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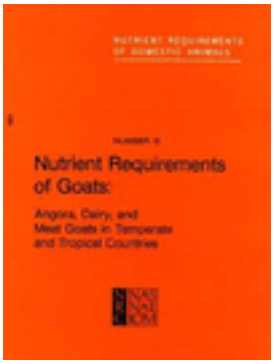

Nutrient Requirements of Goats: Angora, Dairy, and Meat Goats in Temperate and Tropical Countries

Committee on Animal Nutrition, National Research Council

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Number 15
Nutrient Requirements of Domestic Animals

Subcommittee on Goat Nutrition
Committee on Animal Nutrition
Board on Agriculture and Renewable Resources
Commission on Natural Resources
National Research Council

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This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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Preface

This report is one of a series issued under the direction of the Committee on Animal Nutrition, Board on Agriculture and Renewable Resources, National Research Council (NRC). It was prepared by the Subcommittee on Goat Nutrition. Its use may be enhanced by referring also to three other reports in the series on Nutrient Requirements of Domestic Animals: Number 3, *Nutrient Requirements of Dairy Cattle* , fifth revised edition, 1978; Number 5, *Nutrient Requirements of Sheep*, fifth revised edition, 1975; and Number 6, *Nutrient Requirements of Horses*, fourth revised edition, 1978.

The first two parts of Chapter 1, on energy and protein requirements, contain much new information from extensive research at the Raja Balwant Singh College at Bichpuri (Agra), India, under support from USDA PL-480 funding for dairy and meat goats; and from research at the Texas A&M Agricultural Experiment Station at San Angelo for Angora goats. The final three parts of Chapter 1, on mineral, vitamin, and water requirements, and Chapter 5 on nutrition-related metabolic disorders have had to rely mostly on reviewing past work. Chapter 3 on herbage and browse utilization includes new work from Texas. Chapter 4 on ration formulation and examples of typical rations, and Chapter 2 with tables of nutrient requirements, involve extensive, previously unpublished data resources and worldwide experiences of each subcommittee member. Because of the unique nature of goats, the nutrient requirement tables also include allowances for activities during grazing. The feed composition tables also contain new data from research by the subcommittee members and significant contributions by the International Feedstuffs Institute at Utah State University. The inclusion of an extensive number of references in the bibliography was considered desirable for the benefit of future studies, although not all were cited directly in the text.

The subcommittee is indebted to Philip Ross and Selma P. Baron of the Board on Agriculture and Renewable Resources for their assistance in the production of this report and to the members of the Committee on Animal Nutrition for their valuable suggestions and reviews. Special thanks are due A. N. Bhattacharya (Turkey), Tony J. Cunha (California), R. E. McDowell (New York), Pierre Morand-Fehr (France), Amiram Shkolnik (Israel), and Jim Yazman (Arkansas) for their comprehensive reviews and constructive comments, and Bernard S. Schweigert and colleagues (University of California, Davis) and Glenn W. Salisbury (Illinois) who reviewed the report for the Board on Agriculture and Renewable Resources and Commission on National Resources, respectively. the subcommittee also expresses appreciation to Ivan Lindahl for his pioneering efforts in the initiation of this subcommittee.

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1

Introduction

This report represents a first effort to establish the nutrient requirements of goats from original studies directly concerned with the needs of goats. Current scientific literature on goats is not nearly as extensive and comprehensive as it is for other domestic livestock species, and past efforts to set nutrient requirements have relied heavily on extrapolation of values derived from cattle and sheep studies.

There are approximately 400 million goats in the world, with over 2 million head in the United States alone, producing meat, milk, fiber (mohair) and skins (Haenlein, 1978; FAO, 1979; Shelton, 1980a,b; Terrill, 1980). An increasing number of people in the United States and around the world drink milk from goats, and interest in goats is on the increase (Bhattacharya, 1980; Devendra, 1980a; Haenlein, 1980a; Harris, 1980; Iloeje *et al.*, 1980; Leach, 1980). There is an increasing place for goats in commercial agriculture and with the small, part-time farmer (Lowe, 1943; Woinoff, 1949; Shannon, 1956; Garcia, 1958; Clamohoy *et al.*, 1959; Agricultural Research Institute, Cyprus, 1964; Oppong, 1965; Wahid, 1965; Banco Nacional Agropecuario, 1971; Skinner, 1972; Anonymous, 1973; Choveiri, 1973; Joubert, 1973; Maubecin, 1973; Bula *et al.*, 1977; McDowell and Bove, 1977; Ace, 1978; Fitzhugh *et al.*, 1978; Guss, 1978; Sands and McDowell, 1978).

Several national and international goat symposia have been staged recently: the American Dairy Science Association symposium in 1977 at Iowa State University, and in 1979 at Utah State University; the French National Institute for Sheep and Goat Research (ITOVIC) symposia in 1971 and 1981 at Tours; and the Winrock International Livestock Research and Training Center symposia in 1977 and 1978 at Morrilton, Arkansas. The Third International Conference on Goat Production and Disease will meet in 1982 at Tucson, Arizona. Their proceedings add greatly to the knowledge of the nutrient requirements of goats.

It is also increasingly evident that despite similarities to sheep and cattle, goats exhibit significant differences in grazing habits, physical activities, water requirements, feed selection, milk composition, carcass composition, metabolic disorders, and parasites. The nutrient requirements of goats may therefore justifiably be treated separately from those of other ruminants. As older literature becomes more accessible and new communication among world scientists increases, further documentation and information will be forthcoming (Nottbohm and Phillipi, 1933; Zorn *et al.*, 1938; Meklenburcev, 1949; Benzie and Phillipson, 1957; Saperstein, 1960; Crawford and Grogan, 1961; Eker, 1961; Hanson and Andersen, 1962; Hofmeyr *et al.*, 1965; Schaefer, 1967; Rogers *et al.* , 1969; Brandsch and Kruger, 1970; French, 1970; Morand-Fehr and deSimiane, 1977; Corbett, 1978; Haenlein, 1980a,b; Jenness, 1980). This first NRC report on the nutrient requirements of goats must be considered within the limits of available knowledge, and refinements are reserved for subsequent editions as the literature of goats improves.

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2

Nutrient Requirements

ENERGY

Efficient utilization of nutrients depends on an adequate supply of energy, which is of paramount importance in determining the productivity of goats. Energy deficiency retards kid growth, delays puberty, reduces fertility, and depresses milk production (Singh and Sengar, 1970; Sachdeva *et al.*, 1973). With continued deficiency the animals show a concurrent reduction in resistance to infectious diseases and parasites. The problem may be further complicated by deficiencies of protein, minerals, and vitamins.

Energy limitations may result from inadequate feed intake or from the low quality of the diet. Low energy intake that results from either feed restriction or low diet component digestibility prevents goats from meeting their requirements and from attaining their genetic potential. High water content of forages may also become a limiting factor.

Energy requirements are affected by age, body size, growth, pregnancy, and lactation, which have been treated as separate items in presenting requirements (Table 1). Energy requirements are also affected by the environment, hair growth, muscular activity, and relationships with other nutrients in the diet which, for best results, need to be supplied in adequate amounts. Temperature, humidity, sunshine, and wind velocity may increase or decrease energy needs depending upon the region. Stress of any kind may increase energy requirements.

Shearing mohair from Angora goats and pashmina from Cashmere goats decreases insulation and results in increased energy needs, especially during cold weather. Goats are more active and travel greater distances than sheep, which increases energy requirements. Maintenance requirements of goats on pasture, browse, and range, especially in mountainous and transhumance grazing, are considerably higher than those of stable-fed animals. The magnitude of this increase is considered in Table 1 at three levels of activity, and depends on availability of feed, water, topography, elevation and distances travelled in grazing.

Good quality roughages furnish about 2 Mcal metabolizable energy (ME) per kg dry matter (DM). Roughage-concentrate mixed rations are sometimes necessary to increase the energy content of the diet to 2.5 or 3.0 Mcal ME/kg DM when feeding early weaned kids or high-producing dairy goats. The efficiency with which energy is utilized for weight gain, pregnancy, and lactation usually increases with increasing levels of ME concentration in the diet.

It is probable that under certain conditions goats require a minimum of fats in their diet (Fehr and Delage, 1973; Morand-Fehr and Sauvant, 1980), but more studies are needed to better define these requirements.

The energy requirements of goats reported here are amounts needed for maintenance (including physical activity), optimum growth, reproduction, and milk and fiber production; they do not represent maximum levels under *ad libitum* intake. Energy requirements for the various categories of goats in Table 1 have been expressed as digestible energy (DE), ME, and net energy (NE) for maintenance, gain, pregnancy, lactation, and fiber production. Figures for total digestible nutrients (TDN) have been included because they are still widely in use around the world. For converting one form of energy into another the recommendations of Garrett *et al.* (1959) have been used: 100 Mcal gross energy (GE) = 76 Mcal DE = 62 Mcal ME = 35 Mcal NE. These values are higher than would be expected in forage-only diets; however, their relative relationships would still hold. For converting one standard of energy requirement into another, the following equalities have been employed (two or three significant decimal figures are included to reduce rounding errors):

1 kg starch equivalent (SE) or European starch unit (ESU) = 5.082 Mcal DE = 2.356 kcal NE
1 kg digestible organic matter (DOM) = 1.05 kg TDN
1 kg SE or 1 ESU = 1.15 kg TDN = 1.10 kg DOM
1 kg DOM = 4.620 Mcal DE
1 kg TDN = 4.409 Mcal DE
1 feed fattening unit (ffu) = 1.650 Mcal ME

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1 European feed unit (Efu) = 2.500 kcal NE
1 kilojoule (kJ) = 0.239 kcal
1 kcal = 4.184 kJ

Maintenance

Energy requirements for maintenance of goats have been derived from pooled means of experimental data reported in terms of kcal ME/$W_{kg}^{0.75}$ per day. These include: 111.00 (Haenlein, 1950); 115.09 (Majumdar, 1960); 90.35 (Devendra, 1967a); 109.93 (Singh and Sengar, 1970); 100.00 (Flatt *et al.*, 1972); 92.92 (Akinsoyinu, 1974); 91.87 (Winter and Goersch, 1974); 87.31 (Itoh *et al.*, 1979); 101.98 (Rajpoot, 1979); 113.34 (Sengar, 1980). The average is 101.38 kcal ME/$W_{kg}^{0.75}$, which is comparable to figures provided for sheep: 98.31 (ARC, 1965); 95.75 (Olatungi, 1974); 91.99 (Adu, 1975); and 97.58 (NRC, 1975). But the figure is low compared to those for dairy cattle: 128.58 (ARC, 1965); 113.02 (NRC, 1978); and 115.22 (Rattray *et al.*, 1974).

The mean value of 101.38 kcal ME/$W_{kg}^{0.75}$ has been used in Table 1 to determine goat maintenance requirements for body weights ranging from 10 to 100 kg. The energy requirements have also been expressed as they vary with energy concentration in the diet from 2.0 to 2.4 Mcal ME/kg DM.

Activity

The basic ME requirement has also been used to calculate values for grazing at three levels of muscular activity. A 25 percent increment was applied to the basic maintenance requirements in the case of light activity under grazing conditions of intensive management and under tropical conditions. A 50 percent increment should satisfy ME requirements on semiarid rangeland pasture and on slightly hilly land. Grazing on sparsely vegetated grassland and on mountainous transhumance pasture, which necessitates daily long-distance travel for grazing and watering and great differences of altitude, may require a 75 percent increment in the basic maintenance needs to meet additional energy requirements. Goats under stablefed conditions and with minimal activities should be fed according to the basic maintenance requirements only.

Pregnancy

Energy requirements for pregnancy in Table 1 have been derived from the difference of the basic requirements for maintenance (101.38 kcal ME/$W_{kg}^{0.75}$) and two experimental values suggested for pregnancy: 173.60 (Akinsoyinu *et al.*, 1978) and 180.94 (Rajpoot 1979). These values yield a mean of 177.27 kcal ME/$W_{kg}^{0.75}$, which compares closely with 182.41 (McDonald *et al.*, 1973); 179.33 (Akinsoyinu, 1974); and 190.43 (NRC, 1975) for sheep; and 172.97 (NRC, 1978) for dairy cattle. The value of 0.80 Mcal ME in Table 1 also compares well with French recommendations (Morand-Fehr and deSimiane, 1977). In view of the limited information available and the considerable variability among breeds of goats, no differentiation has been made between does producing single kids and those producing twins. An allowance of an additional 20 percent, as recommended for multiple birth in sheep by McDonald *et al.* (1973), has been included. It is understood that pregnancy means the last 2 months of gestation; no extra energy requirements for early pregnancy have been determined. The values take into consideration the weight of the animal and the fetuses.

Growth

Energy requirements for weight gain have been based on three experimental values: 10.18 (Devendra, 1967b); 5.14 (Akinsoyinu, 1974); and 6.43 (Rajpoot, 1979). These values have a mean of 7.25 kcal ME/g of gain, which is equivalent to 4.09 kcal NE. This value is also comparable to those for sheep: 3.74 (Garrett *et al.*, 1959); 3.19 (Evans, 1960); 4.29 (ARC, 1965); 4.21 (Olatungi, 1974); and 2.90 (NRC, 1975). The values for dairy cattle are: 4.19 (Garrett *et al.*, 1959); 2.94 (ARC, 1965); and 3.32 (NRC, 1978). Additional requirements, shown in Table 1, for all growing goats with daily weight gains of 50, 100, and 150 g, have been based on 7.25 kcal ME/g of gain.

Lactation

Energy requirements for lactation have been stated separately for the components of maintenance at different levels of activity and milk production. The requirements have been derived from four experimental values: 1260.00 (Knowles and Watkins, 1938); 1155.90 (Devendra and Burns, 1970); 1328.57 (Winter and Goersch, 1974); and 1240.00 (Rajpoot, 1979). These values yield a mean of 1246.12 kcal ME/kg of 4 percent fat-corrected milk (FCM). This value is comparable to 1202.29 (Blaxter, 1967; McDonald *et al.*, 1973) and 1240.00 kcal ME/kg of 4 percent FCM (NRC, 1978) for dairy cattle. For the requirements of milk production in Table 1 the value of 1246.12 kcal ME/kg of 4 percent FCM has been used over a milk fat range of 2.5 to 6.0 percent. For each 0.5 percent change in fat content from 4 percent milk, an addition or subtraction of 16.28 kcal ME has been applied (NRC, 1978). French recommendations are similar (Morand-Fehr and deSimiane, 1977).

Fiber Production

Energy requirements for fiber production by Angora goats have also been incorporated into Table 1, based on calculations by Huston *et al.* (1971). Although attempts have been made to determine the energy required for mohair fiber production (Gallagher and Shelton, 1972), the values have yet to be established. The values listed in Table 1 were computed by using a 33 percent efficiency of ME for mohair fiber production. No estimates for pashmina production have been made; however, the recommendations for mohair production can be used as a guide.

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PROTEIN

Proteins are the principal constituents of the animal body and are continuously needed in the feed for cell repair and synthetic processes. The transformation of feed protein into body protein is an important process of nutrition and metabolism. Proteins consist of amino acids and are the building blocks of all body cells. Secretions such as enzymes, hormones, mucin, and milk have additional amino acid requirements. Proteins are, therefore, vital for animal maintenance, growth, reproduction, and milk production. However, nonprotein nitrogen (NPN) can substitute for parts of the required protein for these functions (Morgen *et al.*, 1907, 1908, 1909, 1910, 1922, 1925; Law-row *et al.*, 1924; Ungerer, 1924; Paasch, 1925; Honcamp and Keudela, 1927; Williger, 1927; Ziemer, 1931; French, 1957; Champredon and Pion, 1972a,b,c; Fauske, 1972; Kameoka *et al.*, 1972; Mba *et al.*, 1974; Gruhn *et al.*, 1975; Haryu *et al.*, 1975; Harmeyer and Martens, 1980).

Protein deficiencies in the diet deplete stores in the blood, liver, and muscles, and predispose animals to a variety of serious and even fatal ailments. Below a minimum level of 6 percent crude protein (CP) in the diet, feed intake will be reduced, which leads to a combined deficiency of energy and protein (Perkins, 1957; Platt *et al.*, 1964). This deficiency further reduces rumen function and lowers the efficiency of feed utilization. Long-term protein deficiencies retard fetal development, lead to low birth weights, affect kid growth, and depress milk production (Singh and Sengar, 1970).

Protein requirements for maintenance, growth, pregnancy, and lactation have been stated along with the energy requirements in Table 1. They have been presented in terms of total protein (TP) and digestible protein (DP). The former has been recommended as the most accurate guide for converting proteins from feed composition tables to quantities required (Broster, 1972; Preston, 1972; Satter and Roffler, 1975), but DP values are also used widely around the world.

In the past most people have estimated protein requirements based on metabolism trials employing graded protein levels in the diet. The amounts of protein needed to maintain the animal in nitrogen equilibrium were taken as the maintenance requirement. Nitrogen equilibrium was defined as the state in which nitrogen intake matches nitrogen outgo from all sources. The difficulty with this concept is that adult animals can adjust their nitrogen output and reach equilibrium, particularly at lower levels of nitrogen intake. Thus, nitrogen equilibrium as an indicator of adequate protein intake is of questionable value (Singh, 1976) and has not been used here in the determination of protein requirements of goats. Instead, protein requirements have been computed as a ratio to energy.

Some workers have calculated the protein required for maintenance from the endogenous urinary nitrogen (EUN) excretion. Brody (1945) used a factor of 4 to convert EUN to the amount of digestible nitrogen needed for maintenance, while Elliott and Topps (1963) employed a factor of 2.96 for cattle. Neither of these factors can be used satisfactorily for goats; the EUN and maintenance requirements must be determined separately.

Two types of biologically determined protein requirements have been reported. They pertain to minimum and maintenance levels, which must not be confused. The minimum protein requirements for goats have been reported: 1.61 (Majumdar, 1960a); 1.42 (Devendra, 1967a); 1.22 (Singh and Mudgal, 1978); 1.42 (Rajpoot, 1979); and 1.41 (Devendra, 1980b). The mean value is 1.42 g DP or 2.03 g TP/$W_{kg}^{0.75}$ (70 percent average digestibility of total feed protein found in these studies).

Maintenance

Protein requirements for maintenance have been reported: 2.66 (Haenlein, 1950); 2.50 (Majumdar, 1960b); 2.85 (Singh and Sengar, 1970); 3.19 (Winter and Goersch, 1974); 2.12 (Itoh *et al.*, 1979); 3.05 (Rajpoot, 1979); and 3.40 (Sengar, 1980); the mean value is 2.82 g DP or 4.15 g TP/$W_{kg}^{0.75}$, with an average digestibility of 68 percent for total protein. This compares closely with 4.739 TP (NRC, 1975) for sheep and 4.09 g TP/$W_{kg}^{0.75}$ (NRC, 1978) for dairy cattle. For the recommendations in Table 1, the calorie-to-protein ratios were determined to be 1 Mcal DE to 22 g DP to 32 g TP.

Growth

Except for the minimum maintenance requirements of protein, no other biologically determined values for body functions exist. For this report, the experimentally determined energy requirements for maintenance have been used for the development of protein requirements on the basis of calorie-to-protein ratios. In order to complete Table 1, the requirements of protein for weight gains have been derived from the following values: 0.274 (Devendra, 1967b); 0.139 (Akinsoyinu, 1974); and 0.173 (Rajpoot, 1979); the mean is 0.195 g DP or 0.284 g TP/g gain.

