 g/kg DM.

Thus the DE was calculated as:

DE (MJ/kg DM) = 0.024237 x DCP (g/kg DM)
+ 0.034116 x DEE (g/kg DM)
+ 0.0173 x DCHO (g/kg DM)

Where,
DCP (g/kg DM) = 0.93 crude protein (g/kg DM) – 30
DEE (g/kg DM) = 0.96 crude fat (g/kg DM) – 10
DCHO (g/kg DM) = (1000 – ash) x DOM/1000 - (DCP + DEE) all in g/kg DM

2.5.3 Metabolisable energy (ME)

Metabolizable energy (ME) was estimated according to the equation developed by NorFor (2011) using information from Van Es (1978). This equation was considered to be more accurate than other

predictions of ME since the individual digestible nutrients are employed directly in estimating ME. Therefore, the ME values in this Feed Table were estimated as per equation:

ME (MJ/kg DM) = 0.018 x DCP (g/kg DM) + 0.0377 x DEE (g/kg DM) + 0.0145 x DCHO (g/kg DM)

2.6 Examples on use of the Feed Table

The main purpose of this Feed Table is to be used as a tool for optimising feed rations for ruminants. Feed planning can be done at different levels of sophistication, but at all levels the information in Feed Table is useful to make best use of the available resources.

Example 1

If cattle are grazing in a communal land in ECA countries, one can use the Feed Table to assess the quality of the grazed forages. Protein and energy contents are normally very low when grasses are fully mature. If the grass contains CP of less than 70 g/kg DM, as the case during the dry season, then the intake of grass become low and animals lose weight. In this case the animals can be supplemented with 1 kg per day of concentrate mixture (70 parts maize bran + 30 parts cotton seed cake by weight). On the other hand, during the rainy season grass may contain CP of more than 70 g /kg DM and favour high intake and maintain or even gain weight. Such indicators in grass nutritive value can be found in this Feed Table.

Example 2

If a farmer wants to buy a protein rich concentrate to feed the animals (as in Example 1), then the farmer can see which one to buy among the possible feeds that is in the market, as the protein content of the different feeds can be estimated from this Feed Table. Likewise, if the farmer wants to grow forages for the animals then it is possible to see and choose the available different alternatives of forages to grow in terms of nutrient concentrations as indicated in this Feed Table.

Example 3

A farmer has two cows (Cow 1 and Cow 2) both weighing 400 kg of different breeds and at different stage of lactation producing 10 kg and 20 kg of milk per day, respectively. The farmer wants to feed Cow 1 a ration on which it can maintain the milk production of 10 kg per day without losing its body weight and condition. The feeds available to the farmer are Napier grass, maize bran, cassava meal and cotton seed cake. Among these feeds, the Napier grass is the cheapest per unit of ME, therefore it can be fed ad libitum. Assume the farmer has a fixed amount of 3 kg of maize bran available for each cow per day. However, to meet the nutrient requirements of the cows, cassava meal and cotton seed cakes can be bought. Cotton seed cake is the most expensive. To be able to make the right ration for the cow it is necessary to know how much of the Napier grass the cow can eat and what are the requirements for ME, protein, minerals and vitamins for the cows. Since the ECA Book of Nutrient Requirements is not yet available, the requirements can be taken from other sources such as McDonald et al. (2002). The requirements for a 400 kg cows producing 10 kg and 20 kg of milk per day are given in Table 1.

Table 1: Daily requirements of a dairy cows weighing 400 kg live weight and producing 10 kg and 20 kg of milk per day

Nutrient requirement (Maintenance + milk production)	Energy (MJ ME)	Crude protein (g)	Ca (g)	P (g)
Cow 1 (10 kg milk)	90	1240	40	28
Cow 2 (20 kg milk)	130	2040	68	44

It is assumed that the cows will eat 6 kg of dry matter of Napier grass (fresh vegetative with medium CP) per day (approximately 30 kg of fresh material with DM of 199 g/kg feed. Table 2 shows the energy and nutrient contents of the available feeds. Table 3 gives the daily intake of nutrients from Napier grass and the 3 kg of maize bran, and finally the amount of nutrients that has to be supplemented through the cassava meal (cassava with high energy) and/or cotton seed cake (cotton with high CP). All the values are obtained from this Feed Table.

Table 2: Nutrients concentration in feeds available to the farmer

Feed type	ME (MJ/kg DM)	CP (g/kg DM)	Ca (g/kg)	P (g/kg)	g CP per MJ ME
Napier grass	7.99	112	4.48	3.47	14.02
Maize bran	12.7	114	3.08	6.95	8.98
Cassava meal	13.1	41.7	3.40	8.30	3.18
Cotton seed cake	12.1	395	3.2	1.47	32.6
Limestone	-	-	23.2	0.1	-

Table 3: Expected daily intake of different nutrients from Napier grass and maize bran and calculated nutrient deficit

Feed	ME intake (MJ/ day)	CP intake (g/day)	Ca intake (g/day)	P intake (g/day)
Napier t grass (6 kg DM)	47.94	672	26.88	20.82
Maize bran (3 kg DM)	38.1	342	9.24	20.85
Total nutrients intake	86.04	1014	36.12	41.67
Nutrients deficit (Cow 1)	- 3.96	- 226	-7.53	+13.67
Nutrients deficit (Cow 2)	-43.96	-1026	- 31.88	- 2.33

Cow1, which is producing 10 kg of milk per day need an additional 3.96 MJ ME, 226 g CP and 7.53 g calcium per day but shall have excess phosphorus intake of 13.67g per day. The deficit in those nutrients particularly protein will lower the milk yield, therefore it is recommended to supplement the cow with 0.572 kg (226g/395g/kg) of cotton seed cake with DM of 926 g/kg, approx. 0.62 kg per day as fed. From cotton seed cake, Cow 1 will get 1.83 g (0.572 kg x 3.2 g/kg) of Ca. Thus, 0.25 kg (5.7g/23.2 g/kg) of limestone should be added to meet the demand for Ca.

Cow 2, which is producing 20 kg of milk per day, should have additional 43.96 MJ ME, 1026 g CP

and 31.88 g calcium and 2.33 g phosphorus per day (Table 3). These could be obtained by feeding a mixture of cassava meal, cotton seed cake and a mineral supplement.

To get the amount of cassava and cotton seed cake required to meet the deficit in anergy and protein, two equations could be solved simultaneously as:

X kg of cassava x MJ ME/kg + Y kg of CSC x MJ ME/kg = 44 MJ ME
X kg of cassava x g CP/kg + Y kg of CSC x g CP/kg = 1026 g CP
From Table 2, energy concentrations in cassava and cotton seed cake are 13.1 and 12.1 MJ ME/kg DM, respectively, whereas the corresponding CP contents are 41.7 and 395 g/kg DM. Thus,
X kg of cassava x 13.1 MJ ME/kg + Y kg of CSC x 12.1 MJ ME/kg = 44 MJ ME
X kg of cassava x 41.7g CP/kg + Y kg of CSC x 395 g CP/kg = 1026 g CP

This will give you 1.07 kg of cassava (DM of 894 g/kg) equivalent to 1.09 kg and 2.47 kg of cotton seed cake (DM of 926 g/kg) equivalent to 2.67 kg as fed.

Table 4: Needed supplements for the cows

Animal	Feed	ME (MJ/day)	CP (g/day)	Ca (g/day	P (g/day)
Cow 1	Needed to meet deficit	3.96	226	7.53	+13.67
	Cotton Seed cake (0.572 kg)	8.92	226	1.83	0.84
	Limestone (0.25 kg)	0	0	5.8	0
Cow 2	Needed to meet deficit	43.96	1022	31.88	2.33
	Cassava meal (1.07 kg DM)	14.02	44.62	3.64	8.88
	Cotton seed cake (2.47 kg DM)	29.89	975.65	7.90	3.63
	Mineral supplement	0	0	- 20.34	+ 10.18

It is necessary to supplement with 20.34 g of calcium. This may imply that a calcium source without phosphorus is recommended. However, if using limestone as a source of minerals the animal will require to be supplemented with 0.88 kg of limestone (DM of 980 g/kg).

More sophisticated feed planning can be made, where the price of the feed is also taken into consideration. Use of different computer software is more efficient and less time consuming, thus where is available is strongly recommended.

3.0 References

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4.0 Feed table

4.1 Roughages

4.1.1 Green forage and Fodder crops

Scientific name	*Ageratum conyzoides*		*Aristida adsensionius*		*Avena elatius*	*Bothriochloa glabra*	
Common name	Billy goat weed		Three Awn			Pinhole grass	
Description	Young	Mature	Young	Mature		Young	Mature
Component	Fresh vegetative						
Country of origin[1]	Ke	Tz	Ke	Tz	Tz	Ke	Ke
Dry Matter (g/kg)							
Concentration (g/kg DM)							
Ash		208	222	104	83.0		
Organic matter		792	778	896	917		
Crude protein	177	98.1	59.0	32.0	52.0	82.0	32.0
Crude fat			15.0[b]	15.0[b]	10.0		
Crude fibre		204	391[b]	391[b]	290		
NDF			757	820			
ADF			502				
ADL			66.0				
Calcium							
hosphorous							
Digestible OM	660			530		605	373
Energy (MJ / kg DM)							
DE (MJ/kg DM)	11.4			8.29		9.90	5.96
ME (MJ/kg DM)	9.30 [a]			6.99[a]		8.27[a]	5.08[a]
n	1	1	1	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont...)

Scientific name	*Bothriochloa insculpta*							*Bothriochloa radicans*
Common name	Stippel grass							Sweet pitted grass
Description	Young	Mature	Young	Mature	Low CP	Medium CP	High CP	
Component	Leaves		Stems		Whole plant			
Country of origin[1]	Tz	Tz	Tz	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)	200[b]				470	368	250	368
Concentration (g/kg DM)								
Ash	120[b]				127	103	127	143
Organic matter	880				873	897	873	857
Crude protein	171	124	122	51.7	46.2	69.8	111	35.2
Crude fat	27.0[b]				23.0[b]	27.0[b]	26.0	
Crude fibre	349[b]				324[b]	349[b]	325	
NDF	518	581	628	843	710	768	547	
ADF					486			
ADL								
Calcium								4.17
Phosphorous								1.80
Digestible OM	699	703	546		368	406	604	338
Energy (MJ / kg DM)								
DE (MJ/kg DM)	11.8	11.7	9.23		5.86	6.81	9.88	5.19
ME (MJ/kg DM)	9.74[a]	9.69[a]	7.63[a]		4.99[a]	5.77[a]	8.25[a]	4.42[a]
n	4	3	2	3	6	9	3	3

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Brachiaria arrecta*	*Brachiaria brizantha*						
Common name		Signal grass						
Description		Low CP	Medium CP	High CP	Post blooming		Fresh	Dead
Component	Fresh vegetative	Whole plant			Whole plant	Panicles	Leaf sheath	
Country of origin[1]	Bd	Tz,Ke and Bd	Tz and Bd	Tz, Rw and Bd	Tz	Tz	Tz	Tz
Dry Matter (g/kg)		367	331	319	450	380	190	354
Concentration (g/kg DM)								
Ash	48.1	92.8	96.3	110	66.7	77.3	62.0	54.4
Organic matter	952	907	904	890	933	923	938	946
Crude protein	61.0	62.0	84.5	108	35.3	21.0	136	77.5
Crude fat		14.9	15.3	20.0				
Crude fibre		331	343	330				
NDF	778	626		703				
ADF	392	396	385	402				
ADL				83.0				
Calcium		6.80	4.40					
Phosphorous		3.10	7.00					
Digestible OM	310	420	404	554				
Energy (MJ / kg DM)								
DE (MJ/kg DM)	5.45	6.86	6.73	9.18				
ME (MJ/kg DM)	4.59[a]	5.73[a]	5.57[a]	7.61[a]				
n	1	10	5	5	8	2	2	4

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Brachiaria decumbens*			*Brachiaria dictyoneura*	*Brachiaria jubata*	*Brachiaria mulato*
Common name	Signal grass					
Description	Short rainy	Long rainy	Rainy	Leafy stage		
Component	Whole plant			Fresh vegetative		Whole plant
Country of origin[1]	Rw	Rw	Ug	Ug	Ug	Rw and Bd
Dry Matter (g/kg)	253	548	230	230		410
Concentration (g/kg DM)						
Ash						145
Organic matter						855
Crude protein	88.0	64.0	100	83.0	91.0	120
Crude fat	45.0	15.0				
Crude fibre			270	380	350	
NDF						600
ADF						300
ADL						
Calcium			1.50	2.70	3.50	1.91
Phosphorous			1.50	2.40	2.00	1.12
Digestible OM				603	470	501
Energy (MJ / kg DM)						
DE (MJ/kg DM)				9.87	7.85	8.13
ME (MJ/kg DM)	9.24[b]	9.24[b]	9.24b	8.25[a]	6.54[a]	6.71[a]
n	1	1	1	1	1	4

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Brachiaria mutica*			*Brachiaria platynota*	*Brachiaria ruziziensis*		*Brachiaria soluta*
Common name	Para grass				Ruzi/Congo grass		
Description	Early bloom	Bloom			Young	Mature	
Component	Whole plant			Very stemmy	Whole plant		Fresh vegetative
Country of origin[1]	Bd	Bd	Tz	Ug	Ug and Bd	Tz, Ke and Bd	Ug
Dry Matter (g/kg)	292	405	311		153	253	
Concentration (g/kg DM)							
Ash	90.3	82.0	88.0		91.2	75.5	
Organic matter	910	918	912		909	925	
Crude protein	118	77.0	50.4	38.0	95.2	58.7	28.0
Crude fat	17.3	17.0			20.0	21.0	
Crude fibre	318	312		420	270	330	420
NDF			785		545	753	
ADF			507		275	463	
ADL			66.1			65.9	
Calcium				2.30	3.42		3.20
Phosphorous				1.20	3.92		0.80
Digestible OM			430			513	
Energy (MJ / kg DM)							
DE (MJ/kg DM)			7.05			8.55	
ME (MJ/kg DM)			5.95[a]			7.21[a]	
n	3	1	1	1	3	5	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Cenchrus ciliaris*							
Common name	Buffel/African foxtail grass							
Description	Low CP	Medium CP	High CP		Low CP	Medium CP	High CP	
Component	Leaves			Lower leaves	Stems			Upper leaves
Country of origin1	Tz and Ug	Tz and Ke	Tz and Ke	Tz	Tz and Ke	Tz and Ke	Tz	Tz
Dry Matter (g/kg)				276	333		243	324
Concentration (g/kg DM)								
Ash	117c	98.0c	13.2c	101	75.0		58.0	120
Organic matter	883	902	987	899	925		942	880
Crude protein	76.3	129	162	61.7	40.9	69.3	102	86.7
Crude fat	17.0c		26.0c					
Crude fibre		384.c	240					
NDF	769	699	708	766	795	781	753	745
ADF				463	377		332	397
ADL				42.7	60.0		70.5	19.7
Calcium			4.50					
Phosphorous			3.00					
Digestible OM	574	760	726	475	398	589	546	512
Energy (MJ / kg DM)								
DE (MJ/kg DM)	9.16	12.6	13.5	7.73	6.58	9.56	9.51	8.30
ME (MJ/kg DM)	7.64a	10.5a	11.2a	6.50a	5.58a	8.01a	7.90a	6.92a
n	5	13	8	6	7	12	14	7

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Cenchrus ciliaris*				*Chloris gayana*			
Common name	Buffel/African foxtail grass				Rhodes grass			
Description	Low CP	Medium CP	High CP	112 days	8-12 Wks	4-12 Wks	8 - 12 Wks	4 - 6 Wks
Component	Whole plant				Leaves		Stems	
Country of origin[1]	Tz, Rd and Bd	Tz and Bd	Tz and Bd	Tz	Tz and Ke	Tz	Tz	Tz
Dry Matter (g/kg)	247	173	223	303	236			
Concentration (g/kg DM)								
Ash	91.0	108	104					
Organic matter	909	892	897					
Crude protein	76.5	107	151	81.0	110	147	80.6	112
Crude fat	25.8	21.0	21.0					
Crude fibre	344	319	335					
NDF	735	758	715		733	754	777	779
ADF	389	430			263			
ADL					45.0			
Calcium								
Phosphorous								
Digestible OM	411	675	674		649	662	607	524
Energy (MJ / kg DM)								
DE (MJ/kg DM)	7.00	11.1	11.4		10.8	11.2	9.92	8.82
ME (MJ/kg DM)	5.91[a]	9.21[a]	9.38[a]		8.94[a]	9.22[a]	8.30[a]	7.30[a]
n	22	14	8	2	7	16	13	7

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Chloris gayana*				
Common name	Rhodes grass				
Description	202 days	Non-fertilised		Cutting interval of 40 days	Cutting interval of 20 days
Component	Fresh vegetative	Mature	Young	Fresh vegetative	Fresh vegetative
Country of origin[1]	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)	636	322	246		
Concentration (g/kg DM)					
Ash		70.0	100	63.1	63.3
Organic matter		930	900	937	937
Crude protein	55.5	45.8	79.9	56.9	66.0
Crude fat		8.13	13.8	13.1	17.9
Crude fibre		376	365	377	362
NDF					
ADF					
ADL					
Calcium					
Phosphorous					
Digestible OM					
Energy (MJ / kg DM)					
DE (MJ/kg DM)					
ME (MJ/kg DM)					
n	4	3	2	3	3

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Chloris gayana*					
Common name	Rhodes grass					
Description	8 Wks	6 wks Low CP	6 wks High CP	56 days. N-fertilised	56 days	4 wks
Component	Fresh vegetative					
Country of origin[1]	Tz	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)				251	324	
Concentration (g/kg DM)						
Ash				75.0	70.0	
Organic matter				925	930	
Crude protein	110	119	168	77.1	42.7	138
Crude fat				8.90	8.30	
Crude fibre				369	382	
NDF	780	797	745			775
ADF						
ADL						
Calcium						
Phosphorous						
Digestible OM			629		322	677
Energy (MJ / kg DM)						
DE (MJ/kg DM)	11.0		10.8		5.21	11.4
ME (MJ/kg DM)	9.18[a]		8.86[a]		4.33[a]	9.39[a]
n	4	2	2	1	1	4

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Chloris gayana*					
Common name	Rhodes grass					
Description	48 days. N-fertilised	42 days	2 years	3 years	28 days. N-fertilised	28 days
Component	Fresh vegetative		Whole plant		Fresh vegetative	
Country of origin[1]	Tz	Tz	Ke	Tz	Tz	Tz
Dry Matter (g/kg)	246	299			208	255
Concentration (g/kg DM)						
Ash					102	90.0
Organic matter					898	910
Crude protein	90.0	48.5	61.5	71.0	121	72.1
Crude fat	11.0	10.3			12.5	12.3
Crude fibre	357	358			348	373
NDF						
ADF						
ADL						
Calcium						
Phosphorous						
Digestible OM		408				516
Energy (MJ / kg DM)						
DE (MJ/kg DM)		6.46				8.41
ME (MJ/kg DM)		5.37[a]				6.98[a]
n	1	1	2	2	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Chloris gayana*						*Chloris myriostachya*
Common name	Rhodes grass						
Description	14 days. N.fertilised	14 days	12 Wks	10 Wks	Mature	Young	
Component	Fresh vegetative				Whole plant		Fresh vegetative
Country of origin[1]	Tz	Tz	Tz	Tz	Tz, Ke, Ug, Rw and Bd	Ug and Rw	Ug
Dry Matter (g/kg)	196	238			652	264	
Concentration (g/kg DM)							
Ash	110	110			75.7		
Organic matter	890	890			924		
Crude protein	136	87.6	101	100	49.6	119	54.0
Crude fat	16.4	15.2			24.5	30.0	
Crude fibre	347	357			372		327
NDF			719	779	782		
ADF					445		
ADL					73.0		
Calcium					3.80		
Phosphorous					1.50		
Digestible OM		535		693	400		
Energy (MJ / kg DM)							
DE (MJ/kg DM)		8.67		11.4	6.74		
ME (MJ/kg DM)		7.19[a]		9.47[a]	5.97[a]		
n	1	1	2	5	11	4	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Chloris pycnothrix*	*Chloris roxburghiana*				*Chloris virgata*	
Common name		Shult grass				Feather finger grass	
Description		9 Wks	6 Wks	3 Wks		Mature	Young
Component	Fresh vegetative	Leaves			Stems	Whole plant	
Country of origin[1]	Ug	Ke	Ke	Ke	Ke	Tz	Ug
Dry Matter (g/kg)							
Concentration (g/kg DM)							
Ash						120	
Organic matter						880	
Crude protein	72.6	102	105	136	76.7	37.0	47.9
Crude fat							
Crude fibre	358						368
NDF						750	
ADF							
ADL							
Calcium							3.50
Phosphorous							1.50
Digestible OM		632	640	698		630	513
Energy (MJ / kg DM)							
DE (MJ/kg DM)		10.4	10.6	11.7		9.78	8.24
ME (MJ/kg DM)		8.69[a]	8.80[a]	9.66[a]		8.27[a]	6.9[6a]
n	1	1	1	1	3	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Cymbopogon afronardus*	*Cymbopogon excavatus*	*Cymbopogon pospochilii*	
Common name		Lemon grass		
Description				
Component	Fresh vegetative	Whole plant	Leaves	Stem
Country of origin[1]	Ug	Tz and Ug	Ke	Ke
Dry Matter (g/kg)				
Concentration (g/kg DM)				
Ash		76.2		
Organic matter		924		
Crude protein	54.4	54.0	56.0	17.0
Crude fat		19.7		
Crude fibre	337	412		
NDF				
ADF				
ADL				
Calcium				
Phosphorous				
Digestible OM			422	306
Energy (MJ / kg DM)				
DE (MJ/kg DM)			6.88	4.82
ME (MJ/kg DM)			5.79[a]	4.16[a]
n	1	4	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Cynodon dactylon*			*Dactyloctenium aegyptium*		*Dactyloctenium bogdani*
Common name	Bamuda/star grass			Crowfoot grass		
Description	Low CP	Medium CP	High CP	Young	Mature	
Component	Whole plant					
Country of origin[1]	Tz, Ke and Ug	Tz, Ke and Ug	Tz, Ke and Ug	Tz and Ug	Tz	Ke
Dry Matter (g/kg)	380	295	304	302	395	583
Concentration (g/kg DM)						
Ash	106	143	88.7	118	93.8	190
Organic matter	894	857	911	882	906	810
Crude protein	61.8	95.0	128	84.1	58.1	67.0
Crude fat		33.0		15.[0b]	15.0[b]	
Crude fibre	330		314	329		
NDF	703	686	671	680	760	631
ADF	460	395	385	198		381
ADL	66.0	57.0	74.0			62.0
Calcium	4.40					
Phosphorous	4.20					
Digestible OM	413	613	483	510	604	
Energy (MJ / kg DM)						
DE (MJ/kg DM)	6.74	9.86	8.39	8.19	9.71	
ME (MJ/kg DM)	5.67[a]	8.33[a]	6.91[a]	6.79[a]	8.12[a]	
n	6	5	4	2	4	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Digitaria abyssinica*		*Digitaria abyssinica*	*Digitaria comifera*
Common name	Blue couch grass			
Description	Low CP	Medium CP	High CP	
Component	Whole plant		Whole plant	Fresh vegetative
Country of origin[1]	Tz	Ke	Ke	Ug
Dry Matter (g/kg)				
Concentration (g/kg DM)				
Ash	128			
Organic matter	872			
Crude protein	45.3	88.0	169	63.0
Crude fat				
Crude fibre				316.4
NDF	822	642		
ADF		411		
ADL		66.0		
Calcium				
Phosphorous				
Digestible OM		630	740	
Energy (MJ / kg DM)				
DE (MJ/kg DM)		10.3	12.6	
ME (MJ/kg DM)		8.61[a]	10.3[a]	
n	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Digitaria maccroblephara*				*Digitaria maitlandii*	*Digitaria mombasana*	*Digitaria pentizii*
Common name						Digit grass	
Description	3 - 9 Wks	9Wks	6 Wks	3 Wks			
Component	Leaves	Stem			Fresh vegetative	Whole plant	Fresh vegetative
Country of origin[1]	Ke	Ke	Ke	Ke	Ug	Tz	Tz
Dry Matter (g/kg)						406	354
Concentration (g/kg DM)							
Ash	11.2[b]					76.5	100
Organic matter	989					924	900
Crude protein	91.3	64.0	80.0	93.0	69.8	46.1	51.7
Crude fat	18.0[b]						
Crude fibre	323[b]				311		352[c]
NDF						763	
ADF						470	
ADL						69.3	403[c]
Calcium							6.70
Phosphorous							3.50
Digestible OM	694	502	545	500		490	422
Energy (MJ / kg DM)							
DE (MJ/kg DM)	12.4	8.18	8.95	8.33		8.08	6.85
ME (MJ/kg DM)	10.3[a]	6.87[a]	7.48[a]	6.94[a]		6.82[a]	5.79[a]
n	3	1	1	1	1	4	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Digitaria scalarum*	*Digitaria ternata*	*Digitaria umfolozi*	*Digitaria uniglumis*	*Digitaria velutina*
Common name	African couch grass				Velvet finger grass
Description					
Component	Leaves & stem tips	Fresh vegetative	Fresh vegetative	Fresh vegetative	Whole plant
Country of origin[1]	Ke	Ug	Bd	Ug	Tz and Ke
Dry Matter (g/kg)			230		
Concentration (g/kg DM)					
Ash	95.0		41.0		106
Organic matter	905		959		895
Crude protein	144	62.8	97.0	108	88.2
Crude fat	38.0		21.0		
Crude fibre		337	350	320	
NDF	698				670
ADF	443				
ADL	63.0				
Calcium				4.90	
Phosphorous				3.90	
Digestible OM	611	650		685	551
Energy (MJ / kg DM)					
DE (MJ/kg DM)	10.7	10.5		11.3	9.03
ME (MJ/kg DM)	8.99[a]	8.80[a]		9.40[a]	7.54[a]
n	2	1	1	1	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Digitaria vestita*	*Echnochloa pyrimidalis*	*Eleusine coracana*		*Eleusine indica*
Common name			Finger millet		Wild finger millet
Description			Mature	Young	Fresh vegetative
Component	Whole plant	Fresh vegetative	Whole plant	Whole plant	Whole plant
Country of origin[1]	Bd	Ke	Tz	Tz and Bd	Tz and Ug
Dry Matter (g/kg)					449
Concentration (g/kg DM)					
Ash	31.0	86.0[c]	31.9	65.2	88.5
Organic matter	969	914	968	935	912
Crude protein	74.0	92.0	78.1	110	82.1
Crude fat	14.0	11.0c	15.0	15.7	
Crude fibre	350	314c	431	350	336
NDF			647		663
ADF			358		
ADL					
Calcium				6.00	
Phosphorous				3.60	
Digestible OM					492
Energy (MJ / kg DM)					
DE (MJ/kg DM)					8.23
ME (MJ/kg DM)					6.87[a]
n	1	1	11	3	3

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Enteropogon macrostachyus*		*Eragrostis abyssinica*		*Eragrostis aspera*	*Eragrostis blepharoglumis*
Common name						
Description			Young	Mature		
Component	Leaves	Stem	Leaves		Fresh vegetative	Fresh vegetative
Country of origin[1]	Ke	Ke	Bd	Bd	Tz	Ug
Dry Matter (g/kg)			297	315		
Concentration (g/kg DM)						
Ash			34.0	78.0	101	
Organic matter			966	922	899	
Crude protein	92.0	31.0	77.0	46.0	66.0	93.5
Crude fat			21.0	25.0		
Crude fibre			307	291		320
NDF					750	
ADF						
ADL						
Calcium						
Phosphorous						
Digestible OM	595	211			560	
Energy (MJ / kg DM)						
DE (MJ/kg DM)	9.80	3.43			9.08	
ME (MJ/kg DM)	8.17[a]	2.96[a]			7.62[a]	
n	1	1	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Eragrostis caespitosa*		*Eragrostis chapalieri*	*Eragrostis curvula*	*Eragrostis macilenta*
Common name				African love grass	
Description					
Component	Leaves	Stem	Fresh vegetative	Whole plant	Fresh vegetative
Country of origin[1]	Ke	Ke	Ug	Tz and Bd	Ug
Dry Matter (g/kg)				596	
Concentration (g/kg DM)					
Ash	81.0[c]			76.4	
Organic matter	919			924	
Crude protein	81.0	42.0	63.2	51.0	51.6
Crude fat	18.0[c]			15.0	
Crude fibre	375[c]		392.9	415	363
NDF				781	
ADF				423	
ADL					
Calcium			3.60		3.60
Phosphorous			1.60		1.70
Digestible OM	581	320	513		539
Energy (MJ / kg DM)					
DE (MJ/kg DM)	9.67	5.20	9.23		9.60
ME (MJ/kg DM)	8.07[a]	4.42[a]	7.75[a]		8.09[a]
n	1	1	1	2	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Eragrotis olivacea*			*Eragrostis paniciformis*	*Eragrostis racemosa*
Common name					
Description	Low CP	Medium CP	High CP		
Component	Whole plant			Fresh vegetative	Fresh vegetative
Country of origin[1]	Bd	Bd	Bd	Ug	Ug
Dry Matter (g/kg)	415	327	287		
Concentration (g/kg DM)					
Ash	49.0	38.6	49.7		
Organic matter	951	961	950		
Crude protein	49.7	71.9	100	41.4	143
Crude fat	20.9	21.0	21.0		
Crude fibre	337	348	333	367	246
NDF					
ADF					
ADL					
Calcium				3.10	
Phosphorous				1.10	
Digestible OM				484	
Energy (MJ / kg DM)					
DE (MJ/kg DM)				7.75	
ME (MJ/kg DM)				6.56[a]	
n	10	18	6	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Eragrostis superba*					*Eragrostis tenuifolia*	
Common name	Masai love grass					Love grass	
Description	Low CP	Medium CP	High CP	Upper	Lower	Young	Mature
Component	Leaves			Stems		Fresh vegetative	
Country of origin[1]	Tz	Tz and Ke	Tz and Ke	Tz and Ke	Tz and Ke	Tz	Tz and Ug
Dry Matter (g/kg)	358	306	421	410	303	442	
Concentration (g/kg DM)							
Ash	37.4	68.3	89.0	78.1	28.2	81.0	155
Organic matter	963	932	911	922	972	919	845
Crude protein	70.5	102	138	79.0	46.0	65.0	46.8
Crude fat		19.0[b]	19.0[b]				8.10
Crude fibre		323[b]	323[b]				370
NDF	811	787	802	783	803	736	
ADF	453	365	328	327	427	230	
ADL	38.4						
Calcium							2.30
Phosphorous				5.1			1.60
Digestible	473	584	630	494	439	346	476
Energy (MJ / kg DM)							
DE (MJ/kg DM)	8.27	10.0	10.7	8.33	7.63	5.87	7.02
ME (MJ/kg DM)	6.93[a]	8.30[a]	8.85[a]	6.97[a]	6.45[a]	4.93[a]	5.83[a]
n	6	12	3	8	7	1	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Galinsoga paviflora*	*Heteropogon contortus*		*Hyparrhenia bracteata*	*Hyparrhenia cymbaria*
Common name		Black spear grass			
Description		Mature	Young		
Component	Leaves & stem tips	Fresh vegetative		Fresh vegetative	Fresh vegetative
Country of origin[1]	Ke	Tz	Tz and Ug	Bd	Ug
Dry Matter (g/kg)		443	394	225	
Concentration (g/ kg DM)					
Ash		110	102	72.0	151[c]
Organic matter		890	899	928	849
Crude protein	144	31.4	48.6	70.0	59.9
Crude fat		9.80		21.0	
Crude fibre			360	351	375
NDF		762			
ADF		544			
ADL					
Calcium		6.60	3.80		
Phosphorous		2.80	1.50		
Digestible OM		400	350		
Energy (MJ / kg DM)					
DE (MJ/kg DM)		6.15	5.70		
ME (MJ/kg DM)		5.15[a]	4.83[a]		
n	1	4	3	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Hyparrhenia diplandra*		*Hyparrhenia dissoluta*		*Hyparrhenia filipendula*	*Hyparrhenia hirta*
Common name			Yellow thatching grass		Fine thatching grass	
Description	Young	Mature	Mature	Young	Mature	
Component	Fresh vegetative		Whole plant			Whole plant
Country of origin[1]	Bd	Ug	Ug	Ug and Bd	Tz	Tz
Dry Matter (g/kg)	184					
Concentration (g/kg DM)						
Ash	82.0		58.0[c]	72.0	28.2	38.6
Organic matter	918		942	928	972	961
Crude protein	96.0	65.4	59.5	88.2	25.7	16.5
Crude fat	21.0		15.0[c]	19.0		
Crude fibre	350	340	350	319	363c	
NDF						
ADF						
ADL						
Calcium			2.40			
Phosphorous			2.25			
Digestible OM			578		254	309
Energy (MJ / kg DM)						
DE (MJ/kg DM)			9.67		4.38	5.19
ME (MJ/kg DM)			8.09[a]		3.77[a]	4.47[a]
n	1	1	3	2	4	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Hyparrhenia lintonii*	*Hyparrhenia rufa*			*Latipes senegalensis*		*Lolium hybridum*
Common name		Thatch grass			Hook grass		Italian ryegrass
Description		Low CP	Medium CP	High CP			2 years
Component	Fresh vegetative	Whole plant			Leaves	Stem	
Country of origin[1]	Ug	Tz and Bd	Tz, Ug and Bd	Tz	Ke	Ke	Ke
Dry Matter (g/kg)		368	283				
Concentration (g/kg DM)							
Ash	86.0c	82.4	89.2	61.4	75.0[c]		
Organic matter	914	918	911	939	925		
Crude protein	72.8	39.1	62.0	154	85.0	39.0	140
Crude fat	50.0[c]	19.5	20.5		13.0[c]		
Crude fibre	305.4	371	343	309	389[c]		
NDF		763	750	649			
ADF		474	241				
ADL							
Calcium	3.90	8.13	4.00	1.00			
Phosphorous	3.20	3.80	2.40	0.30			
Digestible OM	637	331	378	364	574	323	
Energy (MJ / kg DM)							
DE (MJ/kg DM)	11.0	5.44	6.31	6.86	9.57	5.23	
ME (MJ/kg DM)	9.46[a]	4.63[a]	5.31[a]	5.57[a]	7.93[a]	4.45[a]	
n	1	16	17	9	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Panicum adenophorum*	*Panicum atrosanguineum*	*Panicum coloratum*	
Common name			Makarikari panicum grass	
Description			4-10 Wks	8-12 Wks
Component	Fresh vegetative	Fresh vegetative	Leaves	Stems
Country of origin1[1]	Ug	Ug	Tz and Ke	Tz
Dry Matter (g/kg)			195	
Concentration (g/kg DM)				
Ash				
Organic matter				
Crude protein	51.0	29.4	141	80.8
Crude fat				
Crude fibre	371	301		
NDF			716	780
ADF			399	
ADL			73.0	
Calcium				
Phosphorous				
Digestible OM			659	
Energy (MJ / kg DM)				
DE (MJ/kg DM)			11.1	
ME (MJ/kg DM)			9.17[a]	
n	1	1	7	6

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Panicum coloratum*			*Panicum infestum*	
Common name	Makarikari panicum grass				
Description	Low CP	Medium CP	High CP	Mature	Young
Component	Whole plant			Whole plant	
Country of origin[1]	Tz and Bd	Tz and Bd	Tz, Ug, Rw and Bd	Ke	Ug
Dry Matter (g/kg)	474	337			
Concentration (g/kg DM)					
Ash	84.4	99.9	89.0		
Organic matter	916	900	911		
Crude protein	63.1	101	136	67.0	110
Crude fat		21.0	21.0		
Crude fibre		302	254		305
NDF	709	751	740		
ADF	359				
ADL					
Calcium	4.80	5.60			
Phosphorous	3.80	3.50			
Digestible OM	395	622	678		
Energy (MJ / kg DM)					
DE (MJ/kg DM)	6.62	10.3	11.5		
ME (MJ/kg DM)	5.56[a]	8.58[a]	9.53[a]		
n	5	9	6	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Panicum maximum*				*Panicum milliacerum*	*Panicum phragmitoides*
Common name	Guinea grass				Hog millet/ white millet	
Description	6-9 Wks	3-9 Wks	Mature	Young		Before bloom
Component	Leaves	Stems	Whole plant		Whole plant	Fresh vegetative
Country of origin[1]	Ke	Ke	Tz, Ug, Rw and Bd	Tz, Ke, Ug and Bd	Tz	Bd
Dry Matter (g/kg)	183		302	177		204
Concentration (g/kg DM)						
Ash			136	109		126
Organic matter			864	891		874
Crude protein	107	75.7	72.2	134	47.7	158
Crude fat			17.7	29.4		18.0
Crude fibre			338	299[b]		330
NDF	570		739	654		
ADF	372		451	434		
ADL	54.0			38.4		
Calcium			5.60	6.41		
Phosphorous			3.16	2.75		
Digestible OM	685	594	416	510		
Energy (MJ / kg DM)						
DE (MJ/kg DM)	11.3	9.69	6.59	8.83		
ME (MJ/kg DM)	9.40[a]	8.11[a]	5.50[a]	7.35[a]		
n	3	3	25	9	2	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Panicum trichocladium*		*Pennisetum macrourum*				
Common name	Donkey grass		African Feather grass				
Description	Mature	Young		1 Metre	2 Metre	3 Metre	4 Metre
Component	Whole plant		Leaves	Stems			
Country of origin[1]	Tz	Tz	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)	318	374	371	175	250	269	396
Concentration (g/kg DM)							
Ash	102	117	88.5	62.3	52.4	40.9	37.0
Organic matter	898	883	911	938	948	959	963
Crude protein	60.8	96.0	130.8	104.5	74.5	55.3	27.5
Crude fat	25.0[b]	18.0[b]	16.6	5.20	4.70	4.00	1.80
Crude fibre	350[b]	333					
NDF	708	737	744	843	814	839	836
ADF	488	530	427	623	642	643	641
ADL	76.3	60.0	60.7	89.2			
Calcium	4.85	4.50					
Phosphorous	2.55	2.60					
Digestible OM	426	435					
Energy (MJ / kg DM)							
DE (MJ/kg DM)	7.04	7.18					
ME (MJ/kg DM)	5.97[a]	5.95[a]					
n	11	11	8	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Pennisetum purperium x Pennisetum typhoides*		*Pennisetum purpureum*				
Common name	Bana grass		Elephant/Napier grass				
Description	4 - 6 Wks	8 - 12 Wks	6 years old.	Early blooming	9 Wks	8 Wks	7 Wks
Component	Whole plant		Fresh vegetative				
Country of origin[1]	Ke	Ke	Tz	Tz	Ug	Tz, Ke and Ug	Ug
Dry Matter (g/kg)	138	200	224	194	185	165	
Concentration (g/kg DM)							
Ash	204	207	105	120	114[b]		129[b]
Organic matter	796	793	895	880	886		871
Crude protein	104	68.5	40.0	43.2	125	125	146
Crude fat	35.0[b]		10.9	14.0	27.0[b]		35.0[b]
Crude fibre	269	348		356	330[b]	307	
NDF	565	727	708	752	692	666	657
ADF	497		447		461	390	412
ADL						47.9	
Calcium							
Phosphorous							
Digestible OM	727	646	425		544	598	640
Energy (MJ / kg DM)							
DE (MJ/kg DM)	10.9	9.24	6.64		9.20	10.1	10.8
ME (MJ/kg DM)	9.17[a]	7.75[a]	5.56[a]		7.65[a]	8.32[a]	9.0[a]
n	2	4	11	2	6	13	7

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Pennisetum purpureum*								
Common name	Elephant/Napier grass								
Description	6 Wks	4 Wks	4 months	20 - 26 Wks	14 - 16 Wks	13 Wks	12 Wks	11 Wks	10 Wks
Component	Fresh vegetative								
Country of origin[1]	Tz and Ug	Ke	Bd	Ke	Ke	Ke	Ke and Ug	Ug	Ug
Dry Matter (g/kg)	125					186	152	185[b]	185[b]
Concentration (g/kg DM)									
Ash		231	77.5	172	185	198	204	114[b]	114[b]
Organic matter		769	923	828	815	802	796	886	886
Crude protein	162	121	91.0	39.0	47.4	52.0	107	102	123
Crude fat		35.0[b]	21.0				27.0[b]	27.0[b]	27.0[b]
Crude fibre	274	258	342	341	314	321	330	330	330
NDF	632	543		678	650		617	707	695
ADF	357						382	471	467
ADL							39.0		
Calcium									
Phosphorous									
Digestible OM	670	751		580	646	673	499	484	525
Energy (MJ / kg DM)									
DE (MJ/kg DM)	11.4	11.0		8.51	9.36	9.62	7.62	8.14	8.90
ME (MJ/kg DM)	9.38[a]	9.20[a]		7.20[a]	7.89[a]	8.10[a]	6.37[a]	6.81[a]	7.41[a]
n	10	6	2	6	8	6	6	7	6