Pregnancy

No experimental values have been found for protein requirements of pregnancy. However, two values were calculated from two references: 4.68 (Akinsoyinu *et al.*, 1978) and 4.90 (Rajpoot, 1979); the mean is 4.79 g DP or 6.97 g TP/$W_{kg}^{0.75}$. This value takes into consideration maintenance requirements during the second half of gestation, and is about 10 percent lower than the value of 7.76 g TP/$W_{kg}^{0.75}$ for dairy cattle (NRC, 1978).

Lactation

Protein requirements for milk production were determined from experimental values: 67.83 g DP or 96.90 g TP/kg milk of 4.5 percent fat (Devendra and Burns, 1970) and 46.56 g DP or 66.51 g TP/kg milk of 5.22 percent fat (Rajpoot, 1979), with a mean of 57.20 g DP or 81.71 g TP/kg of milk with 4.86 percent fat. This value is somewhat lower than the 98 g TP/kg of milk with 5 percent fat for

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dairy cattle (NRC, 1978). In the absence of specific experimental evidence, the protein needs for different milk fat contents have been derived from those recommended for dairy cattle (NRC, 1978). It should be noted that the amounts of protein presented in Table 1 for growth, pregnancy, and lactation are based on calorie-to-protein ratios for maintenance, and therefore cannot be considered accurate for every situations because of differences in reproductive and productive rates. Some flexibility based on experience and judicious judgment is, therefore, advisable. French recommendations (Morand-Fehr and deSimiane, 1977) are similar to those listed in Table 1.

Activity

Protein requirements in Table 1 for muscular activity at the three levels above maintenance have not been determined experimentally. Recommendations for protein (TP and DP) requirements for horses at different stages of work include 26 and 36 percent increments above maintenance for light and medium work for mature animals of 200 to 600 kg body weight (NRC, 1973). This assures that the protein-to-calorie ratio required for maintenance is continued under the conditions of work (Crampton, 1964). Later reports indicate that the needs for protein replacement could be small during light work and that excessive protein increases can be undesirable. Supplying greater amounts of concentrates during increased muscular activities may provide additionally needed protein (NRC, 1978). To establish requirements for this report, the TP and DP values for the three activity levels of goats were derived from the protein-to-calorie ratios for the maintenance-only level and low, medium, and high activity levels.

Fiber Production

Protein requirements for fiber production by Angora goats, shown in Table 1, are based on work published at the Texas Agricultural Experiment Station (Houston *et al.*, 1971).

MINERALS

Requirements of minerals have not been established definitively for goats at either maintenance or production levels. However, some classical studies in mineral metabolism have been conducted with goats as experimental subjects. These include studies by Fingerling (1911, 1913), which addressed calcium and phosphorus requirements of lactating goats. Hart *et al.* (1921, 1924, 1927) and Henderson and McGee (1926) reported data on calcium metabolism in goats, which led to the discovery of the role of vitamin D in calcium absorption and metabolism. Lintzel and Radeff (1931) reported important work on iron nutrition in goats. In general, these and more recent studies support assumptions that some mineral requirements in goats are similar to those in other ruminant species; therefore, mineral requirements listed in Table 1 rely for the time being on values recommended for sheep (NRC, 1975) and dairy cattle (NRC, 1978). The literature on mineral nutrition in goats was recently reviewed (Haenlein, 1980).

In addition to the elements in organic matter (oxygen, nitrogen, carbon, and hydrogen), seven major and nine minor minerals are considered dietary essentials for livestock. The major minerals that must be fed in relatively large amounts are calcium, phosphorus, sodium, chlorine, magnesium, potassium, and sulfur. Minor or trace minerals, required in small amounts, include iron, iodine, copper, molybdenum, zinc, manganese, cobalt, selenium, and fluorine. Others which are possibly essential at extremely low levels are chromium, nickel, vanadium, silicon, tin, and arsenic. Most of these essential or possibly essential elements occur naturally in feedstuffs at levels that do not constitute problems in nutrition. However, situations often exist when one or more minerals, especially the major ones, are sufficiently low to reduce productivity. Trace minerals in particular can be present in toxic amounts. Proper balance of minerals and bioavailability from supplements are often more important than actual levels (Miller, 1981). Functions and practical implications of various important minerals are discussed individually.

Calcium

Calcium is a critical nutrient in ration formulation for all species of livestock. Although most of the calcium found in the body is in the skeleton, the element has numerous crucial functions in the soft tissues. A deficiency of calcium in young animals leads to retarded growth and development, and can predispose them to rickets. Because milk is high in calcium (Macy *et al.*, 1953; Parkash and Jenness, 1968), rations for lactating goats need a higher calcium level. Fingerling (1911, 1913) found that if lactating goats did not receive the necessary amounts of calcium and phosphorus in their diets, they would draw from body stores of these elements without initially affecting milk yield or milk composition. If the calcium deficiency continued for weeks, the yield of milk decreased. At intakes of higher levels of calcium the goats replenished their body calcium stores and milk production increased. Changes in milk composition were not observed.

Certain minerals interact with calcium metabolism. Experiments using ligated intestinal loops in anaesthetized goats and radioactively labeled calcium injections (Gibbons *et al.*, 1972) showed that intestinal calcium transport is enhanced by carbohydrates and by low luminal concentrations of sodium. Calcium absorption occurred principally in the duodenum, to a far lesser extent in the jejunum, and least in the lower ileum.

Under grazing conditions calcium is seldom a problem with either Angora or meat-type goats, but it can be very important for high-producing dairy goats. Low calcium diets lead to reduced milk production. Appropriate calcium levels in the diet are also important in the prevention

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of parturient paresis (milk fever). The calcium content of goats' milk is reported to be in the range of 1.14 to 1.63 g/kg (Macy *et al.*, 1953; Parkash and Jenness, 1968). A median value would be 1.38 g/kg, which, is marginally higher than for dairy cattle. This value has been used in formulating the recommendations in Table 1. Suggested calcium supplements or sources include bone meal, dicalcium phosphate, ground limestone, and oyster shell. The percentage composition of these and other sources is found in Table 3.

Phosphorus

Phosphorus is required for both tissue and bone development. A deficiency will result in slowed growth, depraved appetite, and unthrifty appearance; it is often accompanied by low levels of phosphorus in the blood. Fingerling (1911) showed that the general conclusions about calcium-deficient diets also applied to phosphorus. Goats were able to sustain milk production from body reserves for several weeks of negative phosphorus balances. During phosphorus deficiencies, when intake was one-fifth of normal for two months, the production of milk declined 60 percent. Supplementing the diet with P_2O_5 and CaO to achieve daily levels of 6 g phosphorus and 14 g calcium raised milk yields by 10 percent in two weeks and by 15 to 25 percent in four weeks, while diets remained isocaloric and isonitrogenous. The phosphorus level in goats' milk ranges from 0.84 to 1.22 g/kg (Macy *et al.*, 1953; Parkash and Jenness, 1968).

The calcium-to-phosphorus ratio should not drop below 1.2:1 in diets for goats, even though no unanimity exists on the importance of the ratio. The significance of the calcium-to-phosphorus ratio in the genesis of urinary calculi is discussed later on.

A phosphorus deficiency in grazing goats is more likely than a calcium deficiency. It might be encountered with any type of goat grazing on phosphorus-deficient forages. Documented examples of phosphorus deficiency in grazing goats are rare, however. This can be explained by their varied habitats and tendency to browse plants that may be high in phosphorus. Formulation of rations to include adequate phosphorus will be more important with high-producing dairy goats when they are fed with harvested or formulated feedstuffs.

Sodium and Chlorine

Common salt (sodium chloride) is perhaps the mineral most commonly supplied to animals. They require both sodium and chlorine, but sodium is the mineral most likely to be lacking (Schellner, 1972). When provided free choice, goats may consume salt in excess of their requirements, but with no apparent ill effects. Animals that do not receive sufficient salt may show depraved appetites and consume soil or debris. If goats are not provided free choice, salt should be added to the feed. A recommended level would be 0.5 percent of the complete feed or proportionately higher levels in supplements.

Salt is important in several other ways. Placing it in less frequently grazed pastures may influence goats to move to those areas. Salt is also often incorporated at high levels to regulate free intake of nutritional supplements. Trace mineralized salt should not be used in this manner, however, it may lead to an oversupply of some trace elements. Goats in arid regions may have problems with the salt content of some water sources, which can reduce intake of water and feed.

Magnesium

Magnesium is required for many enzyme systems and for proper functioning of the nervous system. It is also closely associated with the metabolism of calcium and phosphorus. Symptoms of magnesium deficiency are anorexia, excitability, and calcification of soft tissue. The most noted problem associated with hypomagnesemia is grass tetany, a malady that frequently occurs in animals grazing on lush green grass or winter cereals in pastures fertilized with nitrogen and potassium. Treatment consists of intravenous administration of calcium and magnesium in the gluconate form. Goats do have a marginal ability to compensate for low dietary magnesium by reducing the rate of its excretion (Razifard, 1971, 1972a,b). Both urinary excretion and milk flow, which contains 0.13 to 0.36 g magnesium per kg, are reduced when magnesium is low in the diet.

Potassium

Potassium, though required in relatively large amounts, is usually present in roughage-based diets to the extent that it does not constitute a problem. Marginal deficiencies result in reduced feed intake, retarded growth, and reduced milk production. More severe deficiencies cause emaciation and poor muscular tone. In growing sheep the potassium requirement is considered to be 0.5 percent of the diet, whereas with lactating dairy cattle the requirement is placed at 0.8 percent of the complete ration (Ward, 1966). These levels are also postulated as the requirements of growing and lactating goats, respectively. Ration values below these are infrequently encountered, and are usually restricted to high-concentrate diets, in which the major ingredient is low in potassium, or to diets of severely weathered or winter range forage. Potassium supplements may be in chloride, bicarbonate, or sulfate form.

Sulfur

Sulfur is a component of all body proteins and is particularly high in goat hair, which consists of a high proportion of the sulfur-containing amino acids, methionine and cystine. Marginal deficiencies cause poor animal performance, and more extreme cases result in excessive salivation, lacrimation, and alopecia. Studies with goats fed supplemental sulfur are rare, but it appears likely that deficiencies of sulfur may be more widespread than previously believed. A recent study by Wheeler *et al.*, (1975)

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indicates potential shortages of sulfur in forage sorghums. Another study by Gartner and Hurwood (1976) indicates that tannic-acid-containing plants such as *Acacia aneura* may provide inadequate amounts of available sulfur. This is of particular concern with range goats, which liberally graze and browse tannin-containing plants. Recommendations are normally expressed in terms of sulfur-to-nitrogen ratio 1:10. However, this ratio may be misleading if either both sulfur and nitrogen are unavailable because of the presence of complexing substances such as tannic acid. Sulfur requirements would then range from 0.16 to 0.32 percent of the diet for ration protein values of 10 to 20 percent. Sulfates, such as sodium sulfate and ammonium sulfate, are the most available forms of sulfur for ration formulation.

Common feedstuffs may contain adequate sulfur, but shortages can occur in forages grown on certain types of soils or in rations containing a high proportion of NPN as protein supplement (Varma and Sawhusey, 1970). The high-producing Angora goat may have an elevated sulfur requirement because of mohair growth, but this possibility needs to be investigated. It has been shown that sulfur-containing amino acids, administered postruminally, stimulate fiber production (Reis and Schinkel, 1964). Although mechanisms exist, the required technology has not reached the stage of practical application.

Iron

Iron is a component of blood hemoglobin that is required for oxygen transport. It is also required for some enzyme systems. Although iron deficiency seldom occurs in mature grazing animals, it may occur in young goat kids because of their minimal body stores of iron at birth and the low iron content of milk (Jenness, 1980). The work of Lintzel and Radeff (1931) suggests that this may be more true with goats than with cattle. If iron deficiencies are observed and it is desired to continue the kids on a milk diet, injections of iron-dextran (150 mg) at two-to-three-week intervals are recommended. In a recent study (Hamada *et al.*, 1970) acceptable tissue color was observed in animals fed a diet containing 0.03 percent ferrous iron. Thus, this value might be taken as a minimum. Ferrous sulfate and ferric citrate are more available than other sources such as ferric oxide and are recommended for ration formulation. The literature is too sparse, however, to state definite feeding requirements for iron.

Iodine

Iodine is necessary for the formation of thyroxine. In states of iodine deficiency the thyroid gland becomes enlarged, a condition called goiter (Honeker, 1949). It is most frequently observed in the young at birth, especially in weak or dead kids. Iodine-deficient areas are widespread in the world, including parts of the United States. Deficiencies are readily corrected by feeding iodized salt (Sutphin *et al.*, 1971). However, iodized salts should not be force-fed (as when salt is used as a feed limiter) because this action could lead to excessive intakes of iodine.

Goats appear to be somewhat unusual with respect to iodine metabolism (Lengemann, 1970, 1979), but no good basis for unique recommendations exists so far.

Copper and Molybdenum

Copper and molybdenum are interrelated in animal metabolism and should be considered together (Hennig *et al.*, 1974). Levels of both can be too low or too high or the level of one can be low and the other too high. The most common problem occurs when a normal or low level of copper is accompanied by a high level of molybdenum. In this case copper is excreted and a deficiency occurs. This condition can be corrected with copper therapy.

Few studies on copper and molybdenum have included goats (NRC, 1980). It appears that sheep are sensitive to copper toxicity and resistant to molybdenosis, but it is not known whether this is also the case with goats.

Zinc

Zinc deficiency symptoms include parakeratosis, stiffness of joints, excessive salivation, swelling of the feet and horny overgrowth, small testicles, and low libido (Neathery *et al.*, 1973). Reduced feed intake and weight loss also occurs with zinc-deficient diets. Zinc must be supplied continuously because little is stored in the body in readily available form (NRC, 1979). Minimum daily requirements for goats have not been established. Young males have developed deficiencies at levels of 4 ppm (Neathery *et al.*, 1973); adult females developed signs on 6–7 ppm when they were lactating. There is also some evidence that males require more zinc than do females (Groppel and Hennig, 1971; Schellner, 1972). Direct and indirect evidence indicates minimum requirements of 10 ppm. Levels of 1000 ppm may be toxic.

Manganese

Manganese is an essential mineral in diets for goats (Groppel, 1969; Anke *et al.*, 1972, 1973a,b,c; Hennig *et al.*, 1972; Schellner, 1972). Deficiency signs include reluctance to walk, deformity of the forelegs, and reduced reproductive efficiency. So far, data are inadequate to suggest optimum levels. Deficiency signs have developed on 5.5 ppm, but not on 90 ppm in the diet (Anke *et al.*, 1973b).

Other Minerals

Fluorine and selenium can be encountered at either deficient or toxic levels in natural diets. Fluorine deficiency appears to be rare; toxic levels result largely from industrial pollution. With sheep, acute fluorine toxicity occurs at levels above 200 ppm (NRC, 1975). Selenium toxicity occurs in sheep from prolonged consumption of plants containing over 3 ppm. The classical deficiency of selenium is white muscle disease (Hebert and Cowan, 1971).

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but milder deficiencies result in reduced performance, especially reproductive efficiency. Selenium supplements may be added to salt supplementation or provided through injections.

Cobalt is a component of vitamin B_{12}. Deficiency signs include loss of appetite, emaciation, weakness, anemia, and decreased production. In sheep an intake of 0.1 ppm is considered adequate. It is assumed that the same would apply to goats. Cobalt sulfate or cobalt chloride added at the rate of 12 g per 100 kg of salt should provide an adequate intake, but this would be indicated only in situations in which cobalt has been shown to provide a response.

A few additional references on specific mineral studies with goats can be found in the appended bibliography.

VITAMINS

Vitamins are a group of compounds essential for normal body processes. Typical range or pasture diets of goats should contain adequate levels of vitamins or vitamin precursors to maintain normal health of the animal. Pen-fed animals, goats held on restricted diets, and high-producing animals may need a supplemental vitamin supply (Honeker, 1949). Recommendations in Table 1 for vitamin requirements of goats rely on similar values for sheep (NRC, 1975) and dairy cattle (NRC, 1978) until more specific experimental evidence for goats becomes available.

Vitamin A

Vitamin A is involved in many areas of body metabolism, and as a result deficiency signs are varied. Experimental evidences of vitamin A deficiencies include keratinization of the ephithelia of the respiratory, alimentary, reproductive, and urinary tracts, and of the eye. Signs include multiple infections, poor bone development, birth of abnormal offspring, and vision impairment. Night blindness, the inability to see under poorly lighted conditions, is the classic deficiency sign. Experimentally produced signs of a vitamin A deficiency in goats include: loss of appetite, loss of weight, unthrifty appearance, night blindness, and a thick nasal discharge (Schmidt, 1941).

Vitamin A is not contained in forages, but its precursors are common in plants and are usually present in proportion to plant pigments. However, not all plant pigments give rise to equal vitamin A activity. Beta-carotene is the standard form of provitamin A. One mg of beta-carotene in the diet is equivalent to approximately 400 IU of vitamin A. Other pigments, xanthophylls for example, are less active.

Vitamin A is stored in the liver and fat of animals during times when intake exceeds requirements. During periods of low carotene supplies in the diet, this stored vitamin A can be mobilized and utilized without signs of a vitamin A deficiency. Eveleth et al. (1949) reported that a vitamin A deficiency in sheep is unlikely if green feed is available during one season of the year. Schmidt (1941) found the tolerance of adult sheep and Angora goats to low carotene diets to be similar. However, Angora kids were found to be more tolerant than lambs. Goats that have had access to good quality green feed can probably be held on a low carotene diet for a minimum of three months without showing signs of a vitamin A deficiency.

Typical goat diets contain adequate carotene to prevent vitamin A deficiency. The tendency of the goat to search out palatable green plant parts ensures it an advantage over other ruminant species. However, goats that are forced to consume more conventional cattle or sheep diets because of the unavailability of browse would not have an advantage (Davis, 1942; Caldas, 1961). Vitamin A deficiency in goats in the tropics would be rare except under such circumstances.

Old weathered hays are poor sources of carotene, which is readily oxidized. Green leafy hays are good sources, and dehydrated legume hays, especially pelleted, are the best natural sources. Synthetic vitamin A is readily available in feed additive and injectable forms from commercial suppliers. The newer formulations are relatively stable, but old premises and injectables should not be used.

Vitamin D

Vitamin D is essential for the absorption and metabolism of calcium and phosphorus. In its absence, or at low levels, normal bone development is impaired. Soft, irregular shaped leg and rib bones resulting from a vitamin D deficiency are signs of "rickets." Thus, vitamin D has been referred to as the antirachitic factor. A form of rickets can also be seen in the newborn of an adult female deficient during pregnancy. Otherwise, deficiencies in adult animals are considered rare.

Vitamin D is available to animals both through the diet and as a result of exposure to sunlight. Ultraviolet radiation from sunlight acts on ergosterol, a plant sterol, and on 7-dehydrocholesterol, a sterol of animal origin, to produce compounds having antirachitic activity (vitamin D_2 and D_3, respectively). Thus, sun-cured hays are excellent sources of vitamin D. Animals exposed to sunlight can obtain some of their requirement directly from irradiation of 7-dehydrocholesterol in the skin. DeLuca (1974) discovered that activation of vitamin D_3 occurs in the liver and kidney of animals.

Vitamin D deficiency is unlikely under normal grazing conditions, although a form of osteodystrophia has been produced experimentally in goats. Vitamin D should be supplied to growing animals that are denied sunlight over extended periods because of cloud cover or confinement to housing.

Vitamin E

Vitamin E deficiency in sheep is commonly associated with white muscle disease, also called stiff lamb disease. This malady is seen in young nursing lambs and will improve with vitamin E therapy (Muth *et al.* , 1958). An

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associated selenium deficiency will intensify the disease. Vitamin E is alleged to improve reproductive efficiency, but dietary supplementation experiments have not produced consistent results.