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Pennisetum purpureum*				*Pennisetum clandestinum*		*Pennisetum polystachion*
Common name	Elephant/Napier grass				Kikuyu grass		Thin Napier grass
Description	3 months	Low CP	Medium CP	High CP	Mature	Young	
Component	Fresh vegetative				Whole plant		
Country of origin[1]	Bd	Tz, Ug and Bd	Tz, Ke, Ug, Rw and Bd		Ke and Rw	Ke and Rw	Tz
Dry Matter (g/kg)	198	253	199	204	283	168	
Concentration (g/kg DM)							
Ash	124	132	141	123	121	119	36.1
Organic matter	876	868	859	877	880	881	964
Crude protein	69.0	80.2	112	153	105	214	35.0
Crude fat	21.0	26.4	25.0	19.0	17.5	38.0	27.0[b]
Crude fibre	379	348	291	307		265	271[b]
NDF		680	661	683	587		
ADF		434	371	346	246		
ADL		77.8	79.0				
Calcium		4.90	5.60	4.16	4.60		
Phosphorous		3.98	4.30	3.58	2.40		
Digestible OM		538	602	470	705	750	315
Energy (MJ / kg DM)							
DE (MJ/kg DM)		8.65	9.70	8.05	11.3	13.0	5.53
ME (MJ/kg DM)		7.28[a]	8.09[a]	6.56	9.38[a]	10.8[a]	4.78[a]
n	7	23	17	11	6	3	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Pteridium aquilinum*	*Rhynchelytrum repens*			*Rottboellia cochinchinensis*	
Common name	Bracken fern	Ruby grass			Itch grass	
Description	2 months	Low CP	Medium CP	High CP	Young	Mature
Component	Fresh vegetative	Whole plant			Whole plant	
Country of origin[1]	Ke	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)			403	351	309	324
Concentration (g/kg DM)						
Ash	74.0	26.0	81.5	92.5	124	85.7
Organic matter	926	974	919	908	876	914
Crude protein	188	30.1	47.6	75.7	82.4	47.3
Crude fat	14.0					
Crude fibre						349
NDF		746	720	693	753	692
ADF		464		290	408	
ADL						
Calcium						
Phosphorous						
Digestible OM		300	452	471	508	579
Energy (MJ / kg DM)						
DE (MJ/kg DM)		5.20	7.44	7.83	8.18	9.40
ME (MJ/kg DM)		4.44[a]	6.56	8.37	6.18	8.32
n	1	5	3	2	6	3

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Rottboellia exaltata*	*Secale cereale*	*Setaria aequalis*	*Setaria anceps*	*Setaria longiseta*
Common name	Guinea-fowl grass	Rye grass	Setaria grass		
Description	Wet season				
Component	Whole plant		Fresh vegetative		
Country of origin[1]	Tz	Tz	Ug	Tz	Ug
Dry Matter (g/kg)	458	164b		172	
Concentration (g/kg DM)					
Ash	108	190		82.0	
Organic matter	892	810		918	
Crude protein	60.9	74.0	57.1	91.0	91.9
Crude fat	23.0[b]	13.0			
Crude fibre	329[b]	110	367		326
NDF	541			788	
ADF					
ADL					
Calcium	4.40				
Phosphorous	2.10				
Digestible OM	**705**				
Energy (MJ / kg DM)					
DE (MJ/kg DM)	11.3				
ME (MJ/kg DM)	9.49[a]				
n	2	2	1	2	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Setaria pallidefusca*	*Setaria sphacelata*			*Setaria splendida*		
Common name		African bristle grass			Giant setaria		
Description		Low CP	Medium CP	High CP	Before bloom	Bloom stage	Post bloom
Component	Fresh vegetative	Whole plant			Whole plant		
Country of origin[1]	Ug	Bd	Tz, Ug and Bd	Tz, Ug and Bd	Bd	Tz and Bd	Tz and Bd
Dry Matter (g/kg)		196	161	130	181	225	207
Concentration (g/kg DM)							
Ash		114	119	129	119	96.0	98.1
Organic matter		886	881	871	882	904	902
Crude protein	40.6	76.9	111	162	161	103	62.9
Crude fat		20.4	20.0	20.5	28.5	19.5	24.9
Crude fibre	377	322	310	293	322	318	291
NDF		708	628				
ADF		444	376				
ADL							
Calcium			6.07	3.98			
Phosphorous			4.37	1.04			
Digestible OM			629				
Energy (MJ / kg DM)							
DE (MJ/kg DM)			10.2				
ME (MJ/kg DM)			8.50[a]				
n	1	26	29	5	3	2	34

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Setaria trinervia*	*Setaria verticillata*		*Sida alba*	*Sorghum almum*
Common name		Bristle grass		Black willow	Columbus grass
Description		Young	Mature		
Component	Fresh vegetative	Whole plant		Fresh vegetative	Whole plant
Country of origin[1]	Ug	Tz	Tz	Tz	Tz
Dry Matter (g/kg)		399		400	232
Concentration (g/kg DM)					
Ash		120	214	119	74.1
Organic matter		880	786	881	926
Crude protein	69.5	59.8	20.3	166	96.8
Crude fat			15.6		27.5
Crude fibre	337				164
NDF		723.3		350	
ADF					
ADL					
Calcium	2.10				6.60
Phosphorous	1.90				2.80
Digestible OM	590	423	579	760	459
Energy (MJ / kg DM)					
DE (MJ/kg DM)	9.58	6.77	7.87	12.6	8.04
ME (MJ/kg DM)	8.03[a]	5.70[a]	6.67[a]	10.4[a]	6.75[a]
n	1	1	1	1	4

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Sorghum sudanense*		*Sporobolus festivus*	*Sporobolus fimbriatus*	*Sporobolus pellucides*	
Common name	Sudan grass					
Description	Mature	Young			Mature	Young
Component	Whole plant		Fresh vegetative	Fresh vegetative	Whole plant	
Country of origin[1]	Ke	Ke	Ug	Ke	Ke	Ke
Dry Matter (g/kg)	174					
Concentration (g/kg DM)						
Ash	93.0[c]	104[c]		60.0		
Organic matter	907	896		940		
Crude protein	89.0	133	44.0	66.0	69.0	28.0
Crude fat	29.0[c]	30.0[c]				
Crude fibre	287		388			
NDF	786	589		746		
ADF	437	346		459		
ADL	50.0	39.0		48.0		
Calcium						
Phosphorous						
Digestible OM	674	720		417	559	302
Energy (MJ / kg DM)						
DE (MJ/kg DM)	11.2	12.1		7.15	9.10	4.83
ME (MJ/kg DM)	9.46[a]	10.1[a]		6.01[a]	7.63[a]	4.14[a]
n	1	1	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Sporobolus pyramidalis*		*Stenotephrum dimidiatum*	*Themeda triandra*			
Common name	Giant rat's tail grass		Pemba grass	Kangaroo grass			
Description	Young	Mature		Young	Mature		
Component	Whole plant		Whole plant	Whole plant		Stems	Leaves
Country of origin[1]	Tz	Tz and Ug	Tz	Tz	Tz, Ke and Ug	Ke	Ke
Dry Matter (g/kg)		398		470			
Concentration (g/kg DM)							
Ash	60.9	90.0	91.5	77.4	109		
Organic matter	939	910	909	923	892		
Crude protein	86.1	51.7	65.0	69.8	39.1	57.3	90.8
Crude fat	6.77		10.5	13.9	16.0[c]		
Crude fibre	280	383	280	367	374		
NDF		688		730			
ADF		212		235			
ADL							
Calcium		11.0			4.10		
Phosphorous		6.60			1.90		
Digestible OM		310		300	405	527	678
Energy (MJ / kg DM)							
DE (MJ/kg DM)		5.16		5.09	6.37	8.52	11.1
ME (MJ/kg DM)		4.37a		4.21[a]	5.38[a]	7.17	9.25[a]
n	6	5	2	6	8	3	4

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Themeda gigantea*	*Tripsacum laxum*			*Tripsacum fasciculatum*
Common name		Guetamala grass			
Description		Low CP	Medium CP	High CP	
Component	Fresh vegetative	Fresh vegetative			Fresh vegetative
Country of origin[1]	Bd	Tz and Bd	Tz, Ug and Bd	Tz, Ug, Rw and Bd	Tz
Dry Matter (g/kg)		268	229	247	
Concentration (g/kg DM)					
Ash	121	91.7	100	106	96.0[c]
Organic matter	879	908	900	894	904
Crude protein	126	74.5	116	162	125
Crude fat	25.0	24.2	23.2	34.5	17.0[c]
Crude fibre	355	322	307	296	335[c]
NDF		700	670		
ADF		417	398		
ADL		35.0	35.0		
Calcium		2.15	2.80	2.70	
Phosphorous		4.50	3.50	1.30	
Digestible OM		512	509	529	
Energy (MJ / kg DM)					
DE (MJ/kg DM)		8.53	8.67	9.41	
ME (MJ/kg DM)		7.18[a]	8.80	7.82[a]	
n	1	81	31	10	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Urochloa bolberdes*	*Urochloa decumbens*	*Urochloa panicoides*	*Urochloa trichopus*	*Urochloa pullulans*	
Common name		Signal grass	Gonya grass		Buffalo grass	
Description					Dry	Wet
Component	Fresh vegetative	Whole plant	Fresh vegetative	Fresh vegetative	Whole plant	
Country of origin[1]	Ke	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)						355
Concentration (g/kg DM)						
Ash		82.5	109	148	33.0	77.0
Organic matter		918	891	852	967	923
Crude protein	70.0	82.5	65.5	36.0	45.0	82.0
Crude fat		13.5				
Crude fibre		291				
NDF			719	780	700	652
ADF					446	242
ADL						
Calcium						
Phosphorous						
Digestible OM				610	342	440
Energy (MJ / kg DM)						
DE (MJ/kg DM)				9.17	5.96	7.50
ME (MJ/kg DM)				7.76[a]	5.05[a]	6.26[a]
n	1	2	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Avena sativa*	*Manihot esculenta*		*Sorghum bicolor*		*Sorghum vulgare*	
Common name	Oats	Cassava				Sorghum	
Description		Young	Mature	Young	Mature	Young	Mature
Component	Whole plant	Crop foliage		Fodder		Crop foliage	
Country of origin[1]	Tz, Ke and Bd	Ug	Ug	Ke	Ke	Tz	Tz
Dry Matter (g/kg)				224	416	339	451
Concentration (g/kg DM)							
Ash	118	81.0			69.3	98.5	108
Organic matter	882	919			931	902	892
Crude protein	114	28.4	21.4	124	56.5	87.1	34.1
Crude fat	19.0				21.0		
Crude fibre	339			227	285		
NDF		419	421		495	664	885
ADF		420	121		312		
ADL		33.0			52.7		
Calcium							
Phosphorous							
Digestible OM		584	681			654	565
Energy (MJ / kg DM)							
DE (MJ/kg DM)		9.41	10.7			10.7	8.88
ME (MJ/kg DM)		7.98[a]	9.07[a]			8.94[a]	7.54[a]
n	6	1	1	2	4	3	3

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Zea mays*							
Common name	Maize							
Description	3 - 12 weeks			Low CP	Medium CP	high CP	Lower part	Upper part
Component	Crop foliage	Stem	Thinnings	Whole plant			Leaves	
Country of origin[1]	Tz	Tz	Ke	Tz, Ke, Ug and Bd	Tz and Ke	Tz and Ug	Ug	Ug
Dry Matter (g/kg)			380	282	325	297		
Concentration (g/kg DM)								
Ash	71.3	45.6	86.0	83.4	111	114		
Organic matter	929	954	914	917	889	886		
Crude protein	52.5	36.0	102	59.0	101	144	95.2	89.7
Crude fat			15.0[d]	11.9	29.1	25.0		
Crude fibre			294[d]	311	212	470		
NDF	589	758	510	669	634	652	640	626
ADF	368	464	568	392	437	316	356	341
ADL						44.0	27.7	23.8
Calcium				2.85		5.55		
Phosphorous				1.55		9.50		
Digestible OM	595	464		612	647	599	576	617
Energy (MJ / kg DM)								
DE (MJ/kg DM)	9.85	7.84		9.90	10.7	10.1	9.53	10.13
ME (MJ/kg DM)	8.18	6.24		8.58	8.22	9.02	7.94[a]	8.45[a]
n	4	5	5	10	12	7	6	6

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Arachis hypogaea*		*Bauhinia fassoglensis*		*Boerhavia diffusa*	*Cajanus cajan*
Common name	Groundnut		Creeping bauhinia		Spreading hog weed	Pigeon pea
Description	Mature	Young	Wet	Dry		
Component	Leaves		Whole plant		Fresh vegetative	Leaves
Country of origin[1]	Tz	Tz	Tz	Tz	Tz	Ug
Dry Matter (g/kg)	259	297	390		295	255
Concentration (g/kg DM)						
Ash	117	109	62.0	65.3	84.5	52.5
Organic matter	883	891	938	935	916	948
Crude protein	116	176	172	99.1	123	249
Crude fat		20.5				60.0[b]
Crude fibre		176				308[b]
NDF	590		569	615	568	455
ADF				363		340
ADL						
Calcium	9.30[b]	9.30[b]				8.40
Phosphorous	2.00[b]	2.00[b]				6.65
Digestible OM	747	364	675		667	
Energy (MJ / kg DM)						
DE (MJ/kg DM)	12.3	6.71	12.0		11.3	
ME (MJ/kg DM)	10.1	5.40[a]	9.85[a]		9.37[a]	
n	2	2	1	1	1	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Calopogonium mucunoides*	*Canavalia brasiliensis*	*Centrosema molle*	*Centrosema pubescens*		
Common name	Calopo	Jack bean		Butterfly-pea		
Description					Young	Mature
Component	Whole plant	Whole plant	Fresh vegetative	Leaves	Stem	
Country of origin[1]	Tz and Ke	Rw	Rw	Tz and Ke	Tz	Tz
Dry Matter (g/kg)	215					
Concentration (g/kg DM)						
Ash	185	128	109			
Organic matter	815	872	891			
Crude protein	147	159	139	226	149	91.5
Crude fat	34.9					
Crude fibre	297					
NDF		480	614	460	603	627
ADF		273	348			
ADL						
Calcium	5.60[b]					
Phosphorous	2.70[b]					
Digestible OM		557	439			
Energy (MJ / kg DM)						
DE (MJ/kg DM)		9.37	7.60			
ME (MJ/kg DM)		7.67[a]	6.23[a]			
n	17	2	1	4	2	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Centrosema pubescens*	*Clitoria ternatea*				*Desmanthus virgatus*
Common name	Butterfly-pea	Blue pea				
Description				Young	Mature	
Component	Whole plant	Leaves	Stem	Whole plant		Fresh vegetative
Country of origin[1]	Tz and Ke	Tz and Ke	Tz	Tz , Ke and Rw	Tz , Ke and Rw	Rw
Dry Matter (g/kg)	247			224	336	
Concentration (g/kg DM)						
Ash	98.7			33.8	70.2	79.7
Organic matter	901			966	930	920
Crude protein	172	253	144	247	150	144
Crude fat				45.0[d]		
Crude fibre	318b			118[d]		
NDF	480	298	615	493	553	585
ADF	304			405	328	381
ADL						
Calcium	3.70			8.90	3.30	
Phosphorous	2.80			3.10	2.60	
Digestible OM	395				497	325
Energy (MJ / kg DM)						
DE (MJ/kg DM)	7.21				8.91	6.05
ME (MJ/kg DM)	5.83				7.29[a]	4.91[a]
n	10	3	4	6	8	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981),

[d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Desmodium intortum*		*Desmodium sandwicense*	*Desmodium uncinatum*	*Desmodium velutinum*
Common name	Green leaf Desmodium		Sand witch	Silver leaf Desmodium	
Description					
Component	Stem	Whole plant	Whole plant	Whole plant	Whole plant
Country of origin[1]	Tz	Tz, Ke, Ug, Rw and Bd	Tz	Tz, Ke, Ug, Rw and Bd	Rd
Dry Matter (g/kg)		222		273	
Concentration (g/kg DM)					
Ash	43.4	152	321	97.0	80.6
Organic matter	957	848	679	903	919
Crude protein	47.5	170	137	169	146
Crude fat		31.9	30.7	27.3	
Crude fibre		285	320	288	
NDF		566		623	532
ADF		363		342	323
ADL		82			
Calcium		6.62			
Phosphorous		3.52			
Digestible OM		502		357	419
Energy (MJ / kg DM)					
DE (MJ/kg DM)		8.61		6.73	7.56
ME (MJ/kg DM)		7.11[a]		5.50[a]	6.17[a]
n	2	35	7	16	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Dolichos biflorus*	*Dolichos formosus*	*Dolichos lablab*	*Flueggea virosa*
Common name	Horse gram	Desert pea	Lablab	Mkwamba (Zanzibar)
Description				
Component	Stems & leaves	Fresh vegetative	Whole plant	Leaves
Country of origin[1]	Tz	Tz	Tz, Ke and Bd	Tz
Dry Matter (g/kg)			170	
Concentration (g/kg DM)				
Ash	135	75.0	70.0	101
Organic matter	865	925	930	899
Crude protein	86.0	84.0	159	159
Crude fat	13.5	8.00		
Crude fibre	294	409		
NDF			486	278
ADF			313	150
ADL				
Calcium			19.8[d]	
Phosphorous			2.60[d]	
Digestible OM			637	572
Energy (MJ / kg DM)				
DE (MJ/kg DM)			11.2	9.86
ME (MJ/kg DM)			8.60	8.08[a]
n	2	1	5	9

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981),

[d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Lablab purpureum*			*Lupinus albus*	*Macroptilium atropurpureum*	
Common name	Lablab bean				Siratro	
Description					Mature	Young
Component	Leaves	Stem	Whole plant	Fresh vegetative	Leaves	Leaves
Country of origin[1]	Ug	Ug	Tz, Ug and Rw		Tz	Tza, Ke and Ug
Dry Matter (g/kg)			264			186
Concentration (g/kg DM)						
Ash			102		96.8	74.0
Organic matter			898		903	926
Crude protein	288	122	175	331	124	209
Crude fat						
Crude fibre						
NDF	387	612	569	504	597	416
ADF	322	580	368	160		407
ADL	61.5	105	111	11.0		
Calcium	14.7	10.5	15.0			10.2
Phosphorous	2.67		3.00			2.50
Digestible OM	618	507	555			692
Energy (MJ / kg DM)						
DE (MJ/kg DM)	11.6	8.78	9.70			12.4
ME (MJ/kg DM)	9.33[a]	7.34[a]	7.90[a]			10.1
n	3	2	5	1	6	13

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Macroptilium atropurpureum*					*Macroptilium martii*		
Commoname	Siratro							
Description		4 - 10 Wks	2 - 3 years	123 -197 days		6-10 Wks	4-10 Wks	4-18 Wks
Component	Stems	Whole plant				Leaves	Stems	Whole plant
Country of origin[1]	Tza and Ke	Tz	Ke	Tz	Tza nd Rw	Tz	Tz	Tz
Dry Matter (g/kg)				466	255			
Concentration (g/kg DM)								
Ash					116			62.0[c]
Organic matter					884			938
Crude protein	119	172	82.3	129	167	156	98.0	142
Crude fat								
Crude fibre					277[b]			
NDF	616	520		515	512	457	641	462
ADF					279			
ADL								
Calcium					4.00			
Phosphorous					2.05			
Digestible OM	590	666			478			
Energy (MJ / kg DM)								
DE (MJ/kg DM)	10.1	11.6			8.50			
ME (MJ/kg DM)	8.41[a]	9.58[a]			7.00[a]			
n	12	15	3	8	4	2	3	5

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Macrotyloma axillare*			*Medicago sativa*	*Mucuna pruriens*		
Common name	Perennial Horse Gram			Alfa-alfa/ Lucerne	Velvet bean		
Description	6-10 Wks	4-10 Wks			Young	Mature	
Component	Leaves	Stems	Whole plant	Fresh vegetative	Leaves	Leaves	Whole plant
Country of origin[1]	Tz and Ke	Tz and Ke	Tz, Ke,Rw and Bd	Tz, Ke and Rw	Ug	Ke and Rw	Tz, Ke, Ug and Rw
Dry Matter (g/kg)				250		463	292
Concentration (g/kg DM)							
Ash			68.8	95.8			123
Organic matter			931	904			877
Crude protein	213	115	180	184	329	89.0	194
Crude fat			27.0	14.0		48.3	
Crude fibre			342	227		220	385
NDF	469	593	440	467	453		531
ADF			285	359	229	310	364
ADL				65.0	60.0		83.0
Calcium							
Phosphorous							
Digestible OM	744	527	535	530	689	630	519
Energy (MJ / kg DM)							
DE (MJ/kg DM)	13.1	9.06	9.84	9.33	13.0	10.8	9.06
ME (MJ/kg DM)	10.7[a]	7.58[a]	8.07[a]	7.52[a]	10.4[a]	9.25[a]	7.52[a]
n	4	4	8	14	6	2	14

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Mucuna utilis*	*Mullera lobulata*	*Mundulea sericea*	*Neonotonia wightii*	*Neonotonia wightii*
Common name			Mkwaia (Swahili)	Glycine	Glycine
Description				Tender	Mature
Component	Whole plant	Leaves	Fresh vegetative	Leaves	Leaves
Country of origin[1]	Rw and Bd	Tz	Tz	Tz	Tz
Dry Matter (g/kg)	312		430		
Concentration (g/kg DM)					
Ash	47.0	176	41.0		
Organic matter	953	824	959		
Crude protein	119	197	111	266	171
Crude fat	21.0	6.30			
Crude fibre	219				
NDF		522	578	470	512
ADF		331	313		388
ADL					
Calcium					
Phosphorous					
Digestible OM		505	545	781	745
Energy (MJ / kg DM)					
DE (MJ/kg DM)		8.20	9.70	14.0	12.8
ME (MJ/kg DM)		7.32[a]	7.90[a]	11.4[a]	10.6[a]
n	4	1	1	3	3

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Neonotonia wightii*					
Common name	Glycine (Fundofundo)					
Description	4 - 10 Wks	123 days	183 days	196 -197 days	4 - 8 Wks	10 Wks
Component	Stems	Fresh vegetative				
Country of origin[1]	Tz	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)		301	486	598		
Concentration (g/kg DM)						
Ash						
Organic matter						
Crude protein	118	158	124	119	165	172
Crude fat						
Crude fibre						
NDF	623			517	594	578
ADF						
ADL						
Calcium						
Phosphorous						
Digestible OM	559				647	596
Energy (MJ / kg DM)						
DE (MJ/kg DM)	9.57				11.3	10.5
ME (MJ/kg DM)	8.01[a]				9.31[a]	8.66[a]
n	7	4	4	4	10	4

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Neonotonia wightii*		*Phaseolus atropurpureus*	*Pueraria phaseloides*		*Rhynchosia minima*
Common name	Glycine		Siratro bean	Tropical kudzu		Jumby bean
Description	Young	Mature	123 - 197 days	Mature	Young	
Component	Fresh vegetative		Fresh vegetative	Whole plant		Whole plant
Country of origin[1]	Tz, Ke and Ug	Tz, Ke and Rw	Tz	Tz	Tz	Tz
Dry Matter (g/kg)		333	463	266		296
Concentration (g/kg DM)						
Ash	102	163		107	96.7	85.9
Organic matter	898	837		893	903	914
Crude protein	203	145	129	144	215	161
Crude fat	28.5	33.3		37.2	27.5	
Crude fibre	276	288		306	230	320
NDF	411	580		578		
ADF	264	450		341		
ADL	46.0	11.0		68.2		
Calcium	7.21	3.80		4.10		
Phosphorous	2.35	2.70		3.00		
Digestible OM	597	510		496		459
Energy (MJ / kg DM)						
DE (MJ/kg DM)	10.7	8.48		8.82		8.24
ME (MJ/kg DM)	8.73a	7.06[a]		7.38[a]		6.71[a]
n	8	30	3	26	4	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Rhynchosia sennaarensis*		*Sceloporus occidentalis*	*Stylosanthes guanensis*	
Common name	Sena		Magnus pea	Stylo	
Description	Young	Mature	2 years	Before bloom	Bloom period
Component	Whole plant		Fresh vegetative	Whole plant	
Country of origin[1]	Tz	Tz	Ke	Ug, Rw and Bd	Tz, Rw and Bd
Dry Matter (g/kg)	202				414
Concentration (g/kg DM)					
Ash	83.1	113		93.6	69.0
Organic matter	917	887		906	931
Crude protein	121	70.0	120	152	101
Crude fat		9.75		18.3	19.7
Crude fibre		358		298	347
NDF				580	
ADF				334	
ADL				90[b]	
Calcium	4.40			6.68	3.60
Phosphorous	3.75			1.87	2.30
Digestible OM	379			501	412
Energy (MJ / kg DM)					
DE (MJ/kg DM)	6.74			8.76	7.23
ME (MJ/kg DM)	5.54[a]			7.15[a]	5.99[a]
n	3	8	1	8	8

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Stylosanthes hamata*					
Common name	Hamata					
Description	4-10 Wks	4-10 Wks	Young	Mature	17-28 Wks	4-10 Wks
Component	Leaves		Stems		Whole plant	
Country of origin[1]	Tz	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)					416	
Concentration (g/kg DM)						
Ash	83.0[c]					
Organic matter	#VALUE!					
Crude protein	137	249	231	134	130	189
Crude fat	21.0[c]					
Crude fibre	268[c]					
NDF	611	424	489	571	538	549
ADF						
ADL						
Calcium	15.5[c]					
Phosphorous	5.60[c]					
Digestible OM		792				732
Energy (MJ / kg DM)						
DE (MJ/kg DM)		14.0				
ME (MJ/kg DM)	10.2[c]	11.5[a]				10.5[a]
n	4	3	4	4	7	8

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Stylosanthes scabra*					
Common name	Scabra					
Description	Mature	Young	Mature	Young	Mature	Young
Component	Leaves		Stems		Whole plant	
Country of origin[1]	Tz	Tz and Ke	Tz and Ke	Tz	Tz, Ke and Rw	Tz and Ke
Dry Matter (g/kg)					495	
Concentration (g/kg DM)						
Ash					71.0	
Organic matter					929	
Crude protein	99.3	196	115	200	133	169
Crude fat					23.0	20.0
Crude fibre						
NDF	696	437	609	521	608	463
ADF					411	
ADL					85.0	
Calcium						
Phosphorous						
Digestible OM		758	506		567	684
Energy (MJ / kg DM)						
DE (MJ/kg DM)		13.2	8.73		9.96	11.7
ME (MJ/kg DM)		10.9[a]	7.31[a]		8.25[a]	9.58[a]
n	4	8	8	4	16	10

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Stylosanthes townville*	*Stylosanthes verano*	*Vigna pubescens*	*Vigna unguiculata*	
Common name	African stylo		Hairypod cowpea	Cowpea	
Description				Young	Mature
Component	Leaves	Fresh vegetative	Whole plant	Fresh Vegetative	
Country of origin[1]	Tz	Rw	Tz	Tz, Ke and Bd	Tz and Ke
Dry Matter (g/kg)					154
Concentration (g/kg DM)					
Ash	114		72.1	66.2	133
Organic matter	886		928	934	868
Crude protein	79.0	94.0	126	255	188
Crude fat		21.0		25.3	40.3
Crude fibre				248	298
NDF			580	431	
ADF			448	186	
ADL					
Calcium				20.6[c]	4.5[d]
Phosphorous				3.10[c]	1.50[d]
Digestible OM			332	669	
Energy (MJ / kg DM)					
DE (MJ/kg DM)			6.08	12.5	
ME (MJ/kg DM)			4.98[a]	10.1[a]	9.96[d]
n	1	1	3	4	3

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Amaranthus caudatus*	*Amaranthus cruentus*	*Amaranthus hypochondriacus*	*Amaranthus hybridus*	
Common name	Foxtail amaranth	Red amaranth	Prince of Wales feather	Smooth amaranthus	
Description				Mature	Young
Component	Fresh vegetative	Fresh vegetative	Fresh vegetative	Whole plant	
Country of origin[1]	Ke	Ke	Ke	Ug	Tz and Ug
Dry Matter (g/kg)					214
Concentration (g/kg DM)					
Ash	34·4	31.7	28.5		141
Organic matter	966	968	972		859
Crude protein	169	160	152	128	193
Crude fat	78.2	69.8	67.3	14.0	23.8
Crude fibre	89.0	79.5	61.0	309	194
NDF					
ADF				340	275
ADL					
Calcium				8.00	13.0
Phosphorous				5.00	6.00
Digestible OM				828	821
Energy (MJ / kg DM)					
DE (MJ/kg DM)				13.6	13.5
ME (MJ/kg DM)				11.2[a]	11.0[a]
n	1	1	1	1	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Bidens pilosa*		*Cana edulis*	*Citrullus vulgaris*	*Commelina africana*	
Common name	Black Jack		Edible cana	Water melon	Kokwaro	
Description	Mature	Young	Wet		Mature	Young
Component	Whole plant		Leaves	Fresh vegetative		
Country of origin[1]	Tz	Tz	Tz and Bd	Tz	Tz	Tz
Dry Matter (g/kg)		303		352		
Concentration (g/kg DM)						
Ash	33.1	81.1	109	105	139	101
Organic matter	967	919	892	895	861	899
Crude protein	39.1	110	148	155	116	199
Crude fat			17.8	18.4		
Crude fibre			215	181		
NDF		536		413	663	709
ADF		290			496	639
ADL						
Calcium						
Phosphorous						
Digestible OM	325	487	478	722	529	613
Energy (MJ / kg DM)						
DE (MJ/kg DM)	5.63	8.39	8.24	12.1	8.57	10.8
ME (MJ/kg DM)	4.79[a]	6.95[a]	6.72[a]	9.95[a]	7.09[a]	8.74[a]
n	5	2	3	4	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Commelina benghalensis*		*Eichhornia crassipes*		*Galinsoga parviflora*	
Common name	Wandering jew		Water hyacinth		Gallant soldier	
Description	Young	Mature			Young	Mature
Component	Fresh vegetative		Leaves	Shoots	Fresh vegetative	
Country of origin[1]	Tz	Tz and Ke	Tz	Tz	Tz	Tz
Dry Matter (g/kg)	188	204	107			
Concentration (g/kg DM)						
Ash	168	175	123	183	51.8	213
Organic matter	832	825	877	817	948	787
Crude protein	176	117	180	180	92.8	56.9
Crude fat	30.0	64.9	18.2	17.9		
Crude fibre	177	318				268
NDF		529	501	543		
ADF		213	211	308		
ADL		94.0				
Calcium	1.14	1.90				
Phosphorous	1.00	0.70				
Digestible OM	610	603	582	570	546	
Energy (MJ / kg DM)						
DE (MJ/kg DM)	10.0	10.0	9.91	9.14	9.50	
ME (MJ/kg DM)	8.27[a]	8.70[a]	8.05[a]	7.40[a]	7.91[a]	
n	4	5	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.1 Green forage and Fodder crops (Cont....)

Scientific name	*Ipomoea aquatica*	*Pistia stratiotes*	*Symphytum officinale*	*Launaea cornuta*
Common name	Water spinach	Water lettuce	Russian comfrey	Bitter lettuce
Description			5-11 weeks	
Component	Fresh vegetative			Fresh vegetative
Country of origin[1]	Tz	Tz	Ug	Tz
Dry Matter (g/kg)		608	155	
Concentration (g/kg DM)				
Ash	172	309		105
Organic matter	828	691		895
Crude protein	178	105	162	139
Crude fat	42.0	8.54		52.4
Crude fibre	156			247
NDF	436	492	466	
ADF	460	402	316	
ADL				
Calcium	7.10[c]		18.9	
Phosphorous	3.20[c]		4.53	
Digestible OM	608		502	
Energy (MJ / kg DM)				
DE (MJ/kg DM)	10.2		8.81	
ME (MJ/kg DM)	8.88		7.19[a]	
n	4	5	9	12

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs

Scientific name	*Adansonia digitata*	*Albizia amara*		*Albizia anthelmintica*	*Albizia gummifera*
Common name	Baobab/Mbuyu	Bitter albizia		Olumugutani (Maasai).	Mukurwe (Kikuyu)
Description		Mature	Young		
Component	Foliage	Foliage	Foliage	Foliage	Foliage
Country of origin[1]	Tz	Ke	Tz	Tz	Tz
Dry Matter (g/kg)	278				279
Concentration (g/kg DM)					
Ash	90.7		63.6	64.3	66.7
Organic matter	909		936	936	933
Crude protein	190	167	294	278	245
Crude fat	12.4			15.0[d]	14.4
Crude fibre	94.0			156	
NDF	403	601	494	588	615
ADF	279	413	235	383	515
ADL		250			
Calcium				2.50[d]	4.60
Phosphorous				0.70[d]	2.80
Digestible OM	647	292	563	528	562
Energy (MJ / kg DM)					
DE (MJ/kg DM)	11.2	5.57	11.0	10.2	10.5
ME (MJ/kg DM)	9.09[a]	4.46[a]	8.70[a]	8.07[a]	8.39[a]
n	6	1	1	2	5

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Albizia harveyi*	*Albizia lebbek*	*Albizia petersiana*	*Atriplex halimus*	
Common name	Mringaringa	Mkungu	Mukumari	Four wing salt bush	
Description				Mature	Young
Component	Foliage	Foliage	Foliage	Foliage	Foliage
Country of origin[1]	Tz	Tz and Ug	Tz	Tz and Bd	Bd
Dry Matter (g/kg)	410		405		
Concentration (g/kg DM)					
Ash	48.5	75.5	55.0	277	182
Organic matter	952	924	945	723	818
Crude protein	215	249	212	168	235
Crude fat		24.9		18.9	21.0
Crude fibre		283			204
NDF	390	455	581		
ADF	334	293	264		
ADL		80			
Calcium		19.8			
Phosphorous		2.10			
Digestible OM	389	603	398	898	
Energy (MJ / kg DM)					
DE (MJ/kg DM)	7.73	11.3	7.82	12.2	
ME (MJ/kg DM)	6.17[a]	9.12[a]	6.25[a]	10.0[a]	
n	3	9	2	2	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Atriplex numularia*	*Azadirachta indica*		*Avicennia marina*	*Balanites aegyptica*
Common name		Neem		Gray Mangrove	Desert date
Description		Mature	Young		Dry season
Component	Foliage	Foliage	Foliage	Foliage	Foliage
Country of origin[1]	Bd	Tz	Tz	Tz	Ke
Dry Matter (g/kg)	342			288	610
Concentration (g/kg DM)					
Ash	110	97.2	97.8	146	78.0
Organic matter	891	903	902	854	922
Crude protein	208	157	209	123	140
Crude fat	21.0	42.0[c]	31.8	32.7	
Crude fibre		127[c]		187	
NDF				478	464
ADF				408	316
ADL					88.5
Calcium		26.5[c]			1.60[c]
Phosphorous		2.4[c]			4.00[c]
Digestible OM			543	381	681
Energy (MJ / kg DM)					
DE (MJ/kg DM)			9.96	6.57	11.7
ME (MJ/kg DM)		8.49[c]	8.16[a]	5.51[a]	9.66[a]
n	2	1	1	1	4