Evidence of spontaneous vitamin E deficiency signs in goats is lacking. It is suggested that the probability of lowered productivity in goats as a result of a vitamin E deficiency is remote. However, vitamin E transferred to the milk is considered important because of the antioxidant properties that aid in milk storage.

Vitamin K

Vitamin K, the blood clotting vitamin, is plentiful in a variety of feedstuffs and, in addition, is readily synthesized in the rumen. A deficiency is unlikely.

B Vitamin Complex

The B vitamins are not considered dietetically essential in adult goats because they are normally synthesized by microorganisms in the rumen. Only vitamin B_{12} (cobalamin) is likely to be deficient in animals having a functional rumen. Cobalt is required for synthesis of vitamin B_{12} and if absent or at extremely low levels in the diet of goats, a vitamin B_{12} deficiency will occur. The B vitamins should be included in diets of very young kids nursing their dams, animals with poorly functioning rumens, sick animals, and those with radically changed diets.

Vitamin C

Vitamin C is synthesized in the body tissues in adequate quantities to satisfy requirements and under normal circumstances need not be added to diets of goats.

WATER

Water is obviously important for goats, and the amount required depends on that needed for the maintenance of normal water balance and to provide for satisfactory levels of production. The normal body water content of the goat varies with age, amount of fat in the body, and environmental temperatures. It would be expected to exceed 60 percent of the body weight and 75 percent of the nonbony tissues. Shkolnik *et al.* (1980) have shown that some goats, such as the black Bedouin of the Negev and Sinai deserts, have the capacity to store as much as 76 percent of their body weight. Water requirements may be met by free water consumption, but other important sources include water contained in the feed ingested and metabolic water resulting from oxidation of energy sources. Major water losses include those from urine, lactation, evaporation, and perspiration.

A safe general recommendation is to provide goats with all the clean water that they will drink (*ad libitum* intake). Extremes in water temperature will increase energy requirements. Taste factors will also affect normal water intake (Goatcher and Church, 1970). Although the above observations are logical, it should be remembered that a high proportion of the world's goat population lives in areas where water requirements are not easily met. The uniqueness of goats in meeting their water requirements deserves further study. The example of the black Bedouin goat suggests that other genotypes may differ in their ability to meet water requirements. Regardless of breed, water intake must exceed milk production. In a study reported by Bergmann (1932), 3.5 kg of water was consumed for each kilogram of milk produced by dairy goats under temperate conditions. French recommendations are 145.6 g water per $w_{kg}^{0.75}$ for maintenance and 1.43 kg water per kilogram of milk as a production requirement (Morand-Fehr and Sauvant, 1978). In the humid tropics Devendra (1967) found that penned indigenous meat goats had a mean daily free water intake of 680 g, of which 80 percent was consumed during the day.

Goats are often more sensitive and reluctant than other species to drink from foul-tasting water sources. If they are forced to drink poor quality water, the result may be infection or undesirable mineral intake. Also, in many parts of the world goats drink from impounded water, and entrapment (bogging in mud) can be a real hazard, especially with Angoras.

Goats are among the most efficient domestic animals in the use of water, approaching the camel in the low rate of water turnover per unit of body weight (Maloiy and Taylor, 1971; Macfarlane and Howard, 1972). Goats appear to be less subject to high temperature stress than other species of domestic livestock such as wooled sheep or many breeds of cattle and require less water evaporation to control body temperature. They also have the ability to conserve water by reducing losses in urine and feces. In many environments the water intake through forage may be high relative to other species because of their ability or willingness to browse. The result is that goats are less dependent on free water sources than other domestic species, but do not equal certain wild animal species in this respect.

Factors affecting the free water intake of goats are lactation level, environmental temperature, water content of forage consumed, amount of exercise, and salt and mineral content of the diet. Therefore, the daily range of free water intake may be from zero to several liters. When feeding on dry forages and when water is lacking, the efficiency of reproduction will suffer (Brown and Lynch, 1972; Lynch *et al.*, 1972). Suboptimum water intake will result initially in reduced feed intake, then reduced performance and gradual starvation. Acute problems result when goats are unable to maintain water balance or control body temperature.

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3

Table of Nutrient Requirements

The nutrient requirements presented in Table 1 can be used to formulate diets for the different classes and categories of goats by proper use of available feedstuffs. The table lists nutrient requirements for maintenance at different levels of muscular activity and additional requirements for growth, pregnancy, lactation, and mohair production. The daily energy requirements for maintenance are 101.38 kcal ME/$W_{kg}^{0.75}$ [1 kg TDN = 4.409 Mcal DE (Garrett *et al.*, 1959) or 76 DE = 62 ME = 35 NE; protein requirements are related to energy needs as follows: 22 g DP or 32 g TP per Mcal DE]. The energy requirement for growth is 7.25 kcal ME/g of gain. Goat kids at very young ages may not be able to consume the suggested required quantities of DM. Similar situations can exist with high-producing dairy goats, but intakes of more than 5 percent of body weight have been reported (Haenlein, 1978). The energy requirements per kg FCM at 4 percent are 1246.12 kcal ME; and a 0.5 percent fat change in 4 percent FCM is 16.28 kcal ME. Additional requirements for mohair production are also presented. Details on Table 1 are discussed in Chapter 2.

TABLE 1 Daily Nutrient Requirements of Goats[a]

Body Weight (kg)	Feed Energy				Crude Protein		Ca (g)	P (g)	Vitamin A (1000 IU)	Vitamin D IU	Dry Matter per Animal			
											1 kg = 2.0 Mcal ME		1 kg = 2.4 Mcal ME	
	TDN (g)	DE (Mcal)	ME (Mcal)	NE (Mcal)	TP (g)	DP (g)					Total (kg)	% of kg BW	Total (kg)	% of kg BW
Maintenance only (includes stable feeding conditions, minimal activity, and early pregnancy)														
10	159	0.70	0.57	0.32	22	15	1	0.7	0.4	84	0.28	2.8	0.24	2.4
20	267	1.18	0.96	0.54	38	26	1	0.7	0.7	144	0.48	2.4	0.40	2.0
30	362	1.59	1.30	0.73	51	35	2	1.4	0.9	195	0.65	2.2	0.54	1.8
40	445	1.96	1.61	0.91	63	43	2	1.4	1.2	243	0.81	2.0	0.67	1.7
50	530	2.34	1.91	1.08	75	51	3	2.1	1.4	285	0.95	1.9	0.79	1.6
60	608	2.68	2.19	1.23	86	59	3	2.1	1.6	327	1.09	1.8	0.91	1.5
70	682	3.01	2.45	1.38	96	66	4	2.8	1.8	369	1.23	1.8	1.02	1.5
80	754	3.32	2.71	1.53	106	73	4	2.8	2.0	408	1.36	1.7	1.13	1.4
90	824	3.63	2.96	1.67	116	80	4	2.8	2.2	444	1.48	1.6	1.23	1.4
100	891	3.93	3.21	1.81	126	86	5	3.5	2.4	480	1.60	1.6	1.34	1.3
Maintenance plus low activity (=25% increment, intensive management, tropical range and early pregnancy)														
10	199	0.87	0.71	0.40	27	19	1	0.7	0.5	108	0.36	3.6	0.30	3.0
20	334	1.47	1.20	0.68	46	32	2	1.4	0.9	180	0.60	3.0	0.50	2.5
30	452	1.99	1.62	0.92	62	43	2	1.4	1.2	243	0.81	2.7	0.67	2.2
40	560	2.47	2.02	1.14	77	54	3	2.1	1.5	303	1.01	2.5	0.84	2.1

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Body Weight (kg)	Feed Energy				Crude Protein				Vitamin A (1000 IU)	Vitamin D IU	Dry Matter per Animal			
											1 kg = 2.0 Mcal ME		1 kg = 2.4 Mcal ME	
	TDN (g)	DE (Mcal)	ME (Mcal)	NE (Mcal)	TP (g)	DP (g)	Ca (g)	P (g)			Total (kg)	% of kg BW	Total (kg)	% of kg BW
50	662	2.92	2.38	1.34	91	63	4	2.8	1.8	357	1.19	2.4	0.99	2.0
60	760	3.35	2.73	1.54	105	73	4	2.8	2.0	408	1.36	2.3	1.14	1.9
70	852	3.76	3.07	1.73	118	82	5	3.5	2.3	462	1.54	2.2	1.28	1.8
80	942	4.16	3.39	1.91	130	90	5	3.5	2.6	510	1.70	2.1	1.41	1.8
90	1030	4.54	3.70	2.09	142	99	6	4.2	2.8	555	1.85	2.1	1.54	1.7
100	1114	4.91	4.01	2.26	153	107	6	4.2	3.0	600	2.00	2.0	1.67	1.7
Maintenance plus medium activity (= 50% increment, semiarid rangeland, slightly hilly pastures, and early pregnancy)														
10	239	1.05	0.86	0.48	33	23	1	0.7	0.6	129	0.43	4.3	0.36	3.6
20	400	1.77	1.44	0.81	55	38	2	1.4	1.1	216	0.72	3.6	0.60	3.0
30	543	2.38	1.95	1.10	74	52	3	2.1	1.5	294	0.98	3.3	0.81	2.7
40	672	2.97	2.42	1.36	93	64	4	2.8	1.8	363	1.21	3.0	1.01	2.5
50	795	3.51	2.86	1.62	110	76	4	2.8	2.1	429	1.43	2.9	1.19	2.4
60	912	4.02	3.28	1.84	126	87	5	3.5	2.5	492	1.64	2.7	1.37	2.3
70	1023	4.52	3.68	2.07	141	98	6	4.2	2.8	552	1.84	2.6	1.53	2.2
80	1131	4.98	4.06	2.30	156	108	6	4.2	3.0	609	2.03	2.5	1.69	2.1
90	1236	5.44	4.44	2.50	170	118	7	4.9	3.3	666	2.22	2.5	1.85	2.0
100	1336	5.90	4.82	2.72	184	128	7	4.9	3.6	723	2.41	2.4	2.01	2.0
Maintenance plus high activity (= 75% increment, arid rangeland, sparse vegetation, mountainous pastures, and early pregnancy)														
10	278	1.22	1.00	0.56	38	26	2	1.4	0.8	150	0.50	5.0	0.42	4.2
20	467	2.06	1.68	0.94	64	45	2	1.4	1.3	252	0.84	4.2	0.70	3.5
30	634	2.78	2.28	1.28	87	60	3	2.1	1.7	342	1.14	3.8	0.95	3.2
40	784	3.46	2.82	1.59	108	75	4	2.8	2.1	423	1.41	3.5	1.18	3.0
50	928	4.10	3.34	1.89	128	89	5	3.5	2.5	501	1.67	3.3	1.39	2.7
60	1064	4.69	3.83	2.15	146	102	6	4.2	2.9	576	1.92	3.2	1.60	2.7
70	1194	5.27	4.29	2.42	165	114	6	4.2	3.2	642	2.14	3.0	1.79	2.6
80	1320	5.81	4.74	2.68	182	126	7	4.9	3.6	711	2.37	3.0	1.98	2.5
90	1442	6.35	5.18	2.92	198	138	8	5.6	3.9	777	2.59	2.9	2.16	2.4
100	1559	6.88	5.62	3.17	215	150	8	5.6	4.2	843	2.81	2.8	2.34	2.3
Additional requirements for late pregnancy (for all goat sizes)														
	397	1.74	1.42	0.80	82	57	2	1.4	1.1	213	0.71		0.59	
Additional requirements for growth—weight gain at 50 g per day (for all goat sizes)														
	100	0.44	0.36	0.20	14	10	1	0.7	0.3	54	0.18		0.15	
Additional requirements for growth—weight gain at 100 g per day (for all goat sizes)														
	200	0.88	0.72	0.40	28	20	1	0.7	0.5	108	0.36		0.30	
Additional requirements for growth—weight gain at 150 g per day (for all goat sizes)														
	300	1.32	1.08	0.60	42	30	2	1.4	0.8	162	0.54		0.45	
Additional requirements for milk production per kg at different fat percentages (including requirements for nursing single, twin or triplet kids at the respective milk production level)														
(% Fat)														
2.5	333	1.47	1.20	0.68	59	42	2	1.4	3.8	760				
3.0	337	1.49	1.21	0.68	64	45	2	1.4	3.8	760				
3.5	342	1.51	1.23	0.69	68	48	2	1.4	3.8	760				
4.0	346	1.53	1.25	0.70	72	51	3	2.1	3.8	760				
4.5	351	1.55	1.26	0.71	77	54	3	2.1	3.8	760				
5.0	356	1.57	1.28	0.72	82	57	3	2.1	3.8	760				

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Body Weight (kg)	Feed Energy				Crude Protein				Vitamin A (1000 IU)	Vitamin D IU	Dry Matter per Animal			
											1 kg = 2.0 Mcal ME		1 kg = 2.4 Mcal ME	
	TDN (g)	DE (Mcal)	ME (Mcal)	NE (Mcal)	TP (g)	DP (g)	Ca (g)	P (g)			Total (kg)	% of kg BW	Total (kg)	% of kg BW
5.5	360	1.59	1.29	0.73	86	60	3	2.1	3.8	760				
6.0	365	1.61	1.31	0.74	90	63	3	2.1	3.8	760				
Additional requirements for mohair production by Angora at different production levels														
Annual Fleece Yield (kg)														
2	16	0.07	0.06	0.03	9	6								
4	34	0.15	0.12	0.07	17	12								
6	50	0.22	0.18	0.10	26	18								
8	66	0.29	0.24	0.14	34	24								

[a] Definitions of terms and equations used are in Chapter 2.

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4

Herbage and Browse Utilization

In comparison to other domestic animals, goats have unique preferences for shrubs and tree leaves, whether deciduous or evergreen (Fingerling, 1905, 1907, 1909; Cory, 1927; Edwards, 1948; Wilson, 1957). Compared with cattle or sheep they select from a wider array of plants, particularly woody plants (Fraps and Cory, 1940; Maher, 1945; McMahan, 1964). Their pattern of diet selection compares closely with that of small ruminant game animals (McMahan, 1964; Hoppe *et al.*, 1977). Grasses and herbaceous flowering plants (forbs or weeds) are also commonly selected (Knight, 1965; Malechek and Leinweber, 1972a,b; Tetteh, 1974). Wilson (1957) observed that goats showed a special preference for the influorescences of grasses. Because of their unusual preferences for leaves of woody plants, they have been exploited as weapons against encroaching brush species. Early studies in the deciduous woodlands of the United States observed that goats would effectively clear away understory and would actually kill some trees up to 6 inches in diameter (Woods, 1903). In East African thorn-bush areas, goats controlled sprouts and regrowth following mechanical control (Staples *et al.*, 1942; Oates, 1956). However, goats do not select only invading plants, and care must be taken to avoid the overstocking that can lead to destruction of all ground cover (Hornby and Rensburg, 1948; Wilson *et al.*, 1975). The most successful use of goats in the control of invading plants involves intensive grazing for a short period, followed by removal of all grazing for an extended period to allow for recovery of desirable plants. This method is not, of course, effective when goats find invading plants unpalatable.

Provenza (1978) portrayed the goat as a mobile pruning machine that modified bushy shrubs and thereby increased the accessibility of cattle to more nutritious forage. The observation of synergistic effects between animal species has led to widespread acceptance of combination grazing. Talbot and Talbot (1963) recognized the mutual benefit of mixed species grazing by wild ruminants in East African savannas. Mixed grazing has also increased yields of animal products from rangelands in Texas (Merrill, 1975).

Goats consume approximately the same weight of forage DM as do sheep of similar size (Geoffroy, 1974). The exact amount that they will voluntarily consume is influenced by several factors. Malechek and Leinweber (1972a,b) suggest that goats will eat more forage if they have access to the more preferred species. Devendra (1975) found that voluntary intake by goats decreased as the forage matured. This effect is overcome partially by chopping and pelleting the forage (Fehr, 1971; Fonolla *et al.*, 1972; Devendra, 1977b). Environmental factors such as temperature and humidity also often affect the level of voluntary intake (Chenost, 1972b).

Browse (leaves and twigs of trees and shrubs) and forbs generally contain higher levels of crude protein and phosphorus during the growing season than do grasses (Rector and Huston, 1976). But many palatable browse species are limited in value because of one or more inhibitors that may bind or otherwise prevent utilization of nutrients contained in the plants. These inhibitors include excessive lignification of woody twigs, and tree leaves that physically bind or encapsulate the nutrients (Short and Reagor, 1970; Singh *et al.*, 1972). Essential oils (terpenebased organic compounds) are present at relatively high levels in some range shrubs and apparently inhibit growth of rumen bacteria (Oh *et al.*, 1968). High levels of tannins are found in some of the important browse plants and depress digestion of feedstuffs by binding and/or inhibiting enzymatic activity (McLeod, 1974; Gartner and Hurwood, 1976). Fraps (1924) reports the trace of digestible protein content of live oak leaves was zero. Nastis (1977) found Gambel oak (*Quercus gambelii*) to be less digestible at a young, tender stage than when mature because of the high tannin concentration in young leaves. Other compounds such as silica may also limit the value of browse materials (Short *et al.*, 1973). Although the reasons are not fully understood, field observations indicate that goats under browse conditions perform better than might be expected from the above cited reports. In spite of concern that browse materials are less nutritious than would be indicated by chemical analysis, there is growing evidence that many, if not most, of the grasses, shrubs, and tree

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leaves selected by goats are of high nutritional value (Fraps and Cory, 1940; Bissell and Weir, 1957; Butterworth, 1967; Wilson *et al.*, 1971; Bhandari and Gupta, 1973; Short *et al.*, 1974; Cordova and Wallace, 1975; Rector and Huston, 1976; Wilson, 1977). It has been suggested that browse plants, shrubs, and tree leaves should be given more attention in the feeding management of goats (Sidahmed *et al.*, 1981b).

Several reports indicate that goats are more efficient digesters of forage, especially the fiber fraction, than other domestic animals (Ademosun, 1970a,b; Gihad, 1976; Devendra, 1977a,b; Sharma and Rajora, 1977). Huston (1976) reported a lower digestive efficiency for goats than for cattle for several forages. Other workers have shown that goats surpass other ruminants in digesting some forages but not others (Jones *et al.*, 1972; ElHag, 1976). Nonplant factors affecting digestibility of forages by goats include geographical location (Chenost, 1972a), level of forage consumption (Devendra, 1967a,b; Sharma and Murdia, 1974), concentrate supplementation (Castle, 1956a; Chenost, 1972c; Saxena *et al.*, 1972), and rate of passage through the gastrointestinal tract (Castle, 1956b; Short *et al.*, 1965; Ehrlein and Hill, 1970; Hamada, 1973). Because significant differences are usually small, it is suggested at this stage that the digestive efficiencies of sheep and goats be considered comparable. Any differences that appear to exist deserve further studies (Coblentz, 1977; McCammon-Feldman, 1980; Van Soest, 1980; Sidahmed *et al.*, 1981a,b).

Campbell *et al.* (1962) conceded the importance of the brush-eating characteristics of the goat, but emphasized the animal's importance as a utilizer of forages and a producer of human consumable goods (meat, milk, and fiber). The goat offers an opportunity, sometimes the only alternative, for deriving value from a vast reservoir of natural resources, and unwanted assortments of herbage, shrubs, tree leaves, and plant refuse and by-products.