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Berchemia discolor*	*Boscia indica*	*Boscia grandiflora*	*Catunaregam spinosa*
Common name	Brown ivory	Kimbunga	Igirigiri	Muhanza
Description				
Component	Foliage	Foliage	Foliage	Foliage
Country of origin[1]	Ke	Tz	Tz	Tz
Dry Matter (g/kg)		592	440	
Concentration (g/kg DM)				
Ash	89.0	66.0	99.0	53.0
Organic matter	911	934	901	947
Crude protein	243	167	250	137
Crude fat	37.0			
Crude fibre	150			
NDF	380	620	220	
ADF	350		220	265
ADL				
Calcium				
Phosphorous				
Digestible OM		480	710	
Energy (MJ / kg DM)				
DE (MJ/kg DM)		8.78	12.6	
ME (MJ/kg DM)		7.15[a]	10.2[a]	
n	1	1	2	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Chlorophora excelsa*	*Commiphora boiviniana*	*Cordia africana*		*Croton megalocarpus*	
Common name	African teak		Sudan teak			
Description		Wet season	Low CP	High CP	Low CP	High CP
Component	Foliage	Foliage	Leaves and twigs		Leaves and twigs	
Country of origin[1]	Tz	Ke	Ke	Ke	Ke	Ke
Dry Matter (g/kg)		257				
Concentration (g/kg DM)						
Ash	176	142	106	110	117	56.7
Organic matter	824	858	894	890	883	943
Crude protein	119	193	192	275	153	215
Crude fat						
Crude fibre						
NDF	335	505	549	382	431	412
ADF	271	369				
ADL						
Calcium						
Phosphorous						
Digestible OM			441	588	596	574
Energy (MJ / kg DM)						
DE (MJ/kg DM)			8.01	10.8	10.0	10.7
ME (MJ/kg DM)			6.45[a]	8.59[a]	8.24[a]	8.66[a]
n	1	1	1	2	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Cussonia holstii*	*Dachystala brinipeus*	*Dalbergia malenoxylon*	*Ehretia cymosa*	*Ficus exesperata*
Common name	Samaa'	Msambia	Mpingo		
Description					
Component	Foliage	Foliage	Foliage	Foliage	Foliage
Country of origin[1]	Tz and Ke	Tz	Tz	Ke	Uganda
Dry Matter (g/kg)					
Concentration (g/kg DM)					
Ash	77.0	61.0	106	98.5	
Organic matter	923	939	894	902	
Crude protein	165	196	189	242	67.5
Crude fat			10.1		
Crude fibre					
NDF	480	405			
ADF	245	271			
ADL					
Calcium					
Phosphorous					
Digestible OM	515		355		
Energy (MJ / kg DM)					
DE (MJ/kg DM)	9.24		6.49		
ME (MJ/kg DM)	7.54[a]		5.10[a]		
n	2	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Ficus mucusu*	*Ficus thoningii*	*Grevillea robusta*	*Ilex mitis*	*Kigelia africana*	
Common name		Wild fig tree	Silver Oak	Bombax	Mahogany	
Description					Low CP	High CP
Component	Foliage	Leaves and twigs	Foliage	Foliage	Tender leaves & twigs	
Country of origin[1]	Ug	Tz and Ke	Tz and Ke	Tz	Tz	Tz
Dry Matter (g/kg)			420	459	375	197
Concentration (g/kg DM)						
Ash		98.8	46.7	72.0	103	99.4
Organic matter		901	953	928	897	901
Crude protein	81.3	134	91.4	128	138	197
Crude fat						
Crude fibre						
NDF			586	616	597	494
ADF			505	357	494	419
ADL						
Calcium			2.70c	1.10[c]		
Phosphorous			0.80c	3.40[c]		
Digestible OM		589	295	240	359	640
Energy (MJ / kg DM)						
DE (MJ/kg DM)		9.99	5.40	4.62	6.40	11.2
ME (MJ/kg DM)		8.24[a]	4.49[a]	3.75[a]	5.22[a]	9.11[a]
n	1	4	8	2	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Lannea schweinfurthii*	*Lannea stuhlmannii*	*Macaranga kilimandscharica*	*Maerua typhylla*
Common name	Camphor	Lerai (Northern Kenya)	Macaranga	
Description				
Component	Leaves	Foliage	Foliage	Foliage
Country of origin1	Tz	Tz	Tz	Tz
Dry Matter (g/kg)	345	360	383	480
Concentration (g/kg DM)				
Ash	164	70.8	45.9	
Organic matter	836	929	954	
Crude protein	113	141	140	212
Crude fat	45.7			
Crude fibre	265			
NDF	465	550	489	
ADF	398	574	391	
ADL				
Calcium			3.60[c]	
Phosphorous			1.80[c]	
Digestible OM	563	454	290	644
Energy (MJ / kg DM)				
DE (MJ/kg DM)	9.23	8.16	5.63	11.3
ME (MJ/kg DM)	7.87[a]	6.69[a]	4.57[a]	9.21[a]
n	6	4	2	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Mangifera indica*	*Mondia whitei*	*Morus alba*			*Parinari curatellifolia*
Common name	Mango		Mulberry			
Description						
Component	Foliage	Roots	Bark	Leaves	Shoots	Foliage
Country of origin[1]	Ke and Ug	Ke	Tz	Tz, Ke, Ug and Bd	Ug	Tz
Dry Matter (g/kg)				407	295	
Concentration (g/kg DM)						
Ash	57.6	91.7	68.3	121	113	32.8
Organic matter	942	908	932	879	887	967
Crude protein	95.0	82.0	89.0	181	202	81.9
Crude fat	27.0[c]	60.2				
Crude fibre		115				
NDF	396	388	472	378	412	
ADF	473	252	363	208	207	
ADL	44.0	62.5	71.0[c]	52.0		
Calcium	22.9[c]			8.50	14.3	
Phosphorous	1.40[c]			4.36	7.80	
Digestible OM	431		902	780		270
Energy (MJ / kg DM)						
DE (MJ/kg DM)	7.70		15.1	13.0		4.99
ME (MJ/kg DM)	6.46[a]		12.6[a]	10.6[a]		4.16[a]
n	2	4	8	20	4	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Persea americana*	*Phyllostachys aurea*	*Pinus aphremphous*	*Psidium guajava*	*Sapium ellipticum*
Common name	Avocado	Bamboo	Pine tree	Guava	
Description					
Component	Foliage	Bamboo leaves	Foliage	Foliage	Leaves and succulent twigs
Country of origin[1]	Tz and Ug	Tz	Ug	Tz	Ke
Dry Matter (g/kg)		464			
Concentration (g/kg DM)					
Ash	23.6	19.0		76.0	75.4
Organic matter	976	981		924	925
Crude protein	172	210	225	88.0	161
Crude fat	40.8	48.0		28.0	
Crude fibre		384		137	
NDF	557	726			307
ADF	355	353			
ADL					
Calcium	4.10		1.00		
Phosphorous	0.40		5.40		
Digestible OM		492			696
Energy (MJ / kg DM)					
DE (MJ/kg DM)		10.1			12.1
ME (MJ/kg DM)		8.41[a]			9.96[a]
n	3	1	1	1	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Senna siamea*	*Trichanthera gigantea*	*Acacia albida*	*Acacia ataxacantha*		*Acacia brevispica*
Common name			Apple-ring acacia	Flame thorn		
Description				Low CP	High CP	
Component	Foliage	Leaves and twigs	Foliage			Foliage
Country of origin[1]	Tz	Tz	Tz	Ke	Ke	Ke
Dry Matter (g/kg)						
Concentration (g/kg DM)						
Ash	41.4	213	55.0	79.3	58.4	
Organic matter	959	788	945	921	942	
Crude protein	84.7	189	231	178	396	200
Crude fat	8.60	29.0				
Crude fibre		130				
NDF	546	463	351	417	350	384
ADF	423	334	251			270
ADL	47.4					
Calcium						4.70[b]
Phosphorous						2.00[b]
Digestible OM			727	557	640	681
Energy (MJ / kg DM)						
DE (MJ/kg DM)			13.3	9.97	12.9	12.0
ME (MJ/kg DM)			10.8[a]	8.12[a]	10.1[a]	9.86[a]
n	1	2	5	1	1	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Acacia coriaria*	*Acacia elatior*	*Acacia mellifera*	*Acacia misera*	*Acacia nilotica*
Common name		River acacia	Black thorn, hook thorn		Scented Thorn
Description					
Component	Foliage	Foliage	Foliage	Foliage	Foliage
Country of origin[1]	Ke	Ke	Ke	Tz	Tz and Ke
Dry Matter (g/kg)				415	
Concentration (g/kg DM)					
Ash			62.0[c]	91.0	65.0
Organic matter			938	909	935
Crude protein	169	162	189	215	118
Crude fat					25.0[c]
Crude fibre					152[c]
NDF	482	503	331	245	243
ADF	373	355	249	150	198
ADL			77.0		108
Calcium			21.0[b]		28.0[e]
Phosphorous			2.00[b]		2.40[e]
Digestible OM	746	693	767		739
Energy (MJ / kg DM)					
DE (MJ/kg DM)	12.8	11.9	13.6		12.7
ME (MJ/kg DM)	10.6[a]	9.90[a]	11.1[a]		10.6[a]
n	1	1	2	2	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Acacia nubica*	*Acacia ongustissiama*	*Acacia reficiens*	*Acacia schweinfurthii*	*Acacia senegal*
Common name				River climbing acacia	Wattlebark
Description					
Component	Foliage	Foliage	Foliage	Foliage	Foliage
Country of origin[1]	Ke	Ke	Ke	Tz	Tz and Ke
Dry Matter (g/kg)			567		
Concentration (g/kg DM)					
Ash	88.0[c]		75.0	47.0	73.1
Organic matter	912		925	953	927
Crude protein	213	232	179	140	242
Crude fat	17.0[c]				
Crude fibre	158c				
NDF	154	464	402	466	461
ADF	114		262	303	289
ADL	51.0				125
Calcium	17.1[c]				39.4[e]
Phosphorous	4.40[c]	1.60[e]			1.90[e]
Digestible OM	871	500			677
Energy (MJ / kg DM)					
DE (MJ/kg DM)	15.0	9.39			12.4
ME (MJ/kg DM)	12.3[a]	7.61[a]			10.0[a]
n	1	2	1	1	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981),

[d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Acacia seyal*	*Acacia tortilis*	*Cajanus cajan*	*Calliandra calothyrsus*	*Calliandra colothyrsus*
Common name	White thorn	Umbrella Thorn	Pigeon pea	Calliandra, red calliandra	
Description				Young	Mature
Component	Tender leaves & twigs	Foliage		Leaves	
Country of origin[1]	Ke	Tz and Ke	Tz and Ke	Tz, Ke, Ug and Bd	Tz, Ke, Ug, Rw and Bd
Dry Matter (g/kg)	651	360	345	219	362
Concentration (g/kg DM)					
Ash	82.0	59.5	71.1	60.6	46.3
Organic matter	918	941	929	939	954
Crude protein	122	179	226	247	189
Crude fat			36.3	31.1	29.1
Crude fibre					562
NDF	224	280	511	427	494
ADF	164	256	337	239	377
ADL	89.0	110	119	80.5	24.7
Calcium		5.40[e]	8.90b	8.80	7.68
Phosphorous		3.00[e]	2.40[b]	7.00	1.54
Digestible OM	712	596	630	395	446
Energy (MJ / kg DM)					
DE (MJ/kg DM)	12.0	10.8	11.8	8.14	8.68
ME (MJ/kg DM)	9.98[a]	8.81[a]	9.68[a]	6.54[a]	7.10[a]
n	3	3	4	20	23

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981),

[d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Calliandra houstoniana*	*Calliandra juzepezukii*	*Commiphora africana*		*Commiphora trothae*
Common name	Powderpuff plant				
Description			Low CP	High CP	
Component	Foliage	Foliage	Foliage		Foliage
Country of origin[1]	Ke	Ke	Tz	Tz	Tz
Dry Matter (g/kg)	243				337
Concentration (g/kg DM)					
Ash	170		44.1	81.7	70.0
Organic matter	831		956	918	930
Crude protein	196	214	81.1	104	170
Crude fat	51.3		11.9		
Crude fibre					
NDF	501	455	627	606	386
ADF	275		466	526	280
ADL			82.8		
Calcium					
Phosphorous					
Digestible OM	410	270		234	740
Energy (MJ / kg DM)					
DE (MJ/kg DM)	7.60	5.69		4.33	12.9
ME (MJ/kg DM)	6.38[a]	4.55[a]		3.56[a]	10.6[a]
n	7	3	1	1	6

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Commiphora hornby*	*Commiphora zimmermanni*	*Delonix regia*	*Delonix elata*	*Dracaena afromontana*
Common name					
Description					
Component	Foliage	Leaves and twigs	Foliage	Foliage	Foliage
Country of origin[1]	Tz	Tz and Ke	Tz	Tz	Tz
Dry Matter (g/kg)		335		331	213
Concentration (g/kg DM)					
Ash	52.5	84.5		62.3	109
Organic matter	948	916		938	891
Crude protein	128	137	166	188	168
Crude fat					
Crude fibre					
NDF	339	447		329	537
ADF	247	406		259	370
ADL					
Calcium				12.0[d]	
Phosphorous				19.0[d]	
Digestible OM		388		735	399
Energy (MJ / kg DM)					
DE (MJ/kg DM)		6.97		13.1	7.18
ME (MJ/kg DM)		5.70[a]		10.7[a]	5.81[a]
n	1	4	1	15	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Eriobotrya japonica*	*Gliricidia sepium*		*Leucaena diversifolia*
Common name	Loquat	Gliricidia		Diversifolia
Description		Mature	Young	
Component	Foliage	Foliage		Foliage
Country of origin[1]	Tz	Tz, Ke, Ug, Rw and Bd	Tz, Ke, Ug and Bd	Ke, Rw and Bd
Dry Matter (g/kg)	434	249	245	356
Concentration (g/kg DM)				
Ash	77.6	97.3	91.8	62.3
Organic matter	922	903	908	938
Crude protein	100	197	238	232
Crude fat		29.0	41.7	36.0
Crude fibre		133	175	
NDF	512	471	472	475
ADF	409	287	306	257
ADL		113	121[e]	128
Calcium	2.50[d]	14.6	19.7	
Phosphorous	1.40[d]	2.36	6.20	
Digestible OM	302	651	566	392
Energy (MJ / kg DM)				
DE (MJ/kg DM)	5.41	11.5	10.7	8.06
ME (MJ/kg DM)	4.48[a]	9.47[a]	8.82[a]	6.55[a]
n	2	25	21	9

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Leucaena leucocephala*				*Leucaena pallid*	*Leucaena trichandra*
Common name			Leucaena			
Description	Low CP	High CP	Medium CP	High CP		Wet season
Component	Bark		Foliage		Foliage	Foliiage
Country of origin[1]	Tz	Tz	Tz, Ke, Ug and Bd	Tz, Ke and Ug	Rw	Ke
Dry Matter (g/kg)			329	256		
Concentration (g/kg DM)						
Ash		77.5	85.8	80.8	54.6	48.1
Organic matter		923	914	919	945	952
Crude protein	90.3	118	214	282	171	262
Crude fat		15.0	33.2	30.9		
Crude fibre		321	142	209		
NDF	540		439	439	624	431
ADF	384		305	247	356	316
ADL			140	167		
Calcium			11.4	4.68		
Phosphorous			2.38	2.41		
Digestible OM			546	577	371	360
Energy (MJ / kg DM)						
DE (MJ/kg DM)			10.2	11.1	7.11	7.56
ME (MJ/kg DM)			11.9	8.96[a]	5.75[a]	5.92[a]
n	1	1	40	28	2	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Millettia dura*	*Moringa oleifera*		*Piliostigma thonningii*	*Sesbania sesban*	*Sesbania gortei*
Common name	Milettia	Moringa			Sesbania	
Description						
Component	Foliage	Foliage	Stalks	Foliage	Foliage	Foliage
Country of origin[1]	Ke	Tz and Ug	Tz	Tz	Tz, Ke, Ug and Bd	Ug
Dry Matter (g/kg)		135			233	
Concentration (g/kg DM)						
Ash	61.6	131	98.4	75.9	70.0	87.0
Organic matter	938	869	902	924	930	913
Crude protein	273	252	93.2	153	225	222
Crude fat		45.2			21.0	
Crude fibre		253			129	
NDF		292	533	573	383	539
ADF		245	438	426	356	355
ADL					60.0	
Calcium		3.35			11.7	15.9
Phosphorous		2.25			4.70	2.10
Digestible OM		627		424	716	532
Energy (MJ / kg DM)						
DE (MJ/kg DM)		11.4		7.71	12.9	9.78
ME (MJ/kg DM)		9.39[a]		6.29[a]	10.5[a]	7.87[a]
n	1	12	2	1	15	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

Trees and Shrubs (Cont....)

Scientific name	Tamarindus indica		Trema orientalis	
Common name	Mkwaju			
Description	Young	Mature		
Component	Leaves		Leaves and succulent twigs	Foliage
Country of origin[1]	Tz	Tz	Ke	Tz and Ke
Dry Matter (g/kg)	335			389
Concentration (g/kg DM)				
Ash	81.8	94.2	115	109
Organic matter	918	906	885	891
Crude protein	120	73.3	284	180
Crude fat	36.6			45.3
Crude fibre	208			
NDF	496	505	339	557
ADF	359	160		506
ADL	210[d]			273[d]
Calcium	29.0[d]			1.70[d]
Phosphorous	4.00[d]			2.90[d]
Digestible OM	518		724	245[d]
Energy (MJ / kg DM)				
DE (MJ/kg DM)	9.22		12.9	5.30
ME (MJ/kg DM)	7.77[a]		10.3[a]	4.43[d]
n	5	5	4	3

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MA-FF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Abrus precatorius*	*Acalypha fruticosa*	*Achyranthes aspera*	*Aspilia mossambicensis*
Common name	Ombulu (Kenya)		Devil's horsewhip	Wild Sunflower, Aspilia
Description				Wet
Component	Foliage	Foliage	Leaves and succulent twigs	Leaves and twigs
Country of origin[1]	Tz	Ke	Ke	Ke
Dry Matter (g/kg)				
Concentration (g/kg DM)				
Ash	72.0	120	179	166
Organic matter	928	880	821	834
Crude protein	90.0	223	278	304
Crude fat				
Crude fibre				
NDF	470	348	401	315
ADF	306			
ADL				
Calcium				
Phosphorous				
Digestible OM		749		734
Energy (MJ / kg DM)				
DE (MJ/kg DM)		12.8		12.5
ME (MJ/kg DM)		10.4[a]		9.97[a]
n	1	1	2	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Blepharispermum zanguebaricum*		*Bridelia micrantha*	*Cadaba farinosa*	*Cadaba kirkii*	*Coffea cofeicola*
Common name			Bridelia			Coffee
Description	Medium CP	High CP				
Component	Foliage		Leaves and twigs	Foliage	Foliage	Leaves
Country of origin[1]	Tz	Tz	Ke	Tz	Tz	Burundi
Dry Matter (g/kg)	215	217	370	350	354	
Concentration (g/kg DM)						
Ash	158	130	64.8	228	214	78.4
Organic matter	842	870	935	772	786	922
Crude protein	182	263	168	193	162	170
Crude fat						
Crude fibre						
NDF	300	480	522	190	275	
ADF			455	110	321	
ADL						
Calcium				14.8[e]		
Phosphorous				1.80[e]		
Digestible OM	900	870	320	833	810	
Energy (MJ / kg DM)						
DE (MJ/kg DM)	14.2	14.7	6.21	12.3	12.0	
ME (MJ/kg DM)	11.6[a]	11.9[a]	4.00[a]	10.1[a]	9.87[a]	
n	1	1	6	4	3	13

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981),

[d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Combretum fragrans*	*Combretum molle*	*Combretum trophea*	*Combretum quenzi*	*Ehretia amoena*
Common name					Mkilika
Description					
Component	Tender leaves & twigs		Foliage	Leaves	Foliage
Country of origin[1]	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)	458	470		320	305
Concentration (g/kg DM)					
Ash	73.7	51.0	83.5	95.3	
Organic matter	926	949	917	905	
Crude protein	153	105	103	178	164
Crude fat					
Crude fibre					
NDF	556	507	541	340	
ADF	430	220	315	219	
ADL					
Calcium					
Phosphorous					
Digestible OM	324	358		713	709
Energy (MJ / kg DM)					
DE (MJ/kg DM)	6.13	6.50		12.3	12.0
ME (MJ/kg DM)	4.96[a]	5.38[a]		10.0[a]	9.90[a]
n	2	2	1	4	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Ehretia littoralis*	*Harrisonia abyssinica*	*Hoslundia opposita*	*Indigofera cliffordiana*
Common name				Indigofera
Description				
Component	Foliage	Foliage	Foliage	Foliage
Country of origin[1]	Tz	Tz	Tz	Ke
Dry Matter (g/kg)				
Concentration (g/kg DM)				
Ash	103	56.0	118	81.0
Organic matter	897	944	882	919
Crude protein	196	162	133	92.0
Crude fat				
Crude fibre		193		
NDF	259		281	496
ADF	179		169	329
ADL				
Calcium				
Phosphorous				
Digestible OM				
Energy (MJ / kg DM)				
DE (MJ/kg DM)				
ME (MJ/kg DM)				
n	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Indigofera lupatana*		*Indigofera spinosa*	*Opilia cordifolia*	*Rhus natalensis*	*Rhus natalensis*
Common name						
Description	Medium CP	High CP			Low CP	Medium CP
Component	Leaves and twigs		Leaves and twigs	Foliage	Leaves and succulent twigs	
Country of origin[1]	Ke	Ke	Ke	Tz	Ke	Ke
Dry Matter (g/kg)						
Concentration (g/kg DM)						
Ash	175	118	145	73.0	103	77.5
Organic matter	825	882	856	927	897	923
Crude protein	160	277	84.5	194	87.0	193
Crude fat						
Crude fibre			417	179		
NDF		349	624		508	529
ADF			514			
ADL			176			
Calcium						
Phosphorous						
Digestible OM	748	757			433	491
Energy (MJ / kg DM)						
DE (MJ/kg DM)	11.7	13.3			7.22	9.03
ME (MJ/kg DM)	9.58	10.7			6.02[a]	7.30[a]
n	1	1	2	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Tithonia diversifolia*	*Triumfetta rhomboidea*	*Triumfetta tomentosa*		*Vernonia lasiopus*	
Common name						
Description			Medium CP	High CP	Medium CP	High CP
Component	Leaves and t twigs	Leaves and twigs	Leaves and twigs		Leaves and twigs	
Country of origin[1]	Ke	Ke	Ke	Ke	Ke	Ke
Dry Matter (g/kg)						
Concentration (g/kg DM)						
Ash	142	82.5	93.3	110	115	129
Organic matter	858	918	907	890	885	871
Crude protein	276	179	152	263	190	241
Crude fat						
Crude fibre						
NDF	345	411	476	359	356	416
ADF						
ADL						
Calcium						
Phosphorous						
Digestible OM	717	655	593	695	702	713
Energy (MJ / kg DM)						
DE (MJ/kg DM)	12.4	11.5	10.2	12.3	11.9	12.2
ME (MJ/kg DM)	9.93[a]	9.40[a]	8.40[a]	9.93[a]	9.74[a]	9.90[a]
n	2	2	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Brachystegia spiciformis*		*Cassia abbreviata*	*Cassia singueana*		*Chamaecrista rutondifolia*
Common name	Msasa			Mhumba		Round leafed cassia
Description	Low CP	Medium CP		Medium CP	High CP	
Component	Foliage		Tender leaves & twigs	Tender leaves & twigs		Foliage
Country of origin[1]	Tz	Tz	Tz	Tz	Tz	Rw
Dry Matter (g/kg)			383	250	322	
Concentration (g/kg DM)						
Ash	60.4	46.0	94.0	84.9	116	76.2
Organic matter	940	954	906	915	884	924
Crude protein	80.6	125	146	176	239	126.1
Crude fat	30.5					
Crude fibre						
NDF	599	458	512	506	383	556
ADF	439	336	351	345	282	358
ADL	43.9					
Calcium						
Phosphorous						
Digestible OM			447	558	593	530
Energy (MJ / kg DM)						
DE (MJ/kg DM)			7.88	9.92	10.5	9.23
ME (MJ/kg DM)			6.45[a]	8.09[a]	8.48[a]	7.62[a]
n	1	1	1	1	1	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Cordia abyssinica*	*Cordia gharaf*	*Cordia holstii*	*Cordia monoica*	*Cordia oralis*	*Cordia sinensi*
Common name						
Description						
Component	Leaves	Foliage	Fresh-vegetative	Foliage	Foliage	Foliage
Country of origin[1]	Tz	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)		369	254	243		
Concentration (g/kg DM)						
Ash	201	205	108	120		148
Organic matter	799	795	892	880		853
Crude protein	83.4	205	222	178	118	201
Crude fat	50.5					
Crude fibre						
NDF	532	407	615			564
ADF	403		629			419
ADL						
Calcium		3.59[e]	4.60[d]	4.58		
Phosphorous		1.50[e]	2.70[d]	9.10		
Digestible OM	503	800	219	452		361
Energy (MJ / kg DM)						
DE (MJ/kg DM)	7.94	12.3	4.76	7.98		6.56
ME (MJ/kg DM)	6.89[a]	9.99[a]	3.66[a]	6.46[a]		5.22[a]
n	1	4	2	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Cratylia argentea*	*Croton polytrichus*	*Crotalaria goodiiformis*		*Crotalaria ochroleuca*		
Common name					Marejea		
Description			Dry	Wet	Young	Mature	8-16 Wks
Component	Foliage	Foliage	Leaves and twigs		Fresh-vegatative		Stems
Country of origin[1]	Rw	Tz	Ke	Ke	Tz	Tz	Tz
Dry Matter (g/kg)		319			185	249	254
Concentration (g/kg DM)							
Ash	146	83.0	93.3	73.1	69.8	55.5	57.2
Organic matter	854	917	907	927	930	945	943
Crude protein	179	240	192	349	314	159	61.8
Crude fat					53.6	19.3	18.0
Crude fibre					244	397	529
NDF	558	520	302	244			
ADF	299						
ADL							
Calcium							
Phosphorous							
Digestible OM	440	680	736	762			
Energy (MJ / kg DM)							
DE (MJ/kg DM)	7.60	12.3	12.7	14.4			
ME (MJ/kg DM)	6.14[a]	9.93[a]	10.4[a]	11.5[a]			
n	2	1	1	1	21	9	6

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Flemingia macrophylla*	*Grewia bicolor*	*Grewia dumicola*	*Grewia similis*	*Grewia tembensis*	
Common name		Mkone				
Description					Dry	Wet
Component	Foliage	Fresh vegetative		Fresh-vegetative	Fresh vegeatative	
Country of origin[1]	Rw	Tz	Tz	Tz	Ke	Ke
Dry Matter (g/kg)		474	434	364		
Concentration (g/kg DM)						
Ash	57.6	93.6	94.6	91.2	141	103
Organic matter	942	906	905	909	859	897
Crude protein	130	166	149	165	156	249
Crude fat						
Crude fibre						
NDF	714	429	560	348	311	385
ADF	390	261	342	215		
ADL		194e				
Calcium		16.0[e]				
Phosphorous		1.10[e]				
Digestible OM	272	630	575	702	633	694
Energy (MJ / kg DM)						
DE (MJ/kg DM)	5.22	10.9	9.91	12.1	10.4	12.3
ME (MJ/kg DM)	4.25[a]	8.93[a]	8.14[a]	9.90[a]	8.50[a]	9.95[a]
n	2	6	3	7	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Trees and Shrubs (Cont....)