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5

Ration Formulation and Examples of Typical Rations

Formulating practical rations requires (1) identification of the total nutrient requirements of a goat or herd of goats according to body size and the physiological functions to be satisfied, and (2) proper combination of available feedstuffs to supply these nutrients in the most economical manner. The requirements listed in Table 1 can be met in many different ways using different combinations of feed ingredients. Local availability and cost of ingredients will be the determining factors. Roughages are normally the least expensive and are considered first. The remaining requirements are met with concentrates. Requirements of goats are presented in Table 1 for:

1) Maintenance
2) Growth and live weight gain
3) Pregnancy
4) Milk production
5) Mohair production

Included with maintenance is a consideration of activity levels that are considered as part of "practical maintenance." These increased levels result from foraging activity, travel, and climbing. Perhaps more than any domestic animal species, goats vary in degree of activity with breed, location, management system, and climate. Thus, four different levels of requirements for "practical maintenance" are considered:

1) Maintenance only, including minimal activity
2) Maintenance plus low level activity
3) Maintenance plus medium level activity
4) Maintenance plus high level activity

The maintenance requirement used to calculate ration examples assumes a largely minimal level of activity, but appropriate rations for goats in more active circumstances can be computed from the respective data for other levels in Table 1. Feeds in the temperate regions will vary considerably from those in the tropics, but a few typical feeds have been selected. While alfalfa hay, corn, and soybean oilmeal may be fed frequently in the temperate regions, in the tropics one might use rather Guinea grass, Cassava chips, coconut cake, and fish meal. Roughages include browse, tree leaves, and crop residues; their voluntary intake will be affected by the dry matter contents. Nutrient contents for all ration ingredients can be extracted from Tables 2 and 3. Rations satisfying all requirements can be calculated not only for energy and protein demands, as in the examples below, but also for minerals and vitamins, as far as nutrient needs are known on a minimum or a challenge basis of supply. Chapter 2 gives additional details for the use of Table 1. Ration formulation examples are based on Tables 2 and 3, but in many instances the data are inadequate or needs have not yet been established specifically for goats. Fortunately, legume forages are good sources of most mineral elements required by goats. When high-quality legumes make up half or more of the roughage in a dairy goat ration, as may be often the case in temperate countries, most of the mineral requirements, except possibly selenium, may be met. The situation can be different in tropical countries where fodder grass, with or without tree leaves, rather than legumes is more commonly fed, and additional mineral needs have to be satisfied. With dependence on legumes, however, phosphorus and sodium may be deficient enough that supplementation will be necessary. The sodium requirement can usually be fulfilled by including 0.5 percent salt (sodium chloride) in the concentrate mixture, or by providing it *ad libitum* as granular salt or salt block.

When poor quality roughages including legumes, forages, and tree leaves are predominant in a ration, more extensive mineral supplementation with calcium, phosphorus, manganese, zinc, copper, iron, selenium, iodine, and cobalt is required. Where possible, all forages should be tested for their mineral content because extreme variation is common, particularly with tropical feedstuffs.

Users of the following ration examples should be aware that the suggested intake levels may not always be achieved in young kids and high-producing dairy goats, although intakes of more than 5 percent body weight have been reported (Haenlein, 1978b). Furthermore, it must be recognized that goats prefer selecting among and within various feed sources and that more forage is often needed in order to achieve the indicated net intake levels.

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1. EXAMPLE RATIONS FOR MAINTENANCE

A. *For a 30 kg goat in tropical areas in a nonproductive state with maintenance only and minimal activity.*
Total Requirements (from Table 1): 1.59 Mcal DE/day
51.0 g TP/day

Ration

	DM basis			As-fed basis		
Feeds	Amount (g)	DE (Mcal)	TP (g)	DM (%)	Amount (g)	% of ration
Chickpea (Gram), straw	620	1.36	33	91	681	65
Alfalfa, fresh	95	0.23	19	26	365	35
Total	715	1.59	52	—	1,046	100

Composition of ration: DE = 2.22 Mcal/kgDM
TP = 7.3% of DM
Level of intake (DM): 2.4% of body weight

B. *For a 50 kg goat in tropical areas in a nonproductive state with maintenance only and minimal activity.*
Total Requirements (from Table 1): 2.34 Mcal DE/day
75 g TP/day

Ration

	DM basis			As-fed basis		
Feeds	Amount (g)	DE (Mcal)	TP (g)	DM (%)	Amount (g)	% of ration
Wheat straw	716	1.40	26	89	804	30
Alexandrian clover (Berseem), fresh	333	0.94	56	18	1,850	70
Total	1,049	2.34	82	—	2,654	100

Composition of ration: DE = 2.23 Mcal/kg DM
TP = 7.8% of DM
Level of intake (DM): 2.1% of body weight

2. EXAMPLE RATIONS FOR LIVEWEIGHT GAIN

A. *For a 20 kg growing animal with minimal body activity gaining 50 g per day.*

Total Requirements (from Table 1)		
Maintenance	1.18 Mcal DE/day	38 g TP/day
Growth	0.44	14
Total	1.62	52

Ration

	DM basis			As-fed basis		
Feeds	Amount (g)	DE (Mcal)	TP (g)	DM (%)	Amount (g)	% of ration
Alfalfa hay, full bloom	80	0.19	14	19	88	18
Corn grain	360	1.44	38	87	414	82
Total	445	1.66	52	—	502	100

Composition of ration: DE = 3.73 Mcal/kg DM
TP = 11.7% of DM
Level of intake (DM): 2.2% of body weight

B. *For a 30 kg growing goat with minimal body activity gaining 150 g per day.*

Total Requirements (from Table 1)		
Maintenance	1.59 Mcal DE/day	51 g TP/day
Growth	1.32	42
Total	2.91	93

Ration

	DM basis			As-fed basis		
Feeds	Amount (g)	DE (Mcal)	TP (g)	DM (%)	Amount (g)	% of ration
Chickpea straw	500	1.10	26	91	549	51
Corn grain	400	1.60	42	87	460	42
Linseed oilmeal	65	0.23	25	90	72	7
Total	965	2.93	93	—	1,081	100

Composition of ration: DE = 3.03 Mcal/kg DM
TP = 9.6% of DM
Level of intake (DM): 3.2% of body weight

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3. EXAMPLE RATIONS FOR PREGNANT DOES

A. *For a 30 kg doe in late gestation and having minimal activity.*

Total Requirements (from Table 1)		
Maintenance	1.59 Mcal DE/day	51 g TP/day
Pregnancy	1.74	56
Total	3.33	107

Ration

	DM basis			As-fed basis		
Feeds	Amount (g)	DE (Mcal)	TP (g)	DM (%)	Amount (g)	% of ration
Wheat straw	500	0.98	18	89	562	25
Oat silage	365	1.00	35	30	1,216	55
Barley grain	400	1.44	53	90	444	20
Total	1,265	3.42	106	—	2,222	100

Composition of ration: DE = 2.70 Mcal/kg DM
TP = 8.4% of DM
Level of intake (DM): 4.2% of body weight

B. *For a 40 kg doe in late gestation and with minimal activity.*

Total Requirements (from Table 1)		
Maintenance	1.98 Mcal DE/day	63 g TP/day
Pregnancy	1.74	56
Total	3.72	119

Ration

	DM basis			As-fed basis		
Feeds	Amount (g)	DE (Mcal)	TP (g)	DM (%)	Amount (g)	% of ration
Johnsongrass hay, mature	960	2.36	91	91	1,055	73
Sorghum grain	350	1.35	40	89	393	27
Total	1,310	3.71	131	—	1,448	100

Composition of ration: DE = 2.83 Mcal/kg DM
TP = 10.0% of DM
Level of intake (DM): 3.3% of body weight

4. EXAMPLE RATIONS FOR LACTATING DOES

A. *For a 30 kg doe producing 1 kg of milk testing 4% fat and having minimal activity.*

Total Requirements (from Table 1)		
Maintenance	1.59 Mcal DE/day	51 g TP/day
Lactation	1.53	72
Total	3.12	123

Ration

	DM basis			As-fed basis		
Feeds	Amount (g)	DE (Mcal)	TP (g)	DM (%)	Amount (g)	% of ration
Alexandrian clover (Berseem), hay	500	1.42	76	88	568	49
Molasses, cane	200	0.70	12	74	270	23
Cassava chips	200	0.79	7	81	247	21
Peanut oil-meal	60	0.21	31	92	65	7
Total	960	3.12	126	—	1,150	100

Composition of ration: DE = 3.25 Mcal/kg DM
TP = 13.1% of DM
Level of intake (DM): 3.2% of body weight

B. *For a 70 kg goat producing 5 kg of milk testing 3.5% fat and with minimal activity.*

Total Requirements (from Table 1)		
Maintenance	3.01 Mcal DE/day	96 g TP/day
Lactation	7.55	340
Total	10.56	436

Ration

	DM basis			As-fed basis		
Feeds	Amount (g)	DE (Mcal)	TP (g)	DM (%)	Amount (g)	% of ration
Corn silage, dough stage	1,000	2.92	77	27	3,704	60
Alfalfa hay, full bloom	500	1.18	85	91	549	9
Corn grain	1,365	5.45	145	87	1,569	26
Soybean oilmeal	280	1.09	130	90	311	5
Total	3,145	10.64	437	—	6,133	100

Composition of ration: DE = 3.38 Mcal/kg DM
TP = 13.9% of DM
Level of intake (DM): 4.5% of body weight

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C. *For a 60 kg goat producing 6 kg of milk testing 3.5% fat and having a low level of activity.*

Total Requirements (from Table 1)		
Maintenance	3.35 Mcal DE/day	105 g TP/day
Lactation	9.06	408
Total	12.41	513

Ration

	DM basis			As-fed basis		
Feeds	Amount (g)	DE (Mcal)	TP (g)	DM (%)	Amount (g)	% of ration
Mixed grass hay	500	1.30	38	89	562	14
Corn grain	1,700	6.78	180	87	1,954	50
25% protein supplement	1,200	4.40	300	85	1,412	36
Total	3,400	12.48	518	—	3,928	100

Composition of ration: DE = 3.67 Mcal/kg DM
TP = 15.2% of DM
Level of intake (DM): 5.7% of body weight

5. EXAMPLE RATIONS FOR ANGORA GOATS

A. *For a 30 kg nonpregnant, nonlactating doe having medium activity and producing mohair at a rate of 4 kg per year.*

Total Requirements (from Table 1)		
Maintenance	2.38 Mcal DE/day	74 g TP/day
Mohair	0.15	17
Total	2.53	91

Ration

	DM basis			As-fed basis		
Feeds	Amount (g)	DE (Mcal)	TP (g)	DM (%)	Amount (g)	% of ration
Johnsongrass hay	600	1.44	46	91	659	67
Sorghum grain	252	0.97	29	89	283	29
Cottonseed oilmeal	34	0.13	16	90	38	4
Total	886	2.54	91	—	980	100

Composition of ration: DE = 2.87 Mcal/kg DM
TP = 10.3% of DM
Level of intake (DM): 3.0% of body weight

B. *For a 20 kg goat kid gaining 100 g/day, having low body activity and producing mohair at a rate of 2 kg per year.*

Total Requirements (from Table 1)		
Maintenance	1.47 Mcal DE/day	46 g TP/day
Growth	0.88	28
Mohair	0.07	9
Total	2.42	83

Ration

	DM basis			As-fed basis		
Feeds	Amount (g)	DE (Mcal)	TP (g)	DM (%)	Amount (g)	% of ration
Alfalfa hay, mature	250	0.59	33	91	275	32
Corn grain	441	1.76	47	87	507	60
Molasses, cane	50	0.17	3	74	68	8
Total	741	2.52	83	—	850	100

Composition of ration: DE = 3.40 Mcal/kg DM
TP = 11.2% of DM
Level of intake (DM): 3.7% of body weight

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C. *For a 40 kg pregnant doe having low body activity and producing mohair at a rate of 6 kg per year.*

Total Requirements (from Table 1)		
Maintenance	2.47 Mcal DE/day	77 g TP/day
Pregnancy	1.74	56
Mohair	0.22	26
Total	4.43	159

Ration

	DM basis			As-fed basis		
Feeds	Amount (g)	DE (Mcal)	TP (g)	DM (%)	Amount (g)	% of ration
Alfalfa hay, mature	700	1.66	93	91	769	48
Corn grain	630	2.51	67	87	724	46
Molasses, cane	75	0.26	4	74	101	6
Total	1,405	4.43	164	—	1,594	100

Composition of ration: DE = 3.15 Mcal/kg DM
TP = 11.7% of DM
Level of intake (DM): 3.5% of body weight

D. *For a 30 kg doe having high body activity, nursing at the rate of 1 kg of milk production of 4% fat per day, and producing mohair at a rate of 4 kg per year.*

Total Requirements (from Table 1)		
Maintenance	2.78 Mcal DE/day	74 g TP/day
Lactation	1.53	72
Mohair	0.07	9
Total	4.38	155

Ration

	DM basis			As-fed basis		
Feeds	Amount (g)	DE (Mcal)	TP (g)	DM (%)	Amount (g)	% of ration
Johnsongrass hay	400	0.98	30	91	440	28
Alfalfa hay, mature	400	0.95	53	91	440	28
Corn grain	600	2.39	64	87	690	42
Cottonseed oilmeal	20	0.08	9	91	22	2
Total	1,420	4.40	156	—	1,592	100

Composition of ration: DE = 3.1 Mcal/kg DM
TP = 11.0% of DM
Level of intake (DM): 4.7% of body weight

6. OTHER EXAMPLE RATIONS FOR GOATS IN TEMPERATE AND TROPICAL REGIONS AND FOR ANGORA GOATS

A. *Temperateregions*

Does: pregnant or dry

Example 1:
pasture plus good mixed hay and
0.5 kg of a 16% protein supplement

Example 2:
0.5 kg silage
0.5 kg mixed hay
0.3 kg beet pulp
0.5 kg 16% protein supplement

Example 3:
1.0 kg beets
0.5 kg alfalfa hay
0.5 kg beet pulp
0.5 kg 16% protein supplement

Does: lactating

Example 1:
1.5 kg clover hay
2.0 kg 14% protein supplement

Example 2:
1.5 kg grass legume hay
2.5 kg 16% protein supplement

Example 3:
0.5 kg mixed hay
2.5 kg corn silage
2.0 kg 18% protein supplement

Example 4:
3.0 kg roots, beets, carrots, steamed potatoes
1.5 kg mixed hay
0.25 kg beet pulp
0.5 kg oats straw
1.0 kg 14% protein supplement

Example 5:
2.0–4.0 kg green chop, pasture
1.5 kg sugar beet leaf silage
0.5 kg alfalfa hay
0.7 kg beet pulp
0.45 kg 14% protein supplement

Kids: nursing
Colostrumon the 1st day, 0.25 to 1.0 kg milk 2 to 3 times a day according to size for six to nine weeks, plus 16% protein supplement consisting of coarse grain, steamed rolled corn, oats, barley, pelleted alfalfa leaf meal, molasses (not more than 10%), and grass hays *ad libitum*
Kids: weaned and yearlings
Good mixed hay *ad libitum*, plus 0.25 to 0.75 kg of 16% protein supplement consisting of coarse grain mixtures and pasture
Bucks: breeding
(out of season)
Good hays *ad libitum* and pasture
(in season)
0.5 to 1.0 kg of a 14% protein supplement, plus mineral supplementation and salt, plus good hays and pasture

B. *Tropical regions*

Postweaning growth and meat production:

Example 1 (India):
50% cereal straw
30% corn grain
20% Alexandrian clover (Berseem), green

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Example 2 (India):
- 40% cereal straw
- 30% oat silage
- 25.5% corn grain
- 4.5% linseed oilmeal

Example 3 (Nigeria):
- 79.3% cassava flour
- 15.2% molasses
- 5.5% urea

Pregnant doe (India):
- 40% cereal straw
- 30% oat silage
- 23.5% barley grain
- 6.5% peanut oilmeal

Supplements for milk production (fed at pasture):

Example 1 (India):
- 45% corn grain
- 35% Alexandrian clover, (Berseem)
- 20% cereal straw

Example 2 (West Indies):
- 34% coconut meal cake
- 20% wheat middlings
- 20% molasses
- 15% citrus meal
- 10% soybean oilmeal
- 1% mineral mix

Example 3 (Malaysia):
- 40% wheat flour
- 34% rice bran
- 12% peanut oilmeal
- 10% coconut meal cake
- 2% molasses
- 2% mineral mix

Example 4 (Mexico):
- 44% sorghumgrain
- 37% corn grain
- 10% soybean oilmeal
- 6% molasses
- 1% urea
- 2% salt and mineral mix

C. *Angora goats*

Growing kids and yearlings:
- 32% alfalfa hay
- 28% cottonseed hulls
- 18% sorghumgrain
- 8% barley grain
- 6% molasses
- 6% cottonseed oilmeal
- 2% salt and mineral mix

Lactating does:
- 47% alfalfa hay
- 20% cottonseed hulls
- 15% sorghumgrain
- 8% barley grain
- 6% molasses
- 2% cottonseed oilmeal
- 2% salt and mineral mix

7. EXAMPLE PROTEIN SUPPLEMENTS (PERCENT OF RATION)

	Total protein content		
	14%	16%	18%
Corn grain	37	35	32
Oats grain	37	35	32
Wheat bran	16	14	15
Oilmeal, soybean, linseed	9	15	20
Dicalcium phosphate	0.5	0.5	0.5
Trace mineral salt	0.5	0.5	0.5
Total	100	100	100

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6

Nutrition-Related Metabolic Disorders

ABORTION

The goat is more susceptible to abortion than other species of domestic livestock. Most of the work relating to abortion in goats has been with the Angora (Van Heerden, 1963; Van Rensburg, 1971; Shelton and Groff, 1974), in which the problem is more severe. Infectious diseases such as brucellosis are also capable of causing abortion in goats (Alton, 1973). The fact that the goat is a *corpusluteum*-dependent species predisposes the animal to abort whenever there is an interference with a functional *corpus luteum* (Wentzel *et al.*, 1975). A low level of abortion is common with the Angora under normal production conditions, but catastrophic losses sometimes occur. Most abortions occur in response to stress between 90 and 110 days of gestation. Undernutrition during the critical stage of rapid fetal development and competition for nutrients between fetal and maternal organisms appear to be one explanation. The incidence of abortion is reduced in flocks in which replacement does are fed for proper size and development prior to the first breeding season and during gestation (Shelton and Stewart, 1973).

A series of studies from South Africa appears to provide a physiological explanation for the type of abortion observed in that country with the Angora. Parturition, either at or prior to term, is normally initiated by elevated corticosteroids of fetal or maternal origin (Wentzel and Roelofse, 1975). Two types of abortion have been identified in the Angora. One is known as stress abortion, which is triggered by low maternal blood glucose (Wentzel *et al.*, 1976). This type is normally induced by poor nutritional condition of the doe (Wentzel *et al.*, 1974), but other stress factors are also involved. Stress abortion is identified by the expulsion of a live of fresh fetus. Low maternal glucose appears to trigger hyper-activity of the fetal adrenal. The cause of abortion in the period 90–110 days of pregnancy is apparently explained by the fetal adrenal gland's producing elevated levels of estrogen precursors (Wentzel *et al*., 1976), and estrogens are known to be potent abortifacients (Wentzel *et al*., 1975). After 110 days the fetal adrenal is more mature and produces corticosteroids, which are slower acting or less potent abortifacients. A second type of abortion is that by the habitual aborter. These goats can be identified by a history of abortion, and by the expulsion of a dead edematous or autolyzed fetus. This type of abortion apparently results from maternal hyperadrenalism. Both types of abortion may be triggered by undernutrition resulting in low blood glucose. Initial or stress abortions can be almost totally prevented by adequate nutrition and the elimination of stress.