Scientific name	*Grewia trichocarpa*		*Lantana camara*	*Sepium ellypticum*
Common name			Tick berry	
Description	Medium CP	High CP		
Component	Fresh vegeatative		Leaves and twigs	Foliage
Country of origin[1]	Ke	Ke	Tz and Ke	Ug
Dry Matter (g/kg)				
Concentration (g/kg DM)				
Ash			99.0	77.0
Organic matter			901	923
Crude protein	124	194	153	218
Crude fat			58.5	
Crude fibre				
NDF		506	335	376
ADF		352	246	509
ADL		133	76.0	55.0
Calcium				
Phosphorous				
DigestibleOM		491	511	605
Energy (MJ / kg DM)				
DE (MJ/kg DM)		8.55	9.53	11.0
ME (MJ/kg DM)		7.14[a]	8.15[a]	8.92[a]
n	1	1	5	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.2 Conserved forages

Scientific name	*Arthraxon quartinianus*	*Beckeropsis uniseta*	*Chloris gayana*	*Eicchornia crassipes*	
Common name			Rhodes grass	Water hyacinth	
Description				Low CP	High CP
Component	Silage	Silage	Silage	Silage	
Country of origin[1]	Ug	Ug	Tz	Tz	Ug
Dry Matter (g/kg)	230	400	285	140	
Concentration (g/kg DM)					
Ash			148	171	
Organic matter			852	829	
Crude protein	80.0	40.0	61.5	97.6	250
Crude fat			35	18.26	
Crude fibre	270	270	407		
NDF				676	
ADF				347	
ADL					
Calcium	2.80	2.70			
Phosphorous	2.40	2.00			
Digestible OM			540	485	
Energy (MJ / kg DM)					
DE (MJ/kg DM)			8.54	7.51	
ME (MJ/kg DM)			7.20	6.22[a]	
n	1	1	2	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.3 Conserved forages (Cont....)

Scientific name	*Gliricidia sepium*	*Leucaena leucocephala*	*Leucaena pallida*	*Medicago sativa*	*Moringa oleifera*
Common name	Gliricidia	Leucaena		Alfaalfa/ Lucerne	Moringa
Description					
Component	Leaf meal	Leaf meal	Dried leaf meal	Leaf meal	Leaf meal
Country of origin[1]	Tz	Tz	Tz	Tz and Ug	Tz
Dry Matter (g/kg)			934		
Concentration (g/kg DM)					
Ash	93.8	97.8		107	128
Organic matter	906	902		893	872
Crude protein	214	219	221	191	276
Crude fat		41.9		25.8	48.3
Crude fibre		159		242	
NDF	435	351	391		303
ADF	291	174	219		218
ADL		99.9			
Calcium		2.50[f]		2.00	
Phosphorous		2.20[f]		5.50	
Digestible OM	769	591			862
Energy (MJ / kg DM)					
DE (MJ/kg DM)	13.1	10.9			15.2
ME (MJ/kg DM)	7.53	9.03[a]			10.0
n	2	17	1	7	4

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.3 Conserved forages (Cont....)

Scientific name	Morus alba		Phaseolus atropurpureus	Trichanthera gigantea
Common name	Mulberry		Siratro bean	
Description	Medium CP	High CP		
Component	Leaf meal		Leaf meal	Leaf meal
Country of origin[1]	Tz	Tz	Tz	Tz
Dry Matter (g/kg)				
Concentration (g/kg DM)				
Ash	140	145		242
Organic matter	860	855		758
Crude protein	150	196	121	147
Crude fat	29.5	22.0		27.0
Crude fibre		130		276
NDF	230			
ADF	221			
ADL				
Calcium	1.15[f]			
Phosphorous	3.20[f]			
Digestible OM	870			
Energy (MJ / kg DM)				
DE (MJ/kg DM)	14.0			
ME (MJ/kg DM)	11.7[a]			
n	1	1	6	3

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.3 Conserved forages (Cont....)

Scientific name	*Manihot esculenta*	*Pennisetum purpureum*		*Sorghum bicolor*	
Common name	Cassava	Elephant/Napier grass		Sorghum	
Description		Low CP	High CP	Low CP	High CP
Component	Leaf silage	Silage		Silage	
Country of origin[1]	Tz	Tz and Ke	Tz and Bd	Ke	Ke
Dry Matter (g/kg)	208	227	187	289	375
Concentration (g/kg DM)					
Ash	82.5	79.0	118	52.1	91.0
Organic matter	918	921	882	948	909
Crude protein	300	53.5	113	58.3	89.2
Crude fat	61	21.0		32.0	18.1
Crude fibre	203	368		266	256
NDF		660	619	635	644
ADF		510	431	551	404
ADL		48.0	48.6	59.0	54.6
Calcium	15.2[f]				
Phosphorous	15.7[f]				
Digestible OM	703	471	450		427
Energy (MJ / kg DM)					
DE (MJ/kg DM)	13.7	7.81	7.55		7.21
ME (MJ/kg DM)	11.3[a]	6.59[a]	6.76		5.99[a]
n	2	4	5	5	3

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.3 Conserved forages (Cont....)

Scientific name	*Sorghum vulgare*	*Tripsacum laxum*		*Zea mays*
Common name	Sorghum	Guetamala grass		Maize
Description		Low CP	Medium CP	
Component	Silage	Silage		Silage
Country of origin[1]	Tz	Bd	Bd	Tz and Ke
Dry Matter (g/kg)		221	253	311
Concentration (g/kg DM)				
Ash	183	98.1	86.5	93.3
Organic matter	817	902	914	907
Crude protein	82.0	45.6	71.8	71.8
Crude fat	17.5	21.0	21.0	14.4
Crude fibre	314	427	408	277
NDF				647
ADF				368
ADL				36.1
Calcium				
Phosphorous				
Digestible OM				557
Energy (MJ / kg DM)				
DE (MJ/kg DM)				9.05
ME (MJ/kg DM)				7.54[a]
n	2	8	9	5

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.3 Conserved forages (Cont....)

Scientific name	*Acacia tortilis*	*Andropogon dummeri*	*Aristida adoensis*	*Aristida adscensionis*	*Avena sativa*
Common name	Umbrella Thorn				Oat
Description					
Component	Hay	Hay	Hay	Hay	Hay
Country of origin[1]	Ke	Ug	Ug	Ug	Ug
Dry Matter (g/kg)					
Concentration (g/kg DM)					
Ash	106				
Organic matter	894				
Crude protein	164	70.0	140	70.0	40.0
Crude fat					
Crude fibre		280	260	270	430
NDF	449				
ADF					
ADL					
Calcium		5.00	5.00	5.00	1.40
Phosphorous		3.00	3.00	2.50	1.00
Digestible OM			553	540	
Energy (MJ / kg DM)					
DE (MJ/kg DM)			9.46	8.81	
ME (MJ/kg DM)			7.78[a]	7.38[a]	
n	1	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.3 Conserved forages (Cont....)

Scientific name	*Brachiaria brizantha*	*Calliandra calothyrsus*		*Cenchrus ciliaris*	*Chloris gayana*	
Common name	Signal grass	Calliandra		Buffel/African foxtail	Rhodes grass	
Description		Whole plant	Leaves		Low CP	Medium CP
Component	Hay	Hay	Leaf (Hay)	Hay	Hay	
Country of origin[1]	Tz and Bd	Ke	Ke	Tz	Tz and Ke	Tz and Ke
Dry Matter (g/kg)					868	846
Concentration (g/kg DM)						
Ash	81.4	53.0	52.0		88.3	82.9
Organic matter	919	947	948		912	917
Crude protein	62.7	189	258	71.5	52.4	73.8
Crude fat	18.4	47.0			16.3	17.9
Crude fibre	343				363	371
NDF	748	308	263		785	745
ADF		215	274		484	473
ADL			120		83.0	57.0
Calcium						
Phosphorous						
Digestible OM	407			598	448	455
Energy (MJ / kg DM)						
DE (MJ/kg DM)	6.80			9.71	7.29	7.61
ME (MJ/kg DM)	5.70[a]			8.14[a]	6.92	6.92
n	9	1	1	2	31	16

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.3 Conserved forages (Cont....)

Scientific name	*Crotalaria ochroleuca*	*Cynodon plectostachyus*		*Hyparrhenia rufa*	*Ipomea batatas*
Common name	Marejea	Bermuda mejorado		Thatch grass	Sweet potato
Description		2ft 2nd cut	2ft 1st cut		
Component	Hay	Hay		Hay	Hay
Country of origin[1]	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)	842				864
Concentration (g/kg DM)					
Ash	86.7			98.0	47.9
Organic matter	913			902	952
Crude protein	285	73.0	92.0	20.0	101
Crude fat	21.2			24.2	16.1
Crude fibre	354			406	182
NDF					
ADF					
ADL					
Calcium					
Phosphorous					
Digestible OM		577	628		683
Energy (MJ / kg DM)					
DE (MJ/kg DM)		9.40	10.3		11.8
ME (MJ/kg DM)		7.88[a]	8.60[a]		9.78[a]
n	3	1	1	2	6

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.3 Conserved forages (Cont....)

Scientific name	*Manihot esculenta*	*Medicago sativa*	*Panicum maximum*		*Pennisetum purpureum*	
Common name	Cassava	Alfaalfa/Lucerne	Guenea grass		Elephant/Napier grass	
Description			Low CP	Medium CP		Before flowering
Component	Hay	Hay	Hay		Hay	Hay
Country of origin[1]	Tz	Tz and Ke	Tz	Ug	Ke	Tz
Dry Matter (g/kg)	880	854	828			
Concentration (g/kg DM)						
Ash	96.3	92.4		73.1	126	
Organic matter	904	908		927	874	
Crude protein	229	163	51.0	85.5	111	81.0
Crude fat	39.1	14.6		17.7		
Crude fibre	240	275		386		
NDF		622	786	944		
ADF		366	364		433	
ADL						
Calcium						
Phosphorous		2.90[e]				
Digestible OM	691	629				641
Energy (MJ / kg DM)						
DE (MJ/kg DM)	12.5	10.8				10.5
ME (MJ/kg DM)	10.3[a]	8.80[a]				8.74[a]
n	2	8	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.4 Crop residues

Scientific name	*Zea mays*						
Common name	Maize						
Description	622	H6302	H6303	H6304	H6305	H6307	Kilima
Component	Maize stover						
Country of origin[1]	Tz	Tz	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)							860
Concentration (g/kg DM)							
Ash		90.8	51.9	60.7			60.0
Organic matter		909	948	939			940
Crude protein	44.0	47.0	30.1	69.6	39.1	60.2	41.0
Crude fat							
Crude fibre							
NDF		670	724	587	725		
ADF							
ADL							
Calcium							
Phosphorous							
Digestible OM		493	447	613	466	418	
Energy (MJ / kg DM)							
DE (MJ/kg DM)		8.01	7.47	10.4	7.46	6.84	
ME (MJ/kg DM)		7.40	6.7	9.20		6.27	
n	1	1	1	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.4 Crop residues (Cont....)

Scientific name	*Zea mays*						
Common name	Maize						
Description	Local	Malawi	PH4	STAHA	Steep slope	Valley bottom	Wet
Component	Maize stover						
Country of origin[1]	Tz	Tz	Ke	Tz	Tz	Tz	Tz and Ke
Dry Matter (g/kg)	898	850		898			890
Concentration (g/kg DM)							
Ash		59.0		78.2	40.5	40.0	83.4
Organic matter		941		922	960	960	917
Crude protein	49.0	49.0	52.0	40.5	50.5	47.0	78.4
Crude fat							13.0
Crude fibre				320			318
NDF			481	792			784
ADF				464			431
ADL				44.0			61.3
Calcium							9.00
Phosphorous							6.90
Digestible OM				438	452	349	487
Energy (MJ / kg DM)							
DE (MJ/kg DM)				7.19	7.77	6.05	8.06
ME (MJ/kg DM)				6.09[a]	6.56[a]	5.12[a]	6.68[a]
n	1	1	1	2	2	3	12

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.4 Crop residues (Cont....)

Scientific name	*Zea mays*			*Sorghum vulgare*	
Common name	Maize			Sorghum	
Description	Laying down in the field	Stacking in the field	storing in a shed		Serena
Component	Stover	Stover	Stover	Stover	
Country of origin[1]	Tz	Tz	Tz	Tz, Ug and Bd	Tz and Bd
Dry Matter (g/kg)					
Concentration (g/kg DM)					
Ash	77.5	73.3	75.5	77.7	43.0
Organic matter	923	927	925	922	957
Crude protein	25.5	32.0	56.5	64.3	43.5
Crude fat				21.0	21.0
Crude fibre				311	423
NDF	763	711	685		
ADF	451	420	390		
ADL	71.1[e]				
Calcium					
Phosphorous					
Digestible OM	474	506	554	472	
Energy (MJ / kg DM)					
DE (MJ/kg DM)	7.35	7.94	8.84	7.91	
ME (MJ/kg DM)	6.08[a]	6.40	7.27[a]	6.65[a]	
n	2	3	2	6	5

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.4 Crop residues (Cont....)

Scientific name	*Eleucine corocana*	*Oriza sativa*		*Triticum aestivum*		
Common name	Finger millet	Rice		Wheat		
Description		Low CP	Medium CP	Low CP	Medium CP	High CP
Component	Straw	Straw		straw		
Country of origin[1]	Ke and Ug	Tzand Bd	Tz, Ke, Ug, Rw and Bd	Rw	Rw	Tz
Dry Matter (g/kg)		839	840			890
Concentration (g/kg DM)						
Ash		159	163		51.0	
Organic matter		841	837		949	
Crude protein	81.3	40.7	61.8	12.2	20.8	36.0
Crude fat		11.2	13.8		21.0	
Crude fibre		363	334		354	416
NDF	705	739	653			789
ADF	383	516	461			550
ADL	100	46.2				
Calcium				5.53	1.77	
Phosphorous				1.33	0.47	
Digestible OM	458	424	331			
Energy (MJ / kg DM)						
DE (MJ/kg DM)	7.59	5.04	6.23			
ME (MJ/kg DM)	6.34[a]	4.19[a]	5.21[a]			
n	3	8	19	4	4	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.4 Crop residues (Cont....)

Scientific name	*Arachis hypogaea*	*Glycine max*		*Phaseolus vulgaris*
Common name	Groundnuts	Soybean		Common bean
Description		Low CP	Medium CP	
Component	Straw	Straw		Straw
Country of origin[1]	Ug and Bd	Ug	Ug	Tz
Dry Matter (g/kg)	786			
Concentration (g/kg DM)				
Ash	242			84.7
Organic matter	758			915
Crude protein	202	32.0	60.0	68.3
Crude fat	21.0			15.0
Crude fibre	395	410		384
NDF	430			540
ADF	235			
ADL				
Calcium	5.80	2.00		
Phosphorous	3.80	1.00		
Digestible OM				593
Energy (MJ / kg DM)				
DE (MJ/kg DM)				9.70
ME (MJ/kg DM)				8.09[a]
n	11	1	1	7

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.5 Chemically treated crop residues and other crop residue

Scientific name	*Zea mays*	*Phaseolus vulgaris*	*Zea mays*	*Phaseolus vulgaris*		*Vigna unguiculata*
Common name	Maize	Common bean	Maize	Common bean		Cowpea
Description						
Component	Urea treated stover	Urea treated straw	Cobs	Chaff	Haulm	Haulm
Country of origin[1]	Tz	Tz	Tz, Ke and Ug	Tz	Tz and Ke	Tz
Dry Matter (g/kg)		578	870			
Concentration (g/kg DM)						
Ash	132	49.5	26.2	186	64.0	95.0
Organic matter	868	951	974	814	936	905
Crude protein	97.7	75.5	19.7	80.5	119	145
Crude fat	9.00	36.5				
Crude fibre	328	554	457	276		
NDF			705			
ADF			570			
ADL			116			
Calcium			0.50[d]			
Phosphorous			0.60[d]			
Digestible OM	682	653	462	588		
Energy (MJ / kg DM)						
DE (MJ/kg DM)	10.6	11.4	7.53	8.43		
ME (MJ/kg DM)	10.3	9.72[a]	6.25[a]	6.87[a]		
n	5	2	3	4	2	3

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.5 Chemically treated crop residues and other crop residue (Cont....)

Scientific name	*Musa acuminata*		*Musa sapiens*		*Musa spp.*			
Common name	Banana		Banana		Banana		Banana	
Description	Young	Mature	Young	Mature	Kipungura	Kisukari	Kitarasa	Mkonosi
Component	Pseudostem		Pseudostem		Corms		Corms	
Country of origin[1]	Ug	Ug	Ke	Ke	Tz	Tz	Tz	Tz
Dry Matter (g/kg)			102	108	228	141	182	239
Concentration (g/kg DM)								
Ash	203	128		178				
Organic matter	797	872		822				
Crude protein	50.0	34.0	138	67.0	42.0	47.0	46.0	33.0
Crude fat								
Crude fibre								
NDF		659		668				
ADF		355		342				
ADL		102		65.0				
Calcium								
Phosphorous								
Digestible OM		463						
Energy (MJ / kg DM)								
DE (MJ/kg DM)		6.83						
ME (MJ/kg DM)		5.63[a]						
n	1	1	1	1	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.5 Chemically treated crop residues and other crop residue (Cont....)