ENTEROTOXEMIA

It has been said with reason that it is impossible to manage a herd of good dairy goats without experiencing some incidence of enterotoxemia, also known as toxic indigestion or overeating disease (Guss, 1977). Diarrhea, depression, lack of coordination, digestive upsets, coma, and death may be observed after excessive feeding on the part of both baby kids and mature animals. Excessive feeding may occur after sudden changes in feeds; with access to palatable, readily fermentable feeds relished by hungry goats; and under conditions of calcium insufficiency and acidosis. Enterotoxemia is a toxic reaction to *Clostridium perfringens* type C or D, against which antitoxins and vaccination programs with toxoid or bacterins are effective. However, the best prevention in stable-fed goats is frequent feeding of milk, grain, and forage in small amounts. Large meals given once a day should be avoided. Changes of concentrates and forages in the ration should be introduced gradually over several days, especially when the protein or energy content of the diet is increased. When urea or other nonprotein nitrogen is to be part of the diet, then the gradual adaptation should take at least three weeks.

Acute indigestion with a rumen pH of less than 4.8 indicates lactic acidosis. It can follow high levels of grain feeding in early lactation and may lead to the secondary complication of enterotoxemia. Recent research with sheep and cattle on the sensitivity of *Streptococcus bovis*,

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the initiator of acute acidosis, to various antibiotics gives hope that powerful aids in the prevention of enterotoxemia may be available for goats (Muir *et al*., 1981).

KETOSIS

Ketosis is a metabolic disorder defined by increased levels of ketone bodies (acetone, betahydroxybutyric acid, and acetoacetic acid) in blood, milk, and urine, and is associated with elevated blood plasma nonesterified fatty acids (NEFA), which are precursors of ketone bodies. Lactation ketosis is observed primarily in high-producing dairy cows and to a lesser extent in dairy goats (Leach, 1971; Mackenzie, 1973; Schultz, 1974; Guss, 1977). Late-pregnancy ketosis is encountered in sheep and goats carrying multiple fetuses. Goats appear to be more resistant than cows or ewes to ketosis. Treatment is similar to that for cows: intravenous glucose, glucocorticoid steroids, adrenocorticotrophic hormone (ACTH) injections, oral drenching with sodium propionate, propylene glycol or chloral hydrate.

Experimentally, phlorizin injections in goats have simulated ketosis by causing glucosuria, hypoglycemia, ketonemia, and blood plasma NEFA level increases (Menahan, 1966). Forcing goats to go without food also results in increases of blood NEFA levels, especially in late pregnancy or during lactation. However, the fat depot is the ultimate source of ketosis, and dairy goats appear to lack the fat reserves of cows and other animals, which might explain why ketosis unusual in goats.

Increased ketogenesis has been produced by infusion of butyric acid into the rumen of goats with phlorizin-induced hypoglycemia; the condition was corrected by intravenous injections of glucose or propionate, or intraruminal administration of propionate (Menahan, 1966). Most ketogenesis was produced, however, from butyric acid infusion into the rumen in late pregnancy and when the goats were forced to fast.

Diabetes accompanied by elevated blood NEFA levels has also been simulated in goats by the administration of intravenous alloxan (Menahan, 1966). A glucose drain during late multiple pregnancy and heavy lactation is the triggering stimulus to lipolysis and ketogenesis. A feedback effect from ketonemia in the presence of insulin appears to prevent further increases of fat mobilization and may be important to the survival of the animal.

Increased plasma NEFA levels were a more sensitive indicator of undernutrition in goats than blood ketones or blood glucose levels (Radloff, 1964). Growth hormone, epinephrine, glucocorticoid steroids, and ACTH have direct effects on and relationships to blood ketone levels in goats.

PARTURIENT PARESIS (MILK FEVER)

The incidence of paralysis-type conditions of this metabolic hypocalcemic disorder differs among genetic groups of dairy cattle, but is also reported for other species, including goats (Littledike, 1974; Guss, 1977). However, it is not observed as frequently in goats as in cows. Signs and treatments are similar to those for cows. Prevention has been tried with different contents of calcium in the diet during the dry period, and with hormone treatment and vitamin D therapy, but no generally accepted management practice has evolved. Parturient paresis has been related to greatly increased mammary blood flow immediately after parturition (Reynolds, 1970).

The relationship of the kinetics of calcium pool size and calcium turnover rate to dietary phosphorus levels were studied and discussed by Twardock *et al*. (1970) and Anderson *et al*. (1970). It was noted that different dietary regimes of goats, including changed calcium-to-phosphorus ratios, had significant effects on the size and biological half-life of the readily exchangeable calcium pool. It was suggested that the response time of the parathyroid hormone and the removal of calcium from the so-called nonexchangeable bone pool was too slow for the immediate calcium needs of parturition and lactation onset in goats; and when the readily exchangeable calcium pool was inadequate to meet these needs, then parturient paresis resulted. A low or high calcium diet over time may be a predisposing factor for a reduced readily exchangeble calcium pool in goats. Dietary phosphorus levels influence the effects of such diets, and also the level of intestinal calcium absorption and available calcium in goats.

POSTHITIS

Posthitis, also known as sheathrot or pizzlerot, has been reported in male goats (Shelton and Livingston, 1975). This problem has been studied extensively in Merino wethers in Australia (Osborne and Widdows, 1961; McMillan and Southcott, 1973). The causative agents are thought to be a high protein ration in combination with the presence of a urea-hydrolyzing organism such as *Corynebacterium renale* (McMillan and Southcott, 1973; Barajas and Biberstein, 1974; Shelton and Livingston, 1975). The problem appears to be aggravated by confinement to areas where irritation or infection are more likely to occur. The problem is not likely to be a serious one with goats, except with mature Angora wethers kept for hair production. The problem may also occur with individual breeding bucks kept in confinement.

TOXIC PLANTS

The problem of poisonous plants is of great importance to owners of much of the world's goat population. It is not known, nor can it be inferred, that goats are either more or less susceptible to toxic plants than other animal species. However, their grazing habits and the environment under which many of them are kept place them in wider contact with toxic plants. Many goats are found in arid areas, and

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are noted for eating a variety of plants under these conditions. Many native forage species found under arid conditions have natural protective mechanisms, including toxic principals that retard evaporation and protect against livestock. Goats are thought to be less sensitive than cattle to the toxic effects of tannic acid. Goats can live for extended periods of time on oak species with high tannic acid, whereas cattle are very susceptible to this material (Dollahite, 1961). Goats are also not bothered by bitterweed (*Hymenoxys odorata*), which causes severe losses with sheep in some areas (Hardy *et al*. 1931). And goats have been used at times to reduce the availability of toxic plants to other animal species (Dollahite, 1972). Some references to toxic plants and their effects include Sperry *et al*. (1964), Kingsbury (1964), Lindahl (1972), and Keeler *et al*. (1978).

UREA TOXICITY

Urea is an important natural compound in the physiological processes of goats, but can be highly toxic if consumed in excess. Although most of the urea that is formed in the liver is excreted through the kidney, a portion passes into the rumen where it is hydrolyzed to ammonia and used by rumen microorganisms for protein synthesis (Vercoe, 1969; Hume *et al*., 1970). Therefore, urea is frequently included in ruminant diets to partially replace protein ingredients. Producers and feed formulators must exercise caution when feeding goats urea, since excessive amounts can result in a buildup of ammonia to toxic levels in the bloodstream (Morris and Payne, 1970; Kromann *et al*., 1971). It is recommended that urea supply no more than one-third of the total crude protein in forage or roughage-type diets and not more than one-half in the concentrate portion of the diet. Also, an adaptation period of at least three weeks is required for the animal to utilize urea efficiently. It is generally believed that 44 g/100 kg body weight at a single feeding will result in acute toxicity. Producers should assure that daily consumption levels at that rate do not occur.

UROLITHIASIS

Goats are known to be susceptible to urolithiasis (urinary calculi), and serious losses can occur when valuable breeding males are placed on calculogenic rations (Sato and Omori, 1977). It is not known whether they are more susceptible or less susceptible than other ruminant species or whether the predisposing factors are different. For the purpose of this discussion it will be assumed that goats do not differ from cattle or sheep with respect to calculus formation. Nutritional imbalances are generally considered the primary cause of stone formation, but infection has been identified as a predisposing factor with some species (Griffith *et al*., 1975). The problem is largely restricted to the male because his urinary tract is much more susceptible to blockage, and it is seem infrequently in grazing goats. The problem is important only in confined animals, which represent a small portion of the world's goat population but include some of the more valuable stud bucks. The chemistry of calculus formation is complex and is not completely understood. One of the more important predisposing factors is a high phosphorus content in the diet, or a content high relative to calcium or potassium content (Robbins *et al*., 1965; Hoar *et al*., 1970). In dry lot rations the potassium levels should be maintained at an adequate level and the calcium-to-phosphorus ratio should be maintained at 1.5:1 or greater. Additional protection may be obtained through the use of ration additives such as ammonium chloride (Crookshank, 1970) or potassium chloride (Shelton and Ellis, 1965; Crookshank, 1966), which will acidify the urine. If infection plays a part in calculus formation, it may be through its effect on pH of the urine. Using medication to combat infection with a view to preventing calculus formation is not generally recommended, but such an action may be a secondary benefit of using antibiotics in the ration for other reasons.

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Feed Composition Tables

Tables 2, 3, and 4 present the composition of feed ingredients. Nutrient concentrations are organized as follows:

Table 2: Dry matter; total digestible nutrients; digestible, metabolizable, and net energy; crude protein; digestible protein; plant cell wall constituents; and crude fiber

Table 3: Dry matter, minerals, and carotene content

Table 4: Composition of mineral supplements

In Tables 2, 3, and 4 animal feed names follow international nomenclature designed to give a qualitative description of each product, where such information is available and pertinent (NRC publications No. 1684 and No. 1919; Harris *et al*., 1980). Each feed description is followed by a 5-digit "International Feed Number" (IFN) for identification. A feed-class number placed in front of the international feed number identifies the class to which the feed has been assigned:

Class 1: Dry forages and roughages

This class includes all forages and roughages cut and cured, and other products with more than 18% crude fiber or containing more than 35% cell wall constituents (dry basis). Forages and roughages are usually low in net energy per unit weight because of the high cell wall content. Examples of dry forages and roughages are: hay, straw, fodder (aerial part with ears and husks for the corn plant, or aerial part with heads for the sorghum plant), stover (aerial part without ears or husks for the corn plant, or aerial part without heads for the sorghum plant), hulls, and pods.

Class 2: Pasture, range plants, and forages fed green

This class includes forages on the stem or cut and fed fresh (grasses, shrubs, tree leaves, browse, and forbs).

Class 3: Silages

This class includes ensiled forages (corn, alfalfa, grass, etc.)

Class 4: Energy feeds

This group includes products with less than 20% protein, and less than 18% crude fiber or less than 35% cell wall constituents. Included are grain; mill by-products; fruits; nuts; roots; and tubers, either fresh, dry, or ensiled.

Class 5: Protein supplements

This class includes products which contain 20% or more of protein from plant or animal origins.

Class 6: Mineral supplements

The feed names are listed by the scientific name; however, several feeds are listed by common name since they do not have scientific names: mountain meadow plants (Class 2); animal tallow, bleached, stabilized (Class 4); blood meal, spray dehydrated (Class 5); and meat, with bone meal rendered (Class 5). Table 5 gives an alphabetical list, under five feed classifications, of common and scientific names of the feeds.

Analytical data in Tables 2, 3, and 4 are expressed in the metric system and are on an as-fed and dry basis. Analytical data may differ in various NRC reports because the data are updated for each report. Individual feed samples may vary widely from averages in the table because of factors such as variety, climate, soil, and length of storage. The values given should be used with judgment and related, if possible, to analyses of critical nutrients for the feed on hand. It has not been possible in all cases to obtain data for goats on energy and protein values of feeds; therefore, sheep and cattle data have been used to fill in some information. In Tables 2 and 3, data obtained for goats are not marked. Sheep data are marked with a superior italic a(^{a}). Values marked with superior italic (^{b}) have been calculated from data for cows by using formulas shown below (Garrett 1976; Moe and Tyrrell, 1976):

$$\% \text{ TDN} = \% \text{ DOM} \div 1.05$$

$$\text{DE Mcal/kg} = \% \text{ TDN} \times 0.04409$$

$$\text{ME Mcal/kg} = 0.82 \times \text{DE Mcal/kg}$$

$$NE_m \text{ Mcal/kg} = 1.115 - 0.8971 \text{ ME} + 0.6507 \text{ ME}^2 - 0.1028 \text{ ME}^3 + 0.005725 \text{ ME}^4$$

$$NE_g \text{ Mcal/kg} = 3.178 \text{ ME} - 0.8646 \text{ ME}^2 + 0.1275 \text{ ME}^3 - 0.006787 \text{ ME}^4 - 3.325$$

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http://www.nap.edu/catalog/30.html

NE_l Mcal/kg = (0.0245 x % TDN) -0.12
DP = (0.933 x crude protein) -3.44 (Class 1 and 2 feeds)
DP = (0.908 x crude protein) -3.77 (Class 3 feeds)
DP = (0.916 x crude protein) -2.76 (Class 4 feeds)

International standards for vitamin A activity as related to vitamin A and beta-carotene are as follows:

1 IU vitamin A = 1 USP unit
= vitamin A activity of 0.300 microgram crystalline vitamin A alcohol
= vitamin A activity of 0.344 microgram vitamin A acetate
= vitamin A activity of 0.550 microgram vitamin A palmitate
1 IU vitamin A = 0.6 microgram beta-carotene
1 mg beta-carotene = 1667 IU vitamin A.

International standards for vitamin A are based on the utilization of vitamin A and beta-carotene by the rat. Since goats do not convert carotene to vitamin A in the same ratio as rats, it is suggested that the values in Table 3, when used in connection with the requirements in Table 1, be converted as follows:

1 mg carotene = 400 IU vitamin A.

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TABLE 2 Composition of Goat Feeds: Dry Matter; Total Digestible Nutrients; Digestible, Metabolizable, and Net Energy; Crude Protein and Digestible Protein; Plant Cell Wall Constituents; and Acid Detergent Fiber and Crude Fiber; Data Expressed As-Fed and Dry (100% Dry Matter)

Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Feed Energy						Protein		Cell Walls (%)	Acid Detergent Fiber (%)	Crude Fiber (%)
				TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Total (%)	Dig. (%)			
	DRY FORAGES AND ROUGHAGES													
	Agropyron desertorum. Wheatgrass, crested													
001	hay, sun-cured	1-05-418	93.0	49.0[a]	2.17[b]	1.78[a]	1.06[b]	0.37[b]	1.09[b]	11.5	7.5[b]	—	34.0	30.5
002			100.0	53.0[a]	2.34[b]	1.92[a]	1.14[a]	0.40[b]	1.18[b]	12.4	8.1[b]	—	36.0	32.9
	Agrostis alba. Redtop													
003	hay, sun-cured, full bloom	1-03-882	91.0	51.0[a]	2.24[b]	1.84[b]	1.10[b]	0.46[b]	1.14[b]	8.5	4.8[b]	—	—	28.2
004			100.0	56.0[a]	2.47[b]	2.03[b]	1.21[b]	0.51[b]	1.25[b]	9.4	5.3[b]	—	—	31.1
	Andropogon spp. Bluestem													
005	hay, sun-cured	1-00-819	90.0	41.0[a]	1.78[b]	1.46[b]	0.88[b]	0.05[b]	0.88[b]	4.9	1.4[b]	—	—	30.8
006			100.0	45.0[a]	1.98[b]	1.63[b]	0.98[b]	0.06[b]	0.98[b]	5.4	1.6[b]	—	—	34.3
	Arachis hypogaea. Peanut													
007	hay, sun-cured	1-03-619	91.0	50.0[a]	2.20[b]	1.81[b]	1.08[b]	0.43[b]	1.12[b]	9.8	6.0[b]	—	—	30.2
008			100.0	55.0[a]	2.43[b]	1.99[b]	1.19[b]	0.47[b]	1.23[b]	10.8	6.6[b]	—	—	33.2
009	hay with fruit, sun-cured	1-03-620	92.0	71.0[a]	3.15[b]	2.58[b]	1.66[b]	1.09[b]	1.64[b]	13.3	9.3[b]	—	—	22.8
010			100.0	78.0[a]	3.44[b]	2.82[b]	1.82[b]	1.19[b]	1.79[b]	14.5	10.1[b]	—	—	24.8
011	pods	1-08-028	91.0	20.0[a]	0.89[b]	0.73[b]	0.70[b]	0.00[b]	0.38[b]	7.1	3.5[b]	67.0	59.0	57.3
012			100.0	22.0[a]	0.97[b]	0.80[b]	0.76[b]	0.00[b]	0.42[b]	7.8	3.9[b]	74.0	65.0	62.9
013	straw	1-30-121	86.0	21.0	0.91[b]	0.75[b]	0.66[b]	0.00[b]	0.40[b]	5.7	0.8	—	—	57.2
014			100.0	24.0	1.06[b]	0.87[b]	0.76[b]	0.00[b]	0.47[b]	6.6	0.9	—	—	66.3
	Avena sativa. Oats													
015	hay, sun-cured	1-03-280	91.0	56.0[a]	2.46[b]	2.01[b]	1.22[b]	0.63[b]	1.26[b]	8.5	4.8[b]	60.0	33.0	27.8
016			100.0	61.0[a]	2.69[b]	2.21[b]	1.33[b]	0.69[b]	1.38[b]	9.3	5.3[b]	66.0	36.0	30.4
017	straw	1-03-283	92.0	46.0[a]	2.03[b]	1.67[b]	0.99[b]	0.25[b]	1.02[b]	4.1	0.6[b]	64.0	43.0	37.3
018			100.0	50.0[a]	2.21[b]	1.81[b]	1.07[b]	0.28[b]	1.11[b]	4.4	0.7[b]	70.0	47.0	40.5
	Brachiaria mutica. Paragrass													
019	hay, sun-cured	1-03-517	90.0	39.0[a]	1.70[b]	1.39[b]	0.84[b]	0.00[b]	0.84[b]	3.9	0.5[b]	—	—	31.9
020			100.0	43.0[a]	1.90[b]	1.56[b]	0.94[b]	0.00[b]	0.93[b]	4.3	0.6[b]	—	—	35.6
	Bromus inermis. Brome, smooth													
021	hay, sun-cured, early bloom	1-00-941	91.0	51.0[a]	2.25[b]	1.85[b]	1.10[b]	0.46[b]	1.14[b]	11.0	7.2[b]	56.0	31.0	28.4
022			100.0	56.0[a]	2.47[b]	2.03[b]	1.21[b]	0.51[b]	1.25[b]	12.1	7.8[b]	62.0	34.0	31.2
023	hay, sun-cured, mature	1-00-944	93.0	48.0[a]	2.12[b]	1.74[b]	1.03[b]	0.33[b]	1.07[b]	5.4	1.8[b]	65.0	42.0	29.8
024			100.0	52.0[a]	2.29[b]	1.88[b]	1.12[b]	0.36[b]	1.15[b]	5.8	2.0[b]	71.0	45.0	32.2
	Cajanus cajan. Pigeonpea													
025	straw	1-30-108	89.0	44.0	1.96[b]	1.61[b]	0.96[b]	0.25[b]	0.98[b]	9.5	3.9	—	—	25.5
026			100.0	50.0	2.21[b]	1.81[b]	1.07[b]	0.28[b]	1.11[b]	10.7	4.4	—	—	28.7
	Carthamus tinctorius. Safflower													
027	hay, sun-cured	1-30-127	85.0	58.0[a]	2.56[b]	2.10[b]	1.30[b]	0.78[b]	1.32[b]	10.9	9.0[c]	—	—	27.0
028			100.0	68.0[a]	3.00[b]	2.46[b]	1.52[b]	0.91[b]	1.55[b]	12.8	10.5[c]	—	—	31.7
	Cicer arietinum. Chickpea													
029	pods, sun-cured	1-27-149	95.0	47.0	2.05[b]	1.68[b]	1.00[b]	0.22[b]	1.03[b]	5.4	2.5	—	—	38.8
030			100.0	49.0	2.16[b]	1.77[b]	1.05[b]	0.23[b]	1.08[b]	5.7	2.6	—	—	40.8
031	straw	1-01-217	91.0	45.0	2.00[b]	1.64[b]	0.98[b]	0.25[b]	1.00[b]	4.8	0.8	—	—	38.8
032			100.0	50.0	2.21[b]	1.81[b]	1.07[b]	0.28[b]	1.11[b]	5.3	0.8	—	—	42.7