Scientific name	*Musa spp.*							
Common name	Banana							
Description	Mlali	Mnyenye-le	Uganda	Mshale	Embuiluma	Giant Cavendish	Kimalin-di	Kimalin-di kifupi
Component	Corms	Corms	Corms	Pseu-dostem	Pseudostem	Pseu-dostem	Pseudostem	
Country of origin[1]	Tz	Tz	Tz	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)	104		150	102				
Concentration (g/kg DM)								
Ash					212	253		335
Organic matter					788	747		665
Crude protein	38.0	32.0	42.0	41.0	76.3	51.2	42.0	47.9
Crude fat					15.7	7.40		13.2
Crude fibre					253	203		274
NDF					643	527		508
ADF					392	381		391
ADL								
Calcium								
Phosphorous								
Digestible OM					262	406		363
Energy (MJ / kg DM)								
DE (MJ/kg DM)					3.94	5.32		4.33
ME (MJ/kg DM)					3.25[a]	4.39[a]		3.62[a]
n	1	1	1	1	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.5 Chemically treated crop residues and other crop residue (Cont....)

Scientific name	Musa spp.					Musa acuminata		
Common name	Banana					Banana		
Description	Kitarasa	Mnanambo	Mnyenyele	Pazz	Robusta		Dry season	Rainy season
Component	Pseudostem					Leaves	Leaves and haulms	
Country of origin[1]	Tz	Tz	Tz	Tz	Tz	Ug	Ug	Ug
Dry Matter (g/kg)						209	187	170
Concentration (g/kg DM)								
Ash				223	187	108	155	
Organic matter				777	813	892	845	
Crude protein	42.0	46.0	49.0	71.6	76.6	103	85.0	179
Crude fat				8.70	11.4	23.0		
Crude fibre				219	264	279		
NDF				541	634	613	480	450
ADF				355	436	332	280	260
ADL						124		
Calcium						14.4	14.4	22.7
Phosphorous						6.60	6.60	3.80
Digestible OM				391	313	419		
Energy (MJ / kg DM)								
DE (MJ/kg DM)				5.48	4.70	7.13		
ME (MJ/kg DM)				4.50[a]	3.85[a]	5.93[a]		
n	1	1	1	1	1	4	2	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.5 Chemically treated crop residues and other crop residue (Cont....)

Scientific name	*Musa sapiens*	*Musa spp.*					
Common name	Banana	Banana					
Description		Embuiluma	Giant Cavendish	Kimalindi kifupi	Kisukari	Lacatan	Bukoba
Component	Leaves	Leaves					
Country of origin[1]	Ke	Tz	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)							
Concentration (g/kg DM)							
Ash	82.0	146	154	196	121	126	113
Organic matter	918	854	846	804	879	874	888
Crude protein	83.0	128	116	107	90.0	108	90.3
Crude fat		68.8	43.9	36.1	46.7	36.2	11.8
Crude fibre		290	305	255	365	303	357
NDF		738	734	755	770	716	757
ADF		443	503	499	517	508	515
ADL							
Calcium							
Phosphorous							
Digestible OM		233	125	238	137	174	488
Energy (MJ / kg DM)							
DE (MJ/kg DM)		5.00	2.91	4.21	3.04	3.53	7.89
ME (MJ/kg DM)		4.50[a]	2.55[a]	3.59[a]	2.74[a]	3.02[a]	6.50[a]
n	1	1	1	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.5 Chemically treated crop residues and other crop residue (Cont....)

Scientific name	*Musa spp.*				*Saccharum officinarum*	*Ipomea batatas*	
Common name	Banana				Sugar cane	Sweet potato	
Description	Uganda	Pazz	Robusta	Mshale		Tender vines	Mature vines
Component	Leaves				Sugarcane tops	Vines, tops	
Country of origin[1]	Tz	Tz	Tz	Tz	Tz and Ke	Tz, Ke, Ug and Bd	Tz, Ke, Ug and Bd
Dry Matter (g/kg)					198	172	317
Concentration (g/kg DM)							
Ash	152	152	141	99.4	132	101	90.3
Organic matter	848	848	859	901	868	899	910
Crude protein	103	125	123	142	71.3	171	122
Crude fat	64.0	36.9	42.1	65.3	17.0b	22.7	24.9
Crude fibre	299	277	275	305		162	187
NDF	772	710	785	734	726	371	424
ADF	501	512	512	479	405	301	327
ADL					370	67.1	72.5
Calcium					2.95		
Phosphorous					2.10		
Digestible OM	181	177	116	143	385	605	720
Energy (MJ / kg DM)							
DE (MJ/kg DM)	3.98	3.62	2.82	3.82	6.14	10.5	12.1
ME (MJ/kg DM)	3.65[a]	3.07[a]	2.44[a]	3.45[a]	5.15[a]	8.60[a]	10.1[a]
n	1	1	1	1	4	20	18

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.5 Chemically treated crop residues and other crop residue (Cont....)

Scientific name	*Ipomoea mombasa*	*Manihot esculenta*	*Manihot glaziovii*		
Common name		Cassava	Cassava-like tree		
Description	Wet		Mature	Young	
Component	Wet vines	Leaves	Leaf		Leaves and twigs
Country of origin[1]	Tz	Tz and Ke	Tz	Tz	Ke
Dry Matter (g/kg)	203	231			
Concentration (g/kg DM)					
Ash	93.0	81.6	66.5	57.8	81.1
Organic matter	907	918	934	942	919
Crude protein	147	248	147	195	294
Crude fat		52.7			
Crude fibre		125			
NDF	393	396	580	538	341
ADF		259	538	307	
ADL		89.0			
Calcium		1.80[e]			19.9[d]
Phosphorous		2.10[e]			5.90[d]
Digestible OM	788	610	436	453	701
Energy (MJ / kg DM)					
DE (MJ/kg DM)	12.9	11.8	7.62	8.27	12.7
ME (MJ/kg DM)	10.1	9.77[a]	6.04[a]	6.49[a]	9.96[a]
n	2	8	1	1	3

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.6 Kitchen wastes

Scientific name	*Musa acuminata*	*Musa spp.*	*Musa spp.*						
Common name	Banana		Banana						
Description		Igipaca	Igisami-ragisanwe	Igisub-ibe	Igitu-ri	Ikiy-ovu	Embuilu-ma	Giant Caven-dish	Kima-lindi (short)
Component	Peels		Peels						
Country of origin[1]	Ug	Bd	Bd	Bd	Bd	Bd	Tz	Tz	Tz
Dry Matter (g/kg)	217	371	374	283	185	200			
Concentration (g/kg DM)									
Ash		79.0	60.0	34.0	55.0	49.0	130	184	220
Organic matter		921	940	966	945	951	870	817	780
Crude protein	65.3	60.0	66.0	35.0	59.0	51.0	73.5	55.9	77.5
Crude fat	56.0	21.0	21.0	21.0	21.0	21.0	40.1	40.5	33.3
Crude fibre		72.0	57.0	52.0	56.0	57.0	102	103	149
NDF	317						491	566	430
ADF	179						209	264	274
ADL	142								
Calcium	2.26								
Phosphorous	2.13								
Digestible OM	505						545	450	529
Energy (MJ / kg DM)									
DE (MJ/kg DM)	8.81						8.94	7.00	7.81
ME (MJ/kg DM)	7.71a						7.66[a]	6.08[a]	6.65[a]
n	2	1	1	1	1	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.6 Kitchen wastes (Cont....)

Scientific name	Musa spp.							
Common name	Banana							
Description	Kisukari	Kisukari	Lacatan	Bukoba	Mshale	Uganda	Pazz	Robusta
Component	Peels							
Country of origin[1]	Tz	Tz	Tz	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)		270				225		
Concentration (g/kg DM)								
Ash	144		157	138	133	109	163	146
Organic matter	856		843	862	867	891	837	855
Crude protein	63.8	120	86.6	47.5	135	97.2	75.3	71.9
Crude fat	41.2		33.0	43.7	48.2	49.7	37.0	42.2
Crude fibre	99.0		116	92.9	155	120	122	101
NDF	583		584	543	500	423	428	529
ADF	262		260	269	351	204	296	291
ADL								
Calcium								
Phosphorous								
Digestible OM	406		479	396	384	147	477	457
Energy (MJ / kg DM)								
DE (MJ/kg DM)	6.71		7.71	6.54	7.03	3.32	7.61	7.52
ME (MJ/kg DM)	5.83[a]		6.54[a]	5.74[a]	5.99[a]	2.99[a]	6.52[a]	6.50[a]
n	1	1	1	1	1	2	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.6 Kitchen wastes (Cont....)

Scientific name	*Musa spp.*						
Common name	Banana						
Description	Kimalindi	Kipungura	Kitarasa	Mkonosi	Mlali	Mnanambo	Mnyenyele
Component	Peels						
Country of origin[1]	Tz	Tz	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)	218	198	224	222	210	196	218
Concentration (g/kg DM)							
Ash							
Organic matter							
Crude protein	128	106	145	108	136	137	126
Crude fat							
Crude fibre							
NDF							
ADF							
ADL							
Calcium							
Phosphorous							
Digestible OM							
Energy (MJ / kg DM)							
DE (MJ/kg DM)							
ME (MJ/kg DM)							
n	1	1	1	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.6 Kitchen wastes (Cont....)

Scientific name	*Cucurbita maxima*	*Lycopersicon esculentum*	*Solanum tuberosum*	*Ananas comosus*	
Common name	Pumpkin	Tomato	Irish Potato	Pineapple	
Description		Munispality	Munispality		
Component	Young leaves	Tomato skin	Irish potato peels	Fruits pulps	Fruits peels
Country of origin[1]	Tz	Tz	Tz	Ug	Ke
Dry Matter (g/kg)	295		212	100	
Concentration (g/kg DM)					
Ash	178	42.0	61.0		
Organic matter	822	958	939		
Crude protein	313	190	99.0	50.0	66.0
Crude fat	18.0	6.00	5.00		
Crude fibre	148	339	330		271
NDF					648
ADF					
ADL					
Calcium					
Phosphorous					
Digestible OM					
Energy (MJ / kg DM)					
DE (MJ/kg DM)					
ME (MJ/kg DM)					
n	1	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.7 Agro-industrial by products

Scientific name	*Anacardium occidentale*	*Cocos nucifera*	*Coffee arabica*	*Elaeis guineensis*	*Gossypium hirsutum*
Common name	Cashew nut	Coconut	Coffee	Palm oil	Cotton
Description					
Component	Testa	Husks	Husks	Fibre	Husks
Country of origin[1]	Tz	Tz	Tz	Tz	Tz and Ug
Dry Matter (g/kg)		916		939	922
Concentration (g/kg DM)					
Ash	17.5	92.0	67.0	45.9	31.3
Organic matter	983	908	933	954	969
Crude protein	132	73.0	83.2	56.1	69.0
Crude fat	167	300	20.0	232	36.8
Crude fibre	88.8	206	391	272	369
NDF					
ADF					
ADL					
Calcium					
Phosphorous					
Digestible OM					
Energy (MJ / kg DM)					
DE (MJ/kg DM)					
ME (MJ/kg DM)					
n	4	2	3	3	4

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.1.7 Agro-industrial by products (Cont....)

Scientific name	*Helianthus annuus*	*Oryza sativa*	*Phaseolus vulgaris*		*Theobrama cacao*	*Vigna radiata*
Common name	Sunflower	Rice	Common bean		Cocoa	Green gram
Description						
Component	Husks	Husks	Haulm	Husks	Husks	Husks
Country of origin[1]	Tz	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)	929	918		864	888	912
Concentration (g/kg DM)						
Ash	17.0	194	11.0	76.0	108	44.0
Organic matter	983	806	989	924	892	956
Crude protein	28.8	66.7	130	34.0	128	62.0
Crude fat	14.8	20.3			53.1	15.5
Crude fibre	634	280			286	415
NDF				609		
ADF						
ADL						
Calcium			11.5[c]			
Phosphorous			0.90[c]			
Digestible OM						
Energy (MJ / kg DM)						
DE (MJ/kg DM)						
ME (MJ/kg DM)						
n	5	2	1	1	2	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.2 Concentrates

4.2.1 Energy concentrates

Scientific name	*Avena sativa*	*Hordeum vulgare*	*Oryza sativa*	*Panicum milliacerum*	*Pennisetum glaucum*
Common name	Oats	Barley	Rice	Hog/white millet	Bullrush Millet
Description					
Component	Grain	Grain	Broken grains	Meal	Grain
Country of origin[1]	Tz	Tz, Ke and Bd	Tz	Tz	Tz
Dry Matter (g/kg)	917	883	811	893	895
Concentration (g/kg DM)					
Ash	39.5	34.3	85.1	19.3	
Organic matter	961	966	915	981	
Crude protein	127	121	98.2	107	86.0
Crude fat	33.0	32.7	45.7	51.8	45.0
Crude fibre	106	54.3	24.4	39.3	27.0
NDF		187[g]	369[e]		
ADF	179[e]	55.0[g]	121[e]		
ADL	102[e]		44.8[e]		
Calcium	1.80[e]	0.40[e]	6.20		
Phosphorous	4.10[e]	3.20e	4.80		
Digestible OM	670[g]	830[g]	664[e]		
Energy (MJ / kg DM)					
DE (MJ/kg DM)	12.1	14.8	11.5		
ME (MJ/kg DM)	9.2[g]	10.7[g]	9.81[a]		
n	3	4	5	6	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.2.1 Energy concentrates (Cont....)

Scientific name	*Sorghum bicolor*	*Sorghum vulgare*		*Triticum aestivum*		*Triticum aestivum x Secale cereale*
Common name		Sorghum		Wheat		Triticale
Description		Low CP	High CP	Low CP	High CP	
Component	Grain	Grain		Grain		Grains
Country of origin[1]	Ke and Ug	Tz	Tz and Bd	Tz and Bd	Tz, Ug, Rw and Bd	Tz
Dry Matter (g/kg)	907	877	880	891	890	891
Concentration (g/kg DM)						
Ash	21.4	23.3	21.9	13.0	43.3	16.3
Organic matter	979	977	978	987	957	984
Crude protein	104	91.0	132	118	169	124
Crude fat	29.0	26.9	36.1	16.5	45.9	14.3
Crude fibre	16.9	34.5	20.6	36.0	27.4	16.5
NDF	94.0[g]	127		292	370	
ADF	38.0[g]	32.0			110	
ADL	11.0[g]	10.0				
Calcium	0.73	3.60	3.55			
Phosphorous	3.49	3.50	5.30			
Digestible OM	880[g]	880[h]	860[h]			
Energy (MJ / kg DM)						
DE (MJ/kg DM)	15.7	15.5	15.6			
ME (MJ/kg DM)	11.7[g]	13.0	13.2[h]			
n	10	23	6	24	11	4

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.2.1 Energy concentrates (Cont....)

Scientific name	*Zea mays*			*Zea mays*				
Common name	Maize			Maize				
Description	Low CP	High CP		Sembe	White corn	Yellow corn		
Component	Crushed grain		Grains	Maize meal				Germ
Country of origin[1]	Tz	Tz	Tz, Ke, Ug and Bd	Tz	Tz	Tz	Tz, Ke and Rw	Ke
Dry Matter (g/kg)		879	887	897	883	883	887	917
Concentration (g/kg DM)								
Ash	10.0		19.9	17.0	16.0	12.0	18.6	39.0
Organic matter	990		980	983	984	988	981	961
Crude protein	135	185	103	99.5	91.5	101	96.6	109
Crude fat	38.2	52.0	41.2	17.2	25.5	24.4	50.1	160
Crude fibre	25.0	50.0	24.2	14.0	14.0	16.5	22.6	67.7
NDF			461				280	220
ADF			39.1					120
ADL			11.7					
Calcium			0.40				0.34[f]	
Phosphorous			2.10				4.84[f]	
Digestible OM			890[e]				793	
Energy (MJ / kg DM)								
DE (MJ/kg DM)							14.5	
ME (MJ/kg DM)							12.4[f]	
n	1	2	19	6	2	5	37	6

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.2.1 Energy concentrates (Cont....)

Scientific name	*Hordeum vulgare*	*Oryza sativa*				*Sorghum vulgare*	
Common name	Barley	Rice				Sorghum	
Description		Low CP	High CP	Low CP	High CP		
Component	Dust	Bran		Rice polishing		Bran	Grits
Country of origin[1]	Tz	Tz, Ke, Rw and Bd	Tzand Bd	Tz	Tz	Tz	Tz
Dry Matter (g/kg)	900	913	894	903	885	890	909
Concentration (g/kg DM)							
Ash	135	189	102	150	93.2	20.0	113
Organic matter	865	811	898	850	907	980	888
Crude protein	144	58.4	106	82.5	135	138	297
Crude fat	23.0	50.5	106	65.5	130	30.2	140
Crude fibre	185	233	128	240	78.5	27.4	70.7
NDF		625	369[e]			739[e]	
ADF		464	121[e]			222[e]	
ADL		44.8[e]	44.8[e]			64.0[e]	
Calcium		7.20		6.10	1.00[f]	3.90	12.6
Phosphorous		6.50		6.40	3.70[f]	6.70	9.40
Digestible OM		296					
Energy (MJ / kg DM)							
DE (MJ/kg DM)		4.96					
ME (MJ/kg DM)		4.45[e]	12.7	12.3	13.2		
n	2	16	11	19	24	6	5

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.2.1 Energy concentrates (Cont....)

Scientific name	*Triticum aestivum*				*Zea mays*			
Common name	Wheat				Maize			
Description		Low CP	Hgh CP				Yellow	
Component	Wheat bran	Wheat feed		Wheat pollard	Maize bran	Maize bran		Hominy meal
Country of origin[1]	Tz, Ke, Ug and Bd	Tz	Tz	Tz, Ke and Ug	Tz, Ke, Ug and Bdi	Tz	Tz	Tz
Dry Matter (g/kg)	890	887	887	889	889			885
Concentration (g/kg DM)								
Ash	55.4	55.0	41.1	43.9	41.6	43.0	50.6	52.0
Organic matter	945	945	959	956	958	957	949	948
Crude protein	160	100	154	164	114	121	148	125
Crude fat	37.2	23.0	24.3	48.3	92.4	124	115	97.3
Crude fibre	78.6	38.0	59.9	73.2	66.3	33.0	66.6	76.3
NDF	468				383			461
ADF	167		173		154			102
ADL	59.5		63.7		17.2			10.7
Calcium	13.0	1.00[d]		1.00[f]	3.08			1.40[g]
Phosphorous	6.30	3.00[d]		5.6[f]	6.95			7.70[g]
Digestible OM	582			735	716			795
Energy (MJ / kg DM)								
DE (MJ/kg DM)	10.8			13.6	13.7			15.0
ME (MJ/kg DM)	12.6			11.5[a]	12.7			12.6
n	86	15	13	43	211	2	1	27

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.2.1 Energy concentrates (Cont....)

Scientific name	*Saccharum officinalum*			*Cana edulis*	*Manihot esculenta*	
Common name	Sugarcane			Edible cana	Cassava	
Description	Low CP	Medium CP	High CP		Low CP	High CP
Component	Cane molasses			Rhizomes	Cassava root meal	
Country of origin[1]	Ug and Bd	Tz, Ke, Ug and Rw	Tz and Ke	Bd	Tz	Tz
Dry Matter (g/kg)	713	725	900	236	882	894
Concentration (g/kg DM)						
Ash	98.0	112		59.0	39.4	39.5
Organic matter	902	888		941	961	960
Crude protein	27.3	40.7	83.1	42.0	28.7	41.7
Crude fat	21.5	29.0		11.5	5.33	13.9
Crude fibre				54.0	36.8	25.8
NDF					504	544
ADF						92.8
ADL					22.6[d]	22.6[d]
Calcium		4.90	1.49		3.40[f]	
Phosphorous		0.10	0.50		8.30[f]	
Digestible OM		800[g]			717	920
Energy (MJ / kg DM)						
DE (MJ/kg DM)		12.6			11.8	15.4
ME (MJ/kg DM)	8.83	10.7[a]			11.3	13.1
n	9	4	2	2	13	10

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981),

[d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.2.1 Energy concentrates (Cont....)

Scientific name	*Manihot utilissima*		*Musa spp.*				
Common name			Banana				
Description			Kiguruwe malindi	Kitarasa	Mshale Mchonoa	Mshale Mnyenyere	Mrarao
Component	Dried tubers	Fermented	Dried				
Country of origin[1]	Bd	Bd	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)	881	864					
Concentration (g/kg DM)							
Ash	31.4	50.0					
Organic matter	969	950					
Crude protein	13.4	131	45.0	58.0	50.0	58.0	52.0
Crude fat	4.67	88.0	6.00	3.00	2.00	3.00	4.00
Crude fibre	24.1	37.3					
NDF							
ADF							
ADL							
Calcium							
Phosphorous							
Digestible OM							
Energy (MJ / kg DM)							
DE (MJ/kg DM)							
ME (MJ/kg DM)							
n	12	4	1	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MA-FF (1986).