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Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Feed Energy						Protein		Cell Walls (%)	Acid Detergent Fiber (%)	Crude Fiber (%)
				TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Total (%)	Dig. (%)			
	Chloris gayana. Rhodesgrass													
033	hay, sun-cured, early	1-03-910	88.0	52.0[a]	2.29[b]	1.88[b]	1.13[b]	0.54[b]	1.17[b]	4.8	1.5[b]	—	—	—
034	vegetative		100.0	59.0[a]	2.60[b]	2.13[b]	1.28[b]	0.62[b]	1.33[b]	5.5	1.7[b]	—	—	—
035	hay, sun-cured, mature	1-03-911	93.0	51.0[a]	2.25[b]	1.85[b]	1.10[b]	0.44[b]	1.14[b]	5.5	1.9[b]	—	—	32.1
036			100.0	55.0[a]	2.43[b]	1.99[b]	1.19[b]	0.47[b]	1.23[b]	5.9	2.1[b]	—	—	34.6
	Cynodon dactylon. Bermudagrass													
037	hay, sun-cured	1-00-703	91.0	42.0	1.85[b]	1.52[b]	0.91[b]	0.10[b]	0.92[b]	8.9	4.2	—	—	27.8
038			100.0	46.0	2.03[b]	1.66[b]	0.99[b]	0.10[b]	1.01[b]	9.8	4.6	—	—	30.4
	Cynodon dactylon. Bermudagrass, coastal													
039	hay, sun-cured, early	1-00-713	94.0	57.0[a]	2.53[b]	2.07[b]	1.25[b]	0.64[b]	1.29[b]	15.0	10.8[b]	62.0	29.0	25.2
040	vegetative		100.0	61.0[a]	2.69[b]	2.21[b]	1.33[b]	0.69[b]	1.38[b]	16.0	11.5[b]	66.0	30.0	26.8
041	hay, sun-cured, late vegetative	1-20-900	91.0	50.0[a]	2.17[b]	1.78[b]	1.06[b]	0.40[b]	1.10[b]	15.0	10.9[b]	—	—	24.8
042			100.0	54.0[a]	2.38[b]	1.95[b]	1.16[b]	0.43[b]	1.20[b]	16.5	12.0[b]	—	—	27.3
	Dactylis glomerata. Orchardgrass													
043	hay, sun-cured, cut 1	1-03-433	92.0	55.0[a]	2.44[b]	2.00[b]	1.21[b]	0.60[b]	1.25[b]	13.9	9.8[b]	57.0	34.0	—
044			100.0	60.0[a]	2.65[b]	2.17[b]	1.31[b]	0.65[b]	1.35[b]	15.1	10.6[b]	62.0	37.0	—
045	hay, sun-cured, cut 2	1-03-434	89.0	57.0[a]	2.55[b]	2.09[b]	1.28[b]	0.73[b]	1.31[b]	11.3	7.5[b]	53.0	33.0	31.7
046			100.0	65.0[a]	2.87[b]	2.35[b]	1.44[b]	0.82[b]	1.47[b]	12.7	8.4[b]	60.0	37.0	35.6
	Digitaria decumbens, Pangolagrass													
047	hay, sun-cured, milk stage	1-03-490	88.0	45.0[a]	2.01[b]	1.65[b]	0.98[b]	0.31[b]	1.01[b]	8.4	4.8[b]	—	—	24.0
048			100.0	52.0[a]	2.29[b]	1.88[b]	1.12[b]	0.36[b]	1.15[b]	9.6	5.5[b]	—	—	27.4
	Echinochloa crusgalli. Barnyardgrass													
049	hay, sun-cured	1-03-105	88.0	46.0[a]	2.02[b]	1.65[b]	0.98[b]	0.31[b]	1.02[b]	7.7	4.2[b]	—	—	27.5
050			100.0	52.0[a]	2.29[b]	1.88[b]	1.12[b]	0.36[b]	1.15[b]	8.8	4.8[b]	—	—	31.3
	Eragrostis spp. Lovegrass													
051	hay, sun-cured, full bloom	1-02-644	92.0	51.0[a]	2.27[b]	1.86[b]	1.11[b]	0.47[b]	1.15[b]	7.8	4.1[b]	—	—	—
052			100.0	56.0[a]	2.47[b]	2.03[b]	1.21[b]	0.51[b]	1.25[b]	8.5	4.5[b]	—	—	—
	Festuca arundinacea. Fescue, Kentucky 31													
053	hay, sun-cured, early	1-09-186	91.0	56.0[a]	2.49[b]	2.04[b]	1.24[b]	0.65[b]	1.27[b]	18.4	14.1[b]	—	—	21.5
054	bloom		100.0	62.0[a]	2.73[b]	2.24[b]	1.36[b]	0.72[b]	1.40[b]	20.2	15.4[b]	—	—	23.6
	Glycine max. Soybean													
055	hay, sun-cured, midbloom	1-04-538	94.0	50.0[a]	2.19[b]	1.79[b]	1.07[b]	0.37[b]	1.10[b]	16.7	12.3[b]	—	—	27.9
056			100.0	53.0[a]	2.34[b]	1.92[b]	1.14[b]	0.40[b]	1.18[b]	17.8	13.2[b]	—	—	29.8
057	hay, sun-cured, mature	1-04-543	90.0	49.0[a]	2.15[b]	1.77[b]	1.05[b]	0.39[b]	1.09[b]	13.0	9.0[b]	—	—	32.4
058			100.0	54.0[a]	2.38[b]	1.95[b]	1.16[b]	0.43[b]	1.20[b]	14.4	10.0[b]	—	—	35.8
	Gossypium spp. Cotton													
059	gin by-product	1-08-413	90.0	42.0[a]	1.83[b]	1.50[b]	0.90[b]	0.09[b]	0.91[b]	6.7	3.1[b]	—	—	30.5
060			100.0	46.0[a]	2.03[b]	1.66[b]	0.99[b]	0.10[b]	1.01[b]	7.4	3.5[b]	—	—	33.8
061	hulls	1-01-599	91.0	41.0[a]	1.80[b]	1.47[b]	0.88[b]	0.05[b]	0.89[b]	3.7	0.3[b]	82.0	66.0	43.3
062			100.0	45.0[a]	1.98[b]	1.63[b]	0.98[b]	0.06[b]	0.98[b]	4.1	0.4[b]	90.0	73.0	47.8
	Hordeum vulgare. Barley													
063	hay, sun-cured, milk stage	1-00-490	84.0	43.0[a]	1.90[b]	1.55[b]	0.92[b]	0.27[b]	0.95[b]	7.1	3.7[b]	—	—	27.3

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Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Feed Energy						Protein		Cell Walls (%)	Acid Detergent Fiber (%)	Crude Fiber (%)
				TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Total (%)	Dig. (%)			
064			100.0	51.0[a]	2.25[b]	1.84[b]	1.10[b]	0.32[b]	1.13[b]	8.4	4.4[b]	—	—	32.4
065	straw	1-00-498	91.0	45.0[a]	1.97[b]	1.61[b]	0.96[b]	0.21[b]	0.99[b]	4.0	0.6[b]	73.0	54.0	38.3
066			100.0	49.0[a]	2.16[b]	1.77[b]	1.05[b]	0.23[b]	1.08[b]	4.3	0.6[b]	80.0	59.0	42.0
	Kochia spp. Summer cypress													
067	hay, sun-cured	1-04-713	92.0	50.0[a]	2.23[b]	1.83[b]	1.09[b]	0.43[b]	1.13[b]	12.6	8.6[b]	—	—	23.6
068			100.0	55.0[a]	2.43[b]	1.99[b]	1.19[b]	0.47[b]	1.23[b]	13.7	9.3[b]	—	—	25.7
	Lespedeza striata. Lespedeza, common													
069	hay, sun-cured, early bloom	1-20-882	91.0	54.0[a]	2.37[b]	1.94[b]	1.17[b]	0.56[b]	1.21[b]	13.7	9.6[b]	—	—	—
070			100.0	59.0[a]	2.60[b]	2.13[b]	1.28[b]	0.62[b]	1.33[b]	15.0	10.6[b]	—	—	—
071	hay, sun-cured, full bloom	1-20-887	89.0	52.0[a]	2.28[b]	1.87[b]	1.12[b]	0.52[b]	1.16[b]	12.8	8.8[b]	—	—	27.4
072			100.0	58.0[a]	2.56[b]	2.10[b]	1.26[b]	0.58[b]	1.30[b]	14.3	9.9[b]	—	—	30.7
	Lolium multiflorum. Ryegrass, Italian													
073	hay, sun-cured, early	1-04-064	89.0	61.0[a]	2.68[b]	2.20[b]	1.36[b]	0.81[b]	1.38[b]	13.6	9.6[b]	—	—	17.6
074	vegetative		100.0	68.0[a]	3.00[b]	2.46[b]	1.52[b]	0.91[b]	1.55[b]	15.2	10.7[b]	—	—	19.7
075	hay, sun-cured, late	1-04-065	86.0	53.0[a]	2.34[b]	1.92[b]	1.16[b]	0.62[b]	1.20[b]	8.8	5.3[b]	—	—	20.4
076	vegetative		100.0	62.0[a]	2.73[b]	2.24[b]	1.36[b]	0.72[b]	1.40[b]	10.3	6.2[b]	—	—	23.8
	Lotus corniculatus. Trefoil, birdsfoot													
077	hay, sun-cured, midbloom	1-20-790	91.0	57.0[a]	2.53[b]	2.07[b]	1.26[b]	0.68[b]	1.30[b]	13.2	9.2[b]	45.0	34.0	—
078			100.0	63.0[a]	2.78[b]	2.28[b]	1.39[b]	0.75[b]	1.42[b]	14.5	10.1[b]	50.0	38.0	—
	Medicago sativa. Alfalfa													
079	meal, 17% protein	1-00-023	92.0	56.0[a]	2.47[b]	2.02[b]	1.22[b]	0.63[b]	1.26[b]	17.3	13.0[b]	41.0	32.0	24.0
080			100.0	61.0[a]	2.69[b]	2.21[b]	1.33[b]	0.69[b]	1.38[b]	18.9	14.2[b]	45.0	35.0	26.2
081	hay, sun-cured, early	1-00-050	90.0	59.0[a]	2.62[b]	2.15[b]	1.32[b]	0.76[b]	1.35[b]	20.7	16.2[b]	34.0	23.0	18.4
082	vegetative		100.0	66.0[a]	2.91[b]	2.39[b]	1.47[b]	0.85[b]	1.50[b]	23.0	18.0[b]	38.0	26.0	20.5
083	hay, sun-cured, late	1-00-054	90.0	57.0[a]	2.49[b]	2.04[b]	1.24[b]	0.67[b]	1.28[b]	17.9	13.7[b]	36.0	25.0	22.4
084	vegetative		100.0	63.0[a]	2.78[b]	2.28[b]	1.39[b]	0.75[b]	1.42[b]	20.0	15.2[b]	40.0	28.0	25.0
085	hay, sun-cured, early bloom	1-00-059	90.0	54.0[a]	2.38[b]	1.95[b]	1.18[b]	0.59[b]	1.22[b]	16.2	12.0[b]	38.0	27.0	23.4
086			100.0	60.0[a]	2.65[b]	2.17[b]	1.31[b]	0.65[b]	1.35[b]	18.0	13.4[b]	42.0	30.0	26.0
087	hay, sun-cured, full bloom	1-00-068	90.0	50.0[a]	2.18[b]	1.79[b]	1.07[b]	0.43[b]	1.11[b]	13.5	9.5[b]	45.0	32.0	26.1
088			100.0	55.0[a]	2.43[b]	1.99[b]	1.19[b]	0.47[b]	1.23[b]	15.0	10.6[b]	50.0	36.0	29.0
089	hay, sun-cured, mature	1-00-071	91.0	49.0[a]	2.17[b]	1.78[b]	1.06[b]	0.40[b]	1.10[b]	11.7	7.8[b]	53.0	40.0	34.4
090			100.0	54.0[a]	2.38[b]	1.95[b]	1.16[b]	0.43[b]	1.20[b]	12.9	8.6[b]	58.0	44.0	37.7
	Oryza sativa. Rice													
091	straw	1-03-925	91.0	41.0	1.80[b]	1.47[b]	0.88[b]	0.05[b]	0.89[b]	4.0	0.6	—	—	32.0
092			100.0	45.0	1.98[b]	1.63[b]	0.98[b]	0.06[b]	0.98[b]	4.4	0.6	—	—	35.3
	Panicum maximum. Guinea-grass													
093	dehydrated pelleted, 15	1-30-084	92.0	53.0[a]	2.36[b]	1.93[b]	1.16[b]	0.54[b]	1.20[b]	15.4	—	—	—	26.0
094	to 28 days' growth		100.0	58.0[a]	2.56[b]	2.10[b]	1.26[b]	0.58[b]	1.30[b]	16.7	—	—	—	28.2
095	hay, sun-cured	1-02-336	89.0	45.0[a]	1.97[b]	1.61[b]	0.96[b]	0.25[b]	0.99[b]	6.3	2.8[b]	—	—	28.1
096			100.0	50.0[a]	2.21[b]	1.81[b]	1.07[b]	0.28[b]	1.11[b]	7.0	3.1[b]	—	—	31.5
	Paspalum dilatatum. Dallis-grass													
097	hay, sun-cured, midbloom	1-01-734	91.0	47.0[a]	2.04[b]	1.67[b]	0.99[b]	0.29[b]	1.02[b]	6.5	3.0[b]	—	—	29.1
098			100.0	51.0[a]	2.25[b]	1.84[b]	1.10[b]	0.32[b]	1.13[b]	7.2	3.3[b]	—	—	32.1

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Nutrient Requirements of Goats: Angora, Dairy, and Meat Goats in Temperate and Tropical Countries
http://www.nap.edu/catalog/30.html

Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Feed Energy						Protein		Cell Walls (%)	Acid Detergent Fiber (%)	Crude Fiber (%)
				TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Total (%)	Dig. (%)			
	Paspalum notatum. Bahiagrass													
099	hay, sun-cured	1-00-462	91.0	47.0[a]	2.05[b]	1.69[b]	1.00[b]	0.29[b]	1.03[b]	7.4	3.8[b]	66.0	37.0	29.2
100			100.0	51.0[a]	2.25[b]	1.84[b]	1.10[b]	0.32[b]	1.13[b]	8.2	4.2[b]	72.0	41.0	32.0
	Pennisetum purpureum. Napiergrass													
101	hay, sun-cured, dough stage	1-20-809	91.0	45.0[a]	1.96[b]	1.61[a]	0.96[b]	0.21[b]	0.98[b]	7.7	4.1[a]	59.0	40.0	30.5
102			100.0	49.0[a]	2.16[b]	1.77[b]	1.05[b]	0.23[b]	1.08[b]	8.5	4.5[b]	65.0	44.0	33.6
103	hay, sun-cured, mature	1-20-808	90.0	42.0[a]	1.87[b]	1.53[a]	0.91[b]	0.13[b]	0.93[b]	4.9	1.4[b]	58.0	42.0	29.4
104			100.0	47.0[a]	2.07[b]	1.70[b]	1.01[b]	0.15[b]	1.03[b]	5.4	1.6[b]	65.0	46.0	32.6
	Phalaris arundinacea. Canarygrass, reed													
105	hay, sun-cured	1-01-104	91.0	50.0[a]	2.21[b]	1.81[b]	1.08[b]	0.43[b]	1.12[b]	9.4	5.6[b]	58.0	33.0	30.1
106			100.0	55.0[a]	2.43[b]	1.99[b]	1.19[b]	0.47[b]	1.23[b]	10.3	6.2[b]	64.0	36.0	33.0
	Phleum pratense. Timothy													
107	hay, sun-cured, late	1-04-881	89.0	57.0[a]	2.52[b]	2.07[b]	1.26[b]	0.70[b]	1.29[b]	10.4	6.6[b]	49.0	27.0	24.1
108	vegetative		100.0	64.0[a]	2.82[b]	2.31[b]	1.41[b]	0.78[b]	1.45[b]	11.7	7.4[b]	55.0	30.0	27.0
109	hay, sun-cured, full bloom	1-04-884	89.0	51.0[a]	2.27[b]	1.86[b]	1.12[b]	0.52[b]	1.15[b]	6.8	3.3[b]	—	—	31.4
110			100.0	58.0[a]	2.56[b]	2.10[b]	1.26[b]	0.58[b]	1.30[b]	7.6	3.7[b]	—	—	35.4
	Pisum sativum sativum. Pea, garden													
111	pods, fresh	1-23-550	18.0	13.0[a]	0.56[b]	0.46[b]	0.29[b]	0.17[b]	0.29[b]	2.7	1.9	—	—	—
112			100.0	70.0[a]	3.09[b]	2.53[b]	1.58[b]	0.97[b]	1.60[b]	14.8	10.4	—	—	—
	Poa pratensis. Bluegrass, Kentucky													
113	hay, sun-cured	1-00-776	89.0	54.0[a]	2.40[b]	1.96[b]	1.19[b]	0.61[b]	1.22[b]	8.4	4.8[b]	—	—	27.6
114			100.0	61.0[a]	2.69[b]	2.21[b]	1.33[b]	0.69[b]	1.38[b]	9.4	5.4[b]	—	—	31.0
	Prosopis spicigera. Mesquite, spicigera													
115	hay, sun-cured	1-30-160	86.0	35.0	1.55[b]	1.27[b]	0.78[b]	0.00[b]	0.76[b]	12.2	3.9	—	—	18.9
116			100.0	41.0	1.81[b]	1.48[b]	0.91[b]	0.00[b]	0.89[b]	14.2	4.5	—	—	22.1
	Pueraria spp. Kudzu													
117	hay, sun-cured	1-02-478	91.0	50.0[a]	2.22[b]	1.82[b]	1.08[b]	0.43[b]	1.12[b]	13.1	9.1[b]	—	—	35.7
118			100.0	55.0[a]	2.43[b]	1.99[b]	1.19[b]	0.47[b]	1.23[b]	14.3	9.9[b]	—	—	39.1
	Saccharum officinarum. Sugarcane													
119	bagasse, dehydrated	1-04-686	91.0	44.0[a]	1.93[b]	1.59[b]	0.94[b]	0.17[b]	0.96[b]	1.5	0.0[b]	—	—	43.9
120			100.0	48.0[a]	2.12[b]	1.74[b]	1.03[b]	0.19[b]	1.06[b]	1.6	0.0[b]	—	—	48.1
	Secale cereale. Rye													
121	hay, sun-cured	1-04-004	93.0	43.0[a]	1.94[b]	1.59[b]	0.95[b]	0.14[b]	0.96[b]	7.9	4.2[b]	—	—	31.1
122			100.0	47.0[a]	2.07[b]	1.70[b]	1.01[b]	0.15[b]	1.03[b]	8.5	4.5[b]	—	—	33.3
123	straw	1-04-007	90.0	40.0[a]	1.74[b]	1.43[b]	0.86[b]	0.01[b]	0.86[b]	2.7	0.0[b]	—	—	38.7
124			100.0	44.0[a]	1.94[b]	1.59[b]	0.96[b]	0.01[b]	0.96[b]	3.0	0.0[b]	—	—	43.1
	Sorghum bicolor. Sorghum													
125	hay, sun-cured, full bloom	1-04-371	90.0	59.0	2.60[b]	2.14[b]	1.31[b]	0.76[b]	1.34[b]	4.7	2.8	—	—	25.9
126			100.0	66.0	2.91[b]	2.39[b]	1.47[b]	0.85[b]	1.50[b]	5.2	3.1	—	—	28.9
127	aerial part, sun-cured,	1-04-301	90.0	48.0[a]	2.11[b]	1.73[b]	1.03[b]	0.36[b]	1.06[b]	6.1	2.5[b]	—	—	25.2
128	mature		100.0	53.0[a]	2.34[b]	1.92[b]	1.14[b]	0.40[b]	1.18[b]	6.7	2.8[b]	—	—	28.0

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Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Feed Energy TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Protein Total (%)	Protein Dig. (%)	Cell Walls (%)	Acid Detergent Fiber (%)	Crude Fiber (%)
	Sorghum bicolor sudanense. Sorghum, Sudangrass													
129	hay, sun-cured, early	1-04-473	90.0	52.0[a]	2.30[b]	1.88[b]	1.13[b]	0.52[b]	1.17[b]	14.0	10.0[b]	47.0	26.0	23.0
130	vegetative		100.0	58.0[a]	2.56[b]	2.10[b]	1.26[b]	0.58[b]	1.30[b]	15.6	11.1[b]	53.0	29.0	25.6
131	hay, sun-cured, late	1-04-474	88.0	50.0[a]	2.21[b]	1.81[b]	1.08[b]	0.48[b]	1.12[b]	12.2	8.3[b]	52.0	29.0	28.0
132	vegetative		100.0	57.0[a]	2.51[b]	2.06[b]	1.23[b]	0.55[b]	1.28[b]	13.9	9.5[b]	60.0	33.0	31.9
	Sorghum halepense. Sorghum, Johnsongrass													
133	hay, sun-cured	1-04-407	89.0	47.0[a]	2.09[b]	1.71[b]	1.02[b]	0.35[b]	1.05[b]	8.5	4.8[b]	—	—	29.9
134			100.0	53.0[a]	2.34[b]	1.92[b]	1.14[b]	0.40[b]	1.18[b]	9.5	5.4[b]	—	—	33.5
	Trifolium alexandrinum. Clover, Egyptian													
135	hay, sun-cured	1-01-340	88.0	57.0	2.54[b]	2.08[b]	1.28[b]	0.72[b]	1.30[b]	13.4	9.3	—	—	23.0
136			100.0	65.0	2.87[b]	2.35[b]	1.44[b]	0.82[b]	1.47[b]	15.2	10.5	—	—	26.0
	Trifolium pratense. Clover, red													
137	hay, sun-cured	1-01-415	89.0	49.0[a]	2.15[b]	1.76[b]	1.05[b]	0.42[b]	1.09[b]	14.2	10.2[b]	50.0	—	25.5
138			100.0	55.0[a]	2.43[b]	1.99[b]	1.19[b]	0.47[b]	1.23[b]	16.0	11.5[b]	56.0	—	28.8
	Triticum aestivum. Wheat													
139	straw	1-05-175	89.0	39.0	1.72[b]	1.41[b]	0.85[b]	0.01[b]	0.85[b]	3.2	0.0[b]	75.0	48.0	36.9
140			100.0	44.0	1.94[b]	1.59[b]	0.96[b]	0.01[b]	0.96[b]	3.6	0.0[b]	85.0	54.0	41.6
	Vicia spp. Vetch													
141	hay, sun-cured	1-05-106	89.0	51.0[a]	2.24[b]	1.84[b]	1.10[b]	0.49[b]	1.14[b]	18.5	14.2[b]	43.0	30.0	27.3
142			100.0	57.0[a]	2.51[b]	2.06[b]	1.23[b]	0.55[b]	1.28[b]	20.8	15.9[b]	48.0	33.0	30.6
	Vigna sinensis. Cowpea, common													
143	hay, sun-cured	1-01-645	90.0	53.0[a]	2.34[b]	1.92[b]	1.15[b]	0.56[b]	1.19[b]	17.5	13.2[b]	—	—	24.0
144			100.0	59.0[a]	2.60[b]	2.13[b]	1.28[b]	0.62[b]	1.33[b]	19.4	14.7[b]	—	—	26.7
145	hay, sun-cured, mature	1-01-644	90.0	52.0[a]	2.31[b]	1.89[b]	1.13[b]	0.52[b]	1.17[b]	10.2	6.4[b]	—	—	30.7
146			100.0	58.0[a]	2.56[b]	2.10[b]	1.26[b]	0.58[b]	1.30[b]	11.3	7.1[b]	—	—	34.0
	Wood													
147	sawdust	1-07-714	90.0	80.0[a]	3.49[b]	2.86[b]	1.91[b]	1.30[b]	1.83[b]	0.3	0.0[b]	—	—	71.5
148			100.0	88.0[a]	3.88[b]	3.18[b]	2.12[b]	1.45[b]	2.04[b]	0.3	0.0[b]	—	—	79.5
	Zea mays. Corn													
149	cobs, ground	1-02-782	90.0	45.0[a]	1.99[b]	1.63[b]	0.97[b]	0.25[b]	1.00[b]	2.8	0.0[b]	80.0	32.0	32.7
150			100.0	50.0[a]	2.21[b]	1.81[b]	1.07[b]	0.28[b]	1.11[b]	3.2	0.0[b]	89.0	35.0	36.2
	Ziziphus nummularia. Jujube, wild													
151	hay, sun-cured	1-30-170	91.0	28.0[a]	1.24[b]	1.02[b]	0.72[b]	0.00[b]	0.58[b]	13.5	9.4[b]	—	—	14.2
152			100.0	31.0[a]	1.37[b]	1.12[b]	0.79[b]	0.00[b]	0.64[b]	14.8	10.4[b]	—	—	15.6
	PASTURE, RANGE PLANTS, AND FORAGES FED GREEN													
	Acacia catechu. Acacia, catechu													
153	leaves, fresh	2-30-132	30.0	6.0	0.25[b]	0.21[b]	0.23[b]	0.00[b]	0.10[b]	1.5	0.4	—	—	6.8
154			100.0	19.0	0.84[b]	0.69[b]	0.77[b]	0.00[b]	0.35[b]	5.0	1.2	—	—	22.6

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				TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Total (%)	Dig. (%)			
	Agave spp. Agave													
155	browse, fresh	2-00-014	12.0	7.0[c]	0.32[b]	0.27[b]	0.16[b]	0.08[b]	0.17[b]	0.8	0.3[b]	—	—	3.3
156			100.0	61.0[c]	2.69[b]	2.21[b]	1.33[b]	0.69[b]	1.38[b]	6.8	2.9[b]	—	—	27.3
	Agropyron desertorum. Wheatgrass, crested													
157	fresh, early vegetative	2-05-420	28.0	21.0[c]	0.92[b]	0.76[b]	0.48[b]	0.31[b]	0.48[b]	6.0	4.7[b]	—	—	6.2
158			100.0	75.0[c]	3.31[b]	2.71[b]	1.73[b]	1.11[b]	1.72[b]	21.5	16.7[b]	—	—	22.2
159	fresh, post ripe	2-05-428	80.0	39.0[c]	1.73[b]	1.42[b]	0.84[b]	0.19[b]	0.86[b]	2.5	0.0[b]	—	—	32.2
160			100.0	49.0[c]	2.16[b]	1.77[b]	1.05[b]	0.23[b]	1.08[b]	3.1	0.0[b]	—	—	40.3
	Agropyron smithii. Wheatgrass, western													
161	fresh, mature	2-05-407	63.0	31.0[c]	1.39[b]	1.14[b]	0.68[b]	0.17[b]	0.70[b]	3.3	0.9[b]	—	—	21.0
162			100.0	50.0[c]	2.21[b]	1.81[b]	1.07[b]	0.28[b]	1.11[b]	5.3	1.5[b]	—	—	33.3
	Agrostis alba. Redtop													
163	fresh, midbloom	2-03-890	39.0	24.0[c]	1.07[b]	0.87[b]	0.53[b]	0.28[b]	0.55[b]	2.9	1.4[b]	—	—	12.6
164			100.0	62.0[c]	2.73[b]	2.24[b]	1.36[b]	0.72[b]	1.40[b]	7.4	3.5[b]	—	—	32.3
165	fresh, mature	2-03-894	51.0	30.0[c]	1.33[b]	1.09[b]	0.65[b]	0.32[b]	0.68[b]	2.9	1.0[b]	—	—	14.5
166			100.0	59.0[c]	2.60[b]	2.13[b]	1.28[b]	0.62[b]	1.33[b]	5.7	1.9[b]	—	—	28.5
	Ailanthus excelsa. Ailanthus, excelsa													
167	browse, fresh	2-30-096	26.0	17.0	0.73[b]	0.60[b]	0.37[b]	0.20[b]	0.38[b]	4.2	3.4	—	—	5.7
168			100.0	64.0	2.82[b]	2.31[b]	1.41[b]	0.78[b]	1.45[b]	16.3	13.0	—	—	21.9
	Albizia lebbeck. Lebbeck tree													
169	leaves, fresh	2-25-615	17.0	8.0	0.36[b]	0.29[b]	0.17[b]	0.04[b]	0.18[b]	2.8	1.9	—	—	5.2
170			100.0	49.0	2.16[b]	1.77[b]	1.05[b]	0.23[b]	1.08[b]	16.8	11.6	—	—	31.5
	Ambrosia spp. Ragweed													
171	fresh, early vegetative	2-03-851	27.0	18.0[c]	0.79[b]	0.64[b]	0.40[b]	0.23[b]	0.41[b]	4.4	3.2[b]	—	—	5.3
172			100.0	67.0[c]	2.95[b]	2.42[b]	1.50[b]	0.88[b]	1.52[b]	16.7	12.1[b]	—	—	19.8
	Andropogon barbinodis. Bluestem, cane													
173	fresh, late vegetative	2-30-195	46.0	22.0[b]	0.97[b]	0.79[b]	0.47[b]	0.09[b]	0.48[b]	3.0	1.2[b]	32.0	—	—
174			100.0	48.0[b]	2.12[b]	1.74[b]	1.03[b]	0.19[b]	1.06[b]	6.5	2.6[b]	70.0	—	—
175	fresh, mature	2-30-057	89.0	41.0[b]	1.81[b]	1.48[b]	0.88[b]	0.09[b]	0.90[b]	2.7	0.0[b]	63.0	—	—
176			100.0	46.0[b]	2.03[b]	1.66[b]	0.99[b]	0.10[b]	1.01[b]	3.0	0.0[b]	71.0	—	—
	Andropogon scoparius. Bluestem, little													
177	fresh, late vegetative	2-29-994	72.0	40.0[b]	1.74[b]	1.43[b]	0.85[b]	0.34[b]	0.88[b]	6.1	3.2[b]	49.0	—	—
178			100.0	55.0[b]	2.43[b]	1.99[b]	1.19[b]	0.47[b]	1.23[b]	8.5	4.5[b]	68.0	—	—
	Anemone heterophylla. Anemone, heterophylla													
179	fresh, late vegetative	2-30-072	23.0	16.0[b]	0.68[b]	0.56[b]	0.35[b]	0.21[b]	0.35[b]	2.5	1.6[b]	6.0	—	—
180			100.0	68.0[b]	3.00[b]	2.46[b]	1.52[b]	0.91[b]	1.55[b]	11.0	6.8[b]	28.0	—	—
	Aristida oligantha. Threeawn, prairie													
181	fresh, mature	2-04-841	60.0	34.0[c]	1.51[b]	1.24[b]	0.74[b]	0.33[b]	0.77[b]	3.1	0.8[b]	—	—	18.8
182			100.0	57.0[c]	2.51[b]	2.06[b]	1.23[b]	0.55[b]	1.28[b]	5.2	1.4[b]	—	—	31.4

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Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Feed Energy						Protein		Cell Walls (%)	Acid Detergent Fiber (%)	Crude Fiber (%)
				TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Total (%)	Dig. (%)			
	Aristida wrightii. Threeawn, Wright													
183	fresh, late vegetative	2-30-016	63.0	26.0[b]	1.14[b]	0.93[b]	0.57[b]	0.00[b]	0.56[b]	4.3	1.9[b]	48.0	—	—
184			100.0	41.0[b]	1.81[b]	1.48[b]	0.91[b]	0.00[b]	0.89[b]	6.9	3.0[b]	76.0	—	—
	Artemisia filifolia. Sagebrush, sand													
185	browse, fresh, early	2-04-133	29.0	19.0[a]	0.84[b]	0.69[b]	0.42[b]	0.25[b]	0.43[b]	3.5	2.3[b]	—	—	6.5
186	vegetative		100.0	66.0[a]	2.91[b]	2.39[b]	1.47[b]	0.85[b]	1.50[b]	12.2	7.9[b]	—	—	22.6
187	browse, fresh, mature	2-04-135	45.0	27.0[a]	1.19[b]	0.98[b]	0.59[b]	0.29[b]	0.61[b]	3.2	1.5[b]	—	—	14.3
188			100.0	60.0[a]	2.65[b]	2.17[b]	1.31[b]	0.65[b]	1.35[b]	7.2	3.3[b]	—	—	31.7
	Artemisia ludoviciana albula. Sagebrush, Mexican													
189	browse, fresh, mature	2-30-052	44.0	21.0[b]	0.94[b]	0.77[b]	0.46[b]	0.10[b]	0.47[b]	4.4	2.6[b]	24.0	—	—
190			100.0	49.0[b]	2.16[b]	1.77[b]	1.05[b]	0.23[b]	1.08[b]	10.2	6.1[b]	56.0	—	—
	Aster spp. Aster													
191	fresh	2-00-443	32.0	21.0[a]	0.93[b]	0.76[b]	0.47[b]	0.27[b]	0.48[b]	2.7	1.4[b]	—	—	6.8
192			100.0	66.0[a]	2.91[b]	2.39[b]	1.47[b]	0.85[b]	1.50[b]	8.4	4.4[b]	—	—	21.1
	Astragalus nuttallii. Milkvetch, Nuttall													
193	fresh, early vegetative	2-29-814	28.0	18.0[b]	0.78[b]	0.64[b]	0.39[b]	0.21[b]	0.40[b]	4.2	2.9[b]	8.0	—	—
194			100.0	63.0[b]	2.78[b]	2.28[b]	1.39[b]	0.75[b]	1.42[b]	14.8	10.4[b]	30.0	—	—
	Atriplex confertifolia. Saltbush, shadscale													
195	browse, fresh, early	2-20-233	29.0	15.0[a]	0.65[b]	0.54[b]	0.32[b]	0.09[b]	0.33[b]	2.6	1.4[b]	—	—	8.3
196	vegetative		100.0	51.0[a]	2.25[b]	1.84[b]	1.10[b]	0.32[b]	1.13[b]	9.0	5.0[b]	—	—	28.5
197	browse, fresh, mature	2-20-453	56.0	29.0[a]	1.28[b]	1.05[b]	0.63[b]	0.20[b]	0.65[b]	3.4	1.2[b]	—	—	15.7
198			100.0	52.0[a]	2.29[b]	1.88[b]	1.12[b]	0.36[b]	1.15[b]	6.0	2.2[b]	—	—	28.0
	Avena sativa. Oats													
199	fresh	2-03-292	20.0	12.0[a]	0.55[b]	0.45[b]	0.27[b]	0.14[b]	0.28[b]	2.7	1.9[b]	—	—	6.0
200			100.0	62.0[a]	2.73[b]	2.24[b]	1.36[b]	0.72[b]	1.40[b]	13.6	9.3[b]	—	—	29.7
	Azadirachta indica. Margosa													
201	browse, fresh	2-30-147	21.0	14.0	0.61[b]	0.50[b]	0.31[b]	0.18[b]	0.32[b]	3.9	2.9	—	—	2.5
202			100.0	67.0	2.95[b]	2.42[b]	1.50[b]	0.88[b]	1.52[b]	18.7	13.8	—	—	11.9
203	leaves, fresh	2-27-194	20.0	4.0	0.19[b]	0.15[b]	0.15[b]	0.00[b]	0.08[b]	3.2	0.7	—	—	4.2
204			100.0	21.0	0.93[b]	0.76[b]	0.77[b]	0.00[b]	0.40[b]	16.1	3.4	—	—	20.7
	Bouteloua curtipendula. Grama, sideoats													
205	fresh, late vegetative	2-29-863	62.0	25.0[b]	1.12[b]	0.91[b]	0.56[b]	0.00[b]	0.55[b]	4.1	—	42.0	—	—
206			100.0	41.0[b]	1.81[b]	1.48[b]	0.91[b]	0.00[b]	0.89[b]	6.7	—	67.0	—	—
207	aerial part without heads,	2-30-042	78.0	24.0[b]	1.09[b]	0.90[b]	0.62[b]	0.00[b]	0.52[b]	3.7	—	52.0	—	—
208	fresh, mature		100.0	32.0[b]	1.41[b]	1.16[b]	0.80[b]	0.00[b]	0.66[b]	4.8	—	68.0	—	—
	Bouteloua hirsuta. Grama, hairy													
209	fresh, late vegetative	2-30-006	55.0	27.0[b]	1.21[b]	0.99[b]	0.59[b]	0.15[b]	0.60[b]	3.6	—	39.0	—	—
210			100.0	50.0[b]	2.21[b]	1.81[b]	1.07[b]	0.28[b]	1.11[b]	6.7	—	72.0	—	—