4.2.1 Energy concentrates (Cont....)

Scientific name	*Musa spp.*				
Common name	Banana				
Description	Mririo mnanambo	Ndishi	Ndishi ng'ombe	Uganda-matoke	Nkonosi
Component	Dried				
Country of origin[1]	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)					
Concentration (g/kg DM)					
Ash					
Organic matter					
Crude protein	59.0	54.0	49.0	63.0	45.0
Crude fat	3.00	2.00	7.00	3.00	6.00
Crude fibre					
NDF					
ADF					
ADL					
Calcium					
Phosphorous					
Digestible OM					
Energy (MJ / kg DM)					
DE (MJ/kg DM)					
ME (MJ/kg DM)					
n	1	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.2.2 Protein concentrates

Scientific name	*Sardonella longiceps*			*Ratrineobola argentea*	*Lates niloticus*		*Haplochromis pyrrhoephalus*
Common name	Sardine (Dagaa)			Omena/ Dagaa Mukene	Nile perch		Furu
Description	Processed	Low CP	High CP		Low CP	High CP	
Component	Fish meal			Fish meal	Fish meal		Fish meal
Country of origin[1]	Tz	Tz	Tz	Ke	Tz	Tz	Tz, Ke, Rw and Bd
Dry Matter (g/ kg)	908	912	906	907	906	929	908
Concentration (g/kg DM							
Ash	155	301	182	140			257
Organic matter	846	699	818	861			743
Crude protein	584	527	652	567	389	634	521
Crude fat	101	84.1	87.2	126	184	88.0	93.1
Crude fibre		28.0	27.4				
NDF							
ADF							
ADL							
Calcium		18.4	44.0[f]				
Phosphorous		16.5	19.1[f]				
Digestible OM							
Energy (MJ / kg DM)							
DE (MJ/kg DM)							
ME (MJ/kg DM)		11.8	11.6				
n	8	909	456	3	4	3	62

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.2.2 Protein concentrates (Cont....)

Common name	*Meat*	*Blood*		*Longhorned grasshoppers "Senene"*	
Description			Fermented 14 days		
Component	Meat meal	Blood meal		Non-edible part	Unprocessed edible part
Country of origin[1]	Tz	Tz, Ke and Rw	Ke	Tz	Tz
Dry Matter (g/kg)	915	885	295		
Concentration (g/kg DM)					
Ash	95.3	84.4	28.0[g]	24.9	36.2
Organic matter	905	916	972	975	964
Crude protein	627	775	528	700	639
Crude fat	150	30.7	20.0[g]	64.1	193
Crude fibre					
NDF					
ADF					
ADL					
Calcium		11.0[d]	1.60[g]		
Phosphorous		2.00[d]	2.10[g]		
Digestible OM					
Energy (MJ / kg DM)					
DE (MJ/kg DM)					
ME (MJ/kg DM)					
n	25	47	4	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.2.2 Protein concentrates (Cont....)

Scientific name	*Acacia albida*		*Acacia tortilis*			*Anacardium occidentale*	*Cajanus cajan*
Common name	Apple-ring acacia		Umbrella			Cashew nut	Pigeon pea
Description							
Component	Pods	Seeds	Pods	Pod+seeds	Ground pods	Crushed cashew nut	Seed meal
Country of origin[1]	Tz	Tz	Tz	Tz and Ke	Tz	Tz	Tz
Dry Matter (g/kg)			894	911	910		889
Concentration (g/kg DM)							
Ash		34.0	54.5	47.7	51.3	26.6	49.7
Organic matter		966	946	952	949	973	950
Crude protein	127	263	144	233	156	205	216
Crude fat			19.9	10.0	17.2	437	26.4
Crude fibre			209	208	202	33.5	63.5
NDF	362	171	357	323			
ADF	288	104	266	244			
ADL							
Calcium							
Phosphorous							
Digestible OM				691			
Energy (MJ / kg DM)							
DE (MJ/kg DM)				9.25			
ME (MJ/kg DM)			11.0	7.33[a]			
n	2	2	15	3	6	11	5

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.2.2 Protein concentrates (Cont....)

Scientific name	Cicer arientenum		Citrullus vulgaris	Elaeis guineensis	Glycine max		
Common name	Chick pea(Dengu)		Water melon	Palm oil	Soybean		
Description							
Component	Wastes/meal	Meal	seeds	Kernel	Toasted	Meal	Grains
Country of origin[1]	Tz	Tz	Tz	Tz	Tz	Tz, Ke and Bd	Tz, Ug and Bd
Dry Matter (g/kg)	901	890			878	897	902
Concentration (g/kg DM)							
Ash		30.0[g]		28.3	52.0[g]	60.3	48.1
Organic matter		970		972	948	940	952
Crude protein	185	440	166	94.5	495	434	399
Crude fat	22.0	8.00		434	192[g]	139	203
Crude fibre	289	63.0		60.1	56.0[g]	69.2	68.3
NDF		93.0[g]			117[g]	141	248[g]
ADF		37.0[g]			69.0[g]	93	165[g]
ADL		2.00[g]			12.0[g]	168[e]	55.0[g]
Calcium		1.10[g]			3.20[g]	2.30[d]	2.50
Phosphorous		3.60[g]			5.30[g]	6.30[d]	5.80
Digestible OM		930[g]			880[g]	920[a]	750[i]
Energy (MJ / kg DM)							
DE (MJ/kg DM)							
ME (MJ/kg DM)							14.9[i]
n	1	1	2	3	4	5	26

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.2.2 Protein concentrates (Cont....)

Scientific name	*Gossypium gossypii*	*Gossypium hirsutum*		*Helianthus annuus*	*Phaseolus vulgaris*	*Ricinus communis*
Common name				Sunflower	Common beans	Castor oil
Description						
Component	Seeds	Seed meal	Seeds	Seeds	Rejected	Seeds
Country of origin[1]	Bd	Tz	Tz	Tz	Tz, Ke, Ug, Rw and Bd	Bd
Dry Matter (g/kg)	898	929	902	937	894	951
Concentration (g/kg DM)						
Ash	39.3	56.3	60.8	21.4	44.0	26.5
Organic matter	961	944	939	979	956	974
Crude protein	226	303	370	169	231	179
Crude fat	217	168	62.1	327	16.6	553
Crude fibre	53.0	212	143	346	58.0	81.5
NDF	318[g]					
ADF	222[g]				262	
ADL						
Calcium	2.50[g]	2.40[g]	4.10[i]		6.22	
Phosphorous	11.7[g]	11.4[g]	13.3[i]		2.44	
DigestibleOM	780[g]	690[g]	670[i]			
Energy (MJ / kg DM)						
DE (MJ/kg DM)						
ME (MJ/kg DM)			10.4[i]		13.4[a]	
n	4	4	6	4	13	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.2.2 Protein concentrates (Cont....)

Scientific name	*Vigna radiata*	*Vigna subterranea*	*Vigna unguiculata*	*Voandzeia subterranea*
Common name	Green gram	Bambara nuts	Cowpea	
Description				
Component	Seeds	Nuts	Seeds	Seeds
Country of origin[1]	Tz	Tz	Tz	Tz
Dry Matter (g/kg)	901	906	886	921
Concentration (g/kg DM)				
Ash	72.5	20.0	43.7	37.5
Organic matter	928	980	956	963
Crude protein	160	242	254	176
Crude fat	25.0	78.0	20.0	61.5
Crude fibre	234	37.5	56.4	79.5
NDF				
ADF				
ADL				
Calcium			2.70[d]	
Phosphorous			4.20[d]	
Digestible OM				
Energy (MJ / kg DM)				
DE (MJ/kg DM)				
ME (MJ/kg DM)				
n	8	2	13	3

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.2.2 Protein concentrates (Cont....)

Scientific name	*Anacardium occidentale*		*Arachis hypogaea*		*Ceiba pentandra*	*Chrysanthemum cinerariijolium*
Common name	Cashew nut		Groundnut		Kapok	Pyrethrum
Description	Low CP	High CP	Low CP	High CP		
Component	Seed cake		Seed cake		Seed cake	Cakes
Country of origin[1]	Tz	Tz	Tz, Rw and Bd	Tz and Bd	Tz	Rw
Dry Matter (g/kg)		919		905	903	819
Concentration (g/kg DM)						
Ash		41.3	25.1	47.8	77.6	243
Organic matter		959	975	952	922	757
Crude protein	190	250	293	465	310	232
Crude fat		72.3	368	82.0	60.6	
Crude fibre		157		44.4	211	364
NDF			201[g]	143[g]		
ADF			140[g]	86.0[g]		
ADL			46.0[g]	25.0[g]		
Calcium	4.90[d]	4.90d	1.90[g]	2.00[g]	3.00[d]	17.8
Phosphorous	8.20[d]	8.20[d]	5.60[g]	5.60[g]	10.0[d]	8.40
Digestible OM			820[g]	830[g]		
Energy (MJ / kg DM)						
DE (MJ/kg DM)						
ME (MJ/kg DM)			10.9[g]	11.6[g]		
n	27	12	9	42	15	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.2.2 Protein concentrates (Cont....)

Scientific name	*Cocos nucifera*	*Elaeis guineensis*	*Glycine max*	*Gossypium hirsutum*		
Common name	Coconut	Palm oil	Soybean	Cotton		Noug
Description				Low CP	High CP	
Component	Seed cake	Seed cake	Seed cake	Seed cake		Noug cake
Country of origin[1]	Tz and Ke	Tz and Bd	Tz and Rw	Tz, Ke and Bd	Tz, Ke, Ug and Bd	Bd
Dry Matter (g/kg)	890	912	914	915	910	747
Concentration (g/kg DM)						
Ash	61.6	37.3	62.5	60.4	65.0	
Organic matter	938	963	937	940	935	
Crude protein	209	152	456	298	395	353
Crude fat	121	174	56.0	81.5	80.1	21.0
Crude fibre	105	178	51.0	170	133	166
NDF				446	365	
ADF	267	426		281	250	
ADL				73.0	76.4	
Calcium	1.20[i]	0.47	2.30[i]	2.28	3.20[i]	
Phosphorous	6.10[i]	5.44	9.70[i]	6.60	14.7[i]	
Digestible OM	750i	448	790i	548	736	
Energy (MJ / kg DM)						
DE (MJ/kg DM)		10.9	16.3	11.8	15.4	
ME (MJ/kg DM)	13.0[i]	10.3[a]	13.3[i]	10.6	12.1	
n	43	27	62	201	209	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.2.2 Protein concentrates (Cont....)

Scientific name	*Helianthus annuus*				*Ricinus communis*	*Sesamum indicum*
Common name	Sunflower				Castor	Sesame/ Simsim
Description	Low CP	Medium CP		High CP		
Component	Seed cake	Seed cake	Decorticated	Seed cake	Oil cake	Seed cake
Country of origin[1]	Tz	Tz, Ke and Bd	Tz	Tz, Ke, Rw and Bd	Tz	Tz and Ke
Dry Matter (g/kg)	918	918	931	915	933	920
Concentration (g/kg DM)						
Ash	52.8	65.9	58.0	71.2	58.0	111
Organic matter	947	934	942	929	942	889
Crude protein	249	357	311	486	275	377
Crude fat	69.7	55.1	49.0	57.9	102	116
Crude fibre	295	210	238	182	245	77.3
NDF	509	438		386[d]		174[e]
ADF	271	307		295[d]		102[e]
ADL	103					34.0[e]
Calcium	15.4	1.70[d]		4.10[i]		18.3[e]
Phosphorous	13.0	7.70[d]		13.3[i]		8.20[e]
Digestible OM	549	639		670[i]		792[e]
Energy (MJ / kg DM)						
DE (MJ/kg DM)	11.4	13.1		14.5		16.1
ME (MJ/kg DM)	11.2	12.0		11.0		13.7[a]
n	254	241	2	6	2	201

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.2.2 Protein concentrates (Cont....)

Scientific name	*Gossypium hirsutum*		*Helianthus annuus*	*Glycine max*	*Sesamum indicum*	*Gossypium hirsutum*
Common name	Cotton		Sunflower	Soybean	Sesame/ Simsim	Cotton
Description	Decorticated	Undecorticated	Undecorticated	Unheated expelle	Epeller method Defatted	
Component	Seed cake		Seed cake		Seed cake	
Country of origin[1]	Tz	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)	878	931	878	905	913	949
Concentration (g/kg DM)						
Ash	66.4	68.8	49.4[f]	60.3	153	62.1
Organic matter	934	931	951	940	847	938
Crude protein	420	233	312	482	352	347
Crude fat	84.4	69.3	123[f]	96.3	77.3	
Crude fibre	132	278	432[f]	61.5	75.9	237
NDF	248[g]	468			174[e]	403[d]
ADF	165[g]	378			102[e]	329[d]
ADL	55.0[g]	98.7			34.0[e]	99.0[d]
Calcium	2.50[g]		2.40[f]		18.3[e]	3.10[d]
Phosphorous	11.7[g]		8.80[f]		8.20[e]	9.90[d]
Digestible OM	780[g]	733				690[g]
Energy (MJ / kg DM)						
DE (MJ/kg DM)		14.1				
ME (MJ/kg DM)	8.91[c]	11.9[a]				
n	9	2	3	3	2	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.3 By-products of brewing industry

Scientific Name					
Common name	Brewers' grain	Brewers' grain	Breweries waste		Brewers' residue
Description			Low CP	High CP	
Component					
Country of origin[1]	Tz	Tz	Tz, Ug and Bd	Tz and Bd	Tz
Dry Matter (g/kg)				243	
Concentration (g/kg DM)					
Ash	62.0	179	47.4	48.7	35.7
Organic matter	938	822	953	951	964
Crude protein	532	255	188	273	212
Crude fat	6.00	57.0	60.4	106	4.20
Crude fibre	22.5	71.7	161	157	154
NDF			560	485	
ADF			258	280	
ADL					
Calcium				3.19	
Phosphorous				5.33	
Digestible OM	610g		327	612	
Energy (MJ / kg DM)					
DE (MJ/kg DM)			7.19	13.2	
ME (MJ/kg DM)			6.13[a]	11.3[a]	
n	2	3	11	6	3

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4. 3 By-products of brewing industry (Cont....)

Scientific Name				*Triticum aestivum*		
Common name	Chibuku waste	Chibuku residue	Spent brewers grain		Brewers yeast	Malt culms
Description						
Component	Pombe residue	Malted + lactic acid	Spent brewers grain	Brwers Grains	Yeast	Malt culms
Country of origin[1]	Tz	Tz	Ke	Ke	Tz, Ke and Ug	Tz
Dry Matter (g/kg)			262	225		916
Ash	89.5	23.0	53.0		80.4	69.0
Organic matter	911	977	947		920	931
Crude protein	245	225	259	290	450	236
Crude fat	60.3	103	64.0	68.0	6.00	19.0
Crude fibre	159	124	150			147
NDF			673	602	8.80[e]	463
ADF			262	241	11.2[e]	163
ADL				86.4[h]	2.00[e]	10.7
Calcium				3.50[h]	2.70	2.70[h]
Phosphorous				5.10[h]	6.00	7.40[h]
Digestible OM				600[h]	905	
Energy (MJ / kg DM)						
DE (MJ/kg DM)					17.0	
ME (MJ/kg DM)					13.3[a]	12.3[c]
n	3	2	5	2	4	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.4 Non-conventional compounds and feeds received special treatments

Scientific/ Chemical Name				*Sodium bicarbonate*	*Cajanus cajan*	
Common name	Poultry waste			Magadi	Pigeon pea	
Description	Broilers	Layers			Sprouted	Soaked, germination & sun dried
Component	Wastes				Seed	Seed
Country of origin[1]	Ke	Ke	Tz and Ke	Tz	Tz	Tz
Dry Matter (g/ kg)		157		987	914	
Concentration (g/kg DM)						
Ash	157	276	352	797	46.1	43.9
Organic matter	843	724	648	203	954	956
Crude protein	158	121	159		205	225
Crude fat	20.0				16.6	20.3
Crude fibre	245		211		91.5	10.0
NDF	592	597	568			
ADF		301	383			
ADL		52.0	77.0			
Calcium						
Phosphorous						
Digestible OM			564			
Energy (MJ / kg DM)						
DE (MJ/kg DM)			7.30			
ME (MJ/kg DM)			5.93[a]			
n	5	5	9	6	4	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4.4 Non-conventional compounds and feeds received special treatments (Cont....)

Scientific name	*Cajanus cajan*				*Sorghum vulgare*		*Zea mays*	
Common name	Pigeon pea				Sorghum		Maize	
Description	Soaked , boiled & sun dried	Soaked & sun dried	Dry heat roasting	Direct boiling & sun dried	Soaked in water	Soaked in sodium bicarbonate	NaOH 5%	NaOH
Component	Seed				Seed		Cobs	
Country of origin[1]	Tz	Tz	Tz	Tz	Tz	Tz	Tz	Tz
Dry Matter (g/kg)	881	926		930				881
Concentration (g/kg DM)								
Ash	35.5	44.5	53.4	38.3	23.1	43.2	83.0	53.0
Organic matter	965	956	947	962	977	957	917	947
Crude protein	200	209	213	209	110	116	149	190
Crude fat	23.3	17.9	20.0	19.5	24.8	23.3	35.0	
Crude fibre	10.0	10.0	10.0	10.0	89.0	53.5	345	
NDF								
ADF								
ADL								
Calcium								
Phosphorous								
Digestible OM								513
Energy (MJ / kg DM)								
DE (MJ/kg DM)								9.58
ME (MJ/kg DM)								7.77[a]
n	1	1	1	1	1	1	1	1

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4. 5 Minerals

Chemical Name			*Calcium Carbonate*	*Calcium oxide*	*Calcium phosphate*	
Common name	Bone meal		Limestone	Lime		Cattle lick
Description	Low Ash	High Ash				
Component	Bone meal		Meal	Meal	Meal	Meal
Country of origin[1]	Tz and Bd	Tz and Bd	Tz and Bd	Tz	Tz	Tz
Dry Matter (g/kg)	926	960	980	983	973	950
Concentration (g/kg DM)						
Ash	599	842	864	900	823	811
Organic matter	401	158				
Crude protein	259	189				
Crude fat	70.8	55.4				
Crude fibre						
NDF						
ADF						
ADL						
Calcium	272[f]	265f	23.2[e]			
Phosphorous	116[f]	93.0f	0.10[e]			
Digestible OM						
Energy (MJ / kg DM)						
DE (MJ/kg DM)						
ME (MJ/kg DM)						
n	75	50	675	17	4	2

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

4. 5 Minerals (Cont….)

Scientific/chemical Name		*Dicalcium phosphate*		*Sodium chloride*			
Common name	Coral lime	Dicalcium phosphate	Lake salt	Common salt	Egg shells	Oyster shells	Salted soil (Igitumba)
Description							
Component	Meal	Meal	Meal				
Country of origin[1]	Tz	Tz	Tz	Tz	Tz	Tz	Bd
Dry Matter (g/kg)	979	972	982	989	993	994	942
Concentration (g/kg DM)							
Ash	962	833	984	946	690	623	904
Organic matter					310		96.0
Crude protein					54.4[e]		1.90[e]
Crude fat					29.0[e]		
Crude fibre							
NDF							
ADF							
ADL							
Calcium		229[f]			322e	229[f]	12.1[e]
Phosphorous		141[f]			1.70e	50.0[f]	0.30[e]
Digestible OM							
Energy (MJ / kg DM)							
DE (MJ/kg DM)							
ME (MJ/kg DM)							
n	6	13	2	8	3	7	4

[1]Country of origin: Bd = Burundi, Ke = Kenya, Rw = Rwanda, Tz = Tanzania and Ug = Uganda

[a] Calculated ME (NorFor, 2011; Van Es, 1979) and borrowed values from [b]FAO (2011), [c]Bo Göhl (1981), [d]Doto et al.(2004), [e]SSA (2011), [f]Laswai et al. (2002),[g]Sauvant et al. (2004), [h]Givens et al. (1990), [i]MAFF (1986).

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