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Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Feed Energy TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Protein Total (%)	Protein Dig. (%)	Cell Walls (%)	Acid Detergent Fiber (%)	Crude Fiber (%)
	Brachiaria mutica. Paragrass													
211	fresh	2-03-525	28.0	14.0[a]	0.61[b]	0.50[b]	0.30[b]	0.08[b]	0.31[b]	1.9	0.9[a]	—	—	9.4
212			100.0	50.0[a]	2.21[b]	1.81[b]	1.07[b]	0.28[b]	1.11[b]	7.0	3.3[a]	—	—	33.9
	Brassica campestris. Rape, turnip													
213	fresh	2-03-872	15.0	9.0[a]	0.38[b]	0.31[b]	0.19[b]	0.09[b]	0.19[b]	1.3	0.7[b]	—	—	4.0
214			100.0	58.0[a]	2.56[b]	2.10[b]	1.26[b]	0.58[b]	1.30[b]	8.8	4.8[b]	—	—	26.6
	Brassica oleracea medullosa. Kale, marrow													
215	fresh, 71 to 84 days' growth	2-30-181	11.0	7.0[a]	0.30[b]	0.24[a]	0.15[b]	0.08[b]	0.15[b]	2.3	1.8[b]	—	—	0.9
216			100.0	61.0[a]	2.69[b]	2.21[b]	1.33[b]	0.69[b]	1.38[b]	20.8	16.0[b]	—	—	8.0
217	fresh, 99 to 112 days'	2-30-182	12.0	7.0[a]	0.32[b]	0.27[a]	0.16[b]	0.08[b]	0.17[b]	1.3	0.8[b]	—	—	2.1
218	growth		100.0	60.0[a]	2.65[b]	2.17[b]	1.31[b]	0.65[b]	1.35[b]	10.6	6.5[b]	—	—	17.2
219	leaves, fresh	2-02-457	16.0	12.0[a]	0.55[b]	0.45[b]	0.29[b]	0.19[b]	0.29[b]	2.5	1.8[b]	—	—	1.6
220			100.0	79.0[a]	3.48[b]	2.86[b]	1.85[b]	1.22[b]	1.82[b]	15.8	11.3[b]	—	—	10.5
221	stems, fresh	2-08-449	14.0	10.0[a]	0.44[b]	0.36[b]	0.23[a]	0.14[b]	0.23[b]	1.6	1.0[b]	—	—	3.2
222			100.0	72.0[a]	3.17[b]	2.60[b]	1.64[b]	1.03[b]	1.64[b]	11.4	7.2[b]	—	—	23.2
	Bromus catharticus. Brome, rescue													
223	fresh, late vegetative	2-08-362	33.0	21.0[b]	0.93[b]	0.76[b]	0.46[b]	0.26[b]	0.47[b]	4.4	3.0[b]	19.0	—	10.0
224			100.0	64.0[b]	2.82[b]	2.31[b]	1.41[b]	0.78[b]	1.45[b]	13.6	9.2[b]	57.0	—	30.7
	Buchloe dactyloides. Buffalograss													
225	fresh, late vegetative	2-29-868	61.0	21.0[b]	0.95[b]	0.78[b]	0.51[b]	0.00[b]	0.45[b]	4.7	2.3[b]	41.0	—	—
226			100.0	35.0[b]	1.54[b]	1.27[b]	0.83[b]	0.00[b]	0.74[b]	7.7	3.7[b]	67.0	—	—
227	fresh, mature	2-01-008	72.0	39.0[a]	1.72[b]	1.41[b]	0.84[b]	0.31[b]	0.87[b]	4.3	1.5[b]	—	—	22.2
228			100.0	54.0[a]	2.38[b]	1.95[b]	1.16[b]	0.43[b]	1.20[b]	5.9	2.1[b]	—	—	30.7
	Carex planostachys. Sedge, thicket													
229	fresh, late vegetative	2-29-865	39.0	19.0[b]	0.86[b]	0.71[b]	0.42[b]	0.11[b]	0.43[b]	4.6	3.0[b]	25.0	—	—
230			100.0	50.0[b]	2.21[b]	1.81[b]	1.07[b]	0.28[b]	1.11[b]	11.8	7.6[b]	63.0	—	—
	Carthamus tinctorius. Safflower													
231	fresh	2-28-574	15.0	9.0[a]	0.39[b]	0.32[b]	0.19[b]	0.09[b]	0.20[b]	2.4	1.7[b]	—	—	3.8
232			100.0	58.0[a]	2.56[b]	2.10[b]	1.26[b]	0.58[b]	1.30[b]	15.9	11.4[b]	—	—	25.0
233	leaves, fresh	2-30-129	16.0	10.0[a]	0.43[b]	0.35[b]	0.21[b]	0.11[b]	0.22[b]	4.5	3.7[b]	—	—	1.7
234			100.0	62.0[a]	2.73[b]	2.24[b]	1.36[b]	0.72[b]	1.40[b]	28.9	23.5[b]	—	—	10.9
235	stems, fresh	2-30-130	15.0	6.0[a]	0.28[b]	0.23[b]	0.14[b]	0.00[b]	0.14[b]	1.1	0.5[b]	—	—	6.1
236			100.0	41.0[a]	1.81[b]	1.48[b]	0.91[b]	0.00[b]	0.89[b]	7.4	3.5[b]	—	—	39.8
	Celtis reticulata. Hackberry, netleaf													
237	leaves, fresh	2-30-045	56.0	24.0[b]	1.05[b]	0.86[b]	0.52[b]	0.00[b]	0.52[b]	4.3	2.1[b]	14.0	—	—
238			100.0	43.0[b]	1.90[b]	1.56[b]	0.94[b]	0.00[b]	0.93[b]	7.8	3.8[b]	26.0	—	—
	Celtis tetendra. Hackberry, tetendra													
239	browse, fresh, mature	2-30-164	53.0	21.0[a]	0.95[b]	0.78[b]	0.48[b]	0.00[b]	0.46[b]	7.4	5.1[b]	—	—	8.7
240			100.0	41.0[a]	1.81[b]	1.48[b]	0.91[b]	0.00[b]	0.89[b]	14.0	9.6[b]	—	—	16.6

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				TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Total (%)	Dig. (%)			
	Cenchrus ciliaris. Buffelgrass													
241	fresh	2-10-360	32.0	13.0[a]	0.56[b]	0.46[b]	0.29[b]	0.00[b]	0.28[b]	1.8	0.5[b]	—	—	10.8
242			100.0	40.0[a]	1.76[b]	1.45[b]	0.89[b]	0.00[b]	0.86[b]	5.5	1.7[b]	—	—	33.9
	Cenchrus spp. Sandbur													
243	fresh, early bloom	2-04-177	20.0	14.0[a]	0.60[b]	0.49[b]	0.31[b]	0.18[b]	0.31[b]	2.1	1.2[b]	—	—	7.6
244			100.0	68.0[a]	3.00[b]	2.46[b]	1.52[b]	0.91[b]	1.55[b]	10.3	6.2[b]	—	—	37.8
	Chloris spp. Windmillgrass													
245	fresh	2-05-479	20.0	11.0[a]	0.49[b]	0.41[b]	0.24[b]	0.10[b]	0.25[b]	1.8	1.0[b]	—	—	5.8
246			100.0	56.0[a]	2.47[b]	2.03[b]	1.21[b]	0.51[b]	1.25[b]	9.1	5.1[b]	—	—	29.2
	Cichorium intybus. Chicory, Bluedaisy													
247	leaves, fresh	2-19-486	23.0	11.0	0.49[b]	0.40[b]	0.24[b]	0.04[b]	0.24[b]	5.0	4.2	—	—	2.5
248			100.0	48.0	2.12[b]	1.74[b]	1.03[b]	0.19[b]	1.06[b]	21.8	18.3	—	—	11.0
	Commelina spp. Dayflower													
249	fresh, late vegetative	2-30-040	17.0	8.0[b]	0.36[b]	0.29[b]	0.18[b]	0.04[b]	0.18[b]	2.0	1.3[b]	7.0	—	—
250			100.0	49.0[b]	2.16[b]	1.77[b]	1.05[b]	0.23[b]	1.08[b]	11.9	7.7[b]	41.0	—	—
	Crotalaria juncea. Crotalaria, Sunn													
251	fresh	2-13-955	20.0	12.0	0.55[b]	0.45[b]	0.27[b]	0.14[b]	0.28[b]	1.2	0.2	—	—	2.1
252			100.0	62.0	2.73[b]	2.24[b]	1.36[b]	0.72[b]	1.40[b]	6.0	0.8	—	—	10.5
	Croton spp. Croton													
253	browse, fresh	2-01-694	40.0	27.0[a]	1.18[b]	0.97[b]	0.60[b]	0.35[b]	0.61[b]	6.4	4.6[b]	—	—	9.2
254			100.0	67.0[a]	2.95[b]	2.42[b]	1.50[b]	0.88[b]	1.52[b]	16.0	11.5[b]	—	—	23.0
	Cucurbita foetidissima. Buffalogourd													
255	leaves, fresh	2-30-038	23.0	11.0[b]	0.49[b]	0.40[b]	0.24[b]	0.05[b]	0.24[b]	4.5	3.4[b]	4.0	—	—
256			100.0	49.0[b]	2.16[b]	1.77[b]	1.05[b]	0.23[b]	1.08[b]	19.9	15.2[b]	19.0	—	—
	Cyamopsis tetragonoloba. Guar													
257	fresh	2-02-333	26.0	16.0	0.72[b]	0.59[b]	0.36[b]	0.20[b]	0.37[b]	4.2	3.0	—	—	7.0
258			100.0	64.0	2.82[b]	2.31[b]	1.41[b]	0.78[b]	1.45[b]	16.4	11.8	—	—	27.4
	Cynodon dactylon. Bermudagrass													
259	fresh	2-00-712	34.0	20.0[a]	0.89[b]	0.73[b]	0.44[b]	0.22[b]	0.45[b]	4.1	2.6[b]	—	—	8.9
260			100.0	60.0[a]	2.65[b]	2.17[b]	1.31[b]	0.65[b]	1.35[b]	12.0	7.8[b]	—	—	26.4
261	fresh, late vegetative	2-10-131	38.0	23.0	1.03[b]	0.84[b]	0.51[b]	0.26[b]	0.53[b]	4.5	2.9[b]	24.0	—	—
262			100.0	61.0	2.69[b]	2.21[b]	1.33[b]	0.69[b]	1.38[b]	11.8	7.6[b]	64.0	—	—
	Dactylis glomerata. Orchardgrass													
263	fresh, early bloom	2-03-442	25.0	16.0[a]	0.72[b]	0.59[b]	0.36[b]	0.21[b]	0.37[b]	2.9	1.9[b]	13.0	8.0	7.9
264			100.0	66.0[a]	2.91[b]	2.39[b]	1.47[b]	0.85[b]	1.50[b]	11.8	7.6[b]	54.0	31.0	32.0
	Dactyloctenium aegyptium. Crowfootgrass, Durban													
265	fresh	2-21-442	17.0	11.0[a]	0.51[b]	0.42[b]	0.26[b]	0.16[b]	0.26[b]	2.3	1.6[b]	—	—	4.7
266			100.0	69.0[a]	3.04[b]	2.50[b]	1.55[b]	0.94[b]	1.57[b]	13.8	9.4[b]	—	—	28.0

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Nutrient Requirements of Goats: Angora, Dairy, and Meat Goats in Temperate and Tropical Countries
http://www.nap.edu/catalog/30.html

Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Feed Energy						Protein		Cell Walls (%)	Acid Detergent Fiber (%)	Crude Fiber (%)
				TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Total (%)	Dig. (%)			
	Dalbergia sissoo. Dalbergia, sissoo													
267	pods, fresh	2-30-174	17.0	4.0	0.16[b]	0.13[b]	0.13[b]	0.00[b]	0.07[b]	2.8	0.6	—	—	4.1
268			100.0	21.0	0.93[b]	0.76[b]	0.77[b]	0.00[b]	0.40[b]	16.2	3.7	—	—	24.2
	Dalea formosa. Dalea, feather													
269	browse, fresh, early	2-29-844	40.0	22.0[b]	0.95[b]	0.78[b]	0.47[b]	0.17[b]	0.48[b]	6.8	—	18.0	—	—
270	vegetative		100.0	54.0[b]	2.38[b]	1.95[b]	1.16[b]	0.43[b]	1.20[b]	17.1	—	46.0	—	—
	Dasylirion texanum. Sotol, Texas													
271	leaves, fresh	2-04-528	57.0	33.0[a]	1.46[b]	1.20[b]	0.72[b]	0.33[b]	0.74[b]	4.0	1.8[b]	—	—	22.2
272			100.0	58.0[a]	2.56[b]	2.10[b]	1.26[b]	0.58[b]	1.30[b]	7.1	3.2[b]	—	—	39.0
	Digera aneensis. Digera, aneensis													
273	fresh	2-30-149	13.0	9.0[a]	0.40[b]	0.33[b]	0.21[b]	0.13[b]	0.21[b]	3.7	3.0[b]	—	—	2.4
274			100.0	72.0[a]	3.17[b]	2.60[b]	1.64[b]	1.03[b]	1.64[b]	29.0	23.6[b]	—	—	18.9
	Diospyros texana. Persimmon, Texas													
275	leaves, fresh	2-29-858	48.0	26.0[b]	1.14[b]	0.94[b]	0.56[b]	0.21[b]	0.58[b]	5.7	3.6[b]	17.0	—	—
276			100.0	54.0[b]	2.38[b]	1.95[b]	1.16[b]	0.43[b]	1.20[b]	11.8	7.6[b]	36.0	—	—
	Echinochloa crusgalli. Barnyardgrass													
277	fresh	2-03-108	21.0	13.0[a]	0.55[b]	0.45[b]	0.28[b]	0.14[b]	0.28[b]	1.6	0.8[b]	—	—	5.9
278			100.0	61.0[a]	2.69[b]	2.21[b]	1.33[b]	0.69[b]	1.38[b]	8.0	4.0[b]	—	—	28.7
	Elymus canadensis. Wildrye, Canada													
279	fresh, late vegetative	2-29-848	48.0	22.0[b]	0.98[b]	0.80[b]	0.48[b]	0.05[b]	0.49[b]	4.1	2.2[b]	31.0	—	—
280			100.0	46.0[b]	2.03[b]	1.66[b]	0.99[b]	0.10[b]	1.01[b]	8.5	4.5[b]	64.0	—	—
	Elymus junceus. Wildrye, Russian													
281	fresh	2-05-469	33.0	22.0[a]	0.96[b]	0.79[b]	0.49[b]	0.28[b]	0.49[b]	4.7	3.2[b]	—	—	7.4
282			100.0	66.0[a]	2.91[b]	2.39[b]	1.47[b]	0.85[b]	1.50[b]	14.1	9.7[b]	—	—	22.4
	Engelmannia pinnatifida. Engelmann daisy													
283	fresh	2-29-879	30.0	13.0[b]	0.56[b]	0.46[b]	0.28[b]	0.00[b]	0.27[b]	2.8	1.5[b]	15.0	—	—
284			100.0	42.0[b]	1.85[b]	1.52[b]	0.92[b]	0.00[b]	0.91[b]	9.2	5.1[b]	49.0	—	—
	Eriochloa sericea. Cupgrass, Texas													
285	fresh, late vegetative	2-29-996	40.0	15.0[b]	0.67[b]	0.55[b]	0.34[b]	0.00[b]	0.32[b]	3.1	1.5[b]	27.0	—	—
286			100.0	38.0[b]	1.68[b]	1.37[b]	0.87[b]	0.00[b]	0.81[b]	7.8	3.8[b]	69.0	—	—
287	fresh, mature	2-30-059	83.0	25.0[b]	1.10[b]	0.90[b]	0.65[b]	0.00[b]	0.51[b]	4.1	1.0[b]	58.0	—	—
288			100.0	30.0[b]	1.32[b]	1.09[b]	0.78[b]	0.00[b]	0.62[b]	5.0	1.2[b]	70.0	—	—
	Eurotia lanata. Winterfat, common													
289	fresh, early vegetative	2-05-489	30.0	19.0[a]	0.85[b]	0.69[b]	0.42[b]	0.24[b]	0.43[b]	6.3	4.8[b]	—	—	7.8
290			100.0	64.0[a]	2.82[b]	2.31[b]	1.41[b]	0.78[b]	1.45[b]	21.0	16.2[b]	—	—	26.0

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Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Feed Energy						Protein		Cell Walls (%)	Acid Detergent Fiber (%)	Crude Fiber (%)
				TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Total (%)	Dig. (%)			
291	fresh, stem-cured	2-26-142	80.0	28.0[a]	1.24[b]	1.01[b]	0.66[b]	0.00[b]	0.59[b]	8.7	5.3[b]	58.0	35.0	—
292			100.0	35.0[a]	1.54[b]	1.27[b]	0.83[b]	0.00[b]	0.74[b]	10.8	6.7[b]	72.0	44.0	—
	Evax prolifera. Evax, prolifera													
293	fresh, early vegetative	2-30-068	38.0	18.0[b]	0.78[b]	0.64[b]	0.38[b]	0.04[b]	0.39[b]	4.6	3.0[b]	16.0	—	—
294			100.0	46.0[b]	2.03[b]	1.66[b]	0.99[b]	0.10[b]	1.01[b]	12.0	7.8[b]	42.0	—	—
	Ficus benghalensis. Banyantree													
295	leaves, fresh	2-27-208	32.0	16.0	0.72[b]	0.59[b]	0.35[b]	0.10[b]	0.36[b]	3.1	1.3	—	—	8.7
296			100.0	51.0	2.25[b]	1.84[b]	1.10[b]	0.32[b]	1.13[b]	9.6	4.1	—	—	27.0
	Ficus glomerata. Fig, cluster													
297	leaves, fresh	2-27-209	30.0	16.0	0.71[b]	0.59[b]	0.35[b]	0.13[b]	0.36[b]	3.4	2.0	—	—	3.7
298			100.0	54.0	2.38[b]	1.95[b]	1.16[b]	0.43[b]	1.20[b]	11.2	6.7[b]	—	—	12.3
	Ficus religiosa. Peepultree													
299	leaves, fresh	2-27-207	17.0	6.0	0.27[b]	0.22[b]	0.14[b]	0.00[b]	0.13[b]	2.4	1.3	—	—	3.8
300			100.0	36.0	1.59[b]	1.30[b]	0.84[b]	0.00[b]	0.76[b]	14.0	7.6	—	—	22.4
	Ficus roxburghii. Fig, Roxburgh													
301	fresh	2-30-177	33.0	19.0[c]	0.84[b]	0.69[b]	0.41[b]	0.18[b]	0.43[b]	4.5	2.1[a]	—	—	2.6
302			100.0	57.0[c]	2.51[b]	2.06[b]	1.23[b]	0.55[b]	1.28[b]	13.4	6.2[a]	—	—	7.7
	Ficus virens. Fig, spotted													
303	leaves, fresh	2-28-704	15.0	9.0	0.42[b]	0.34[b]	0.21[b]	0.11[b]	0.21[b]	1.7	1.0	—	—	4.2
304			100.0	62.0	2.73[b]	2.24[b]	1.36[b]	0.72[b]	1.40[b]	11.2	6.3	—	—	27.7
	Forestiera pubescens. Forestiera, downy													
305	browse, fresh, late	2-29-837	38.0	29.0[b]	1.26[b]	1.03[b]	0.66[b]	0.42[b]	0.65[b]	4.9	—	11.0	—	—
306	vegetative		100.0	75.0[b]	3.31[b]	2.71[b]	1.73[b]	1.11[b]	1.72[b]	12.9	—	30.0	—	—
	Grewia oppositifolia roxburghii. Grewia, oppositifolia, roxburghii													
307	browse, fresh	2-30-097	33.0	7.0[a]	0.29[b]	0.24[b]	0.25[b]	0.00[b]	0.12[b]	6.5	1.7[a]	—	—	6.5
308			100.0	20.0[a]	0.88[b]	0.72[b]	0.77[b]	0.00[b]	0.37[b]	19.7	5.1[a]	—	—	19.8
	Gutierrezia texana. Snakeweed, Texas													
309	fresh, late vegetative	2-04-245	30.0	14.0[c]	0.61[b]	0.50[b]	0.30[b]	0.03[b]	0.30[b]	4.4	3.1[a]	—	—	5.7
310			100.0	46.0[c]	2.03[b]	1.66[b]	0.99[b]	0.10[b]	1.01[b]	14.7	10.3[b]	—	—	19.0
	Gymnosperia spinosa. Gymnosperia, spinosa													
311	leaves, fresh	2-30-124	18.0	11.0	0.50[b]	0.41[b]	0.25[b]	0.14[b]	0.26[b]	1.7	1.1	—	—	2.8
312			100.0	63.0	2.78[b]	2.28[b]	1.39[b]	0.75[b]	1.42[b]	9.4	6.1	—	—	15.3
	Helianthus spp. Sunflower													
313	fresh, late vegetative	2-04-722	12.0	7.0[c]	0.33[b]	0.27[b]	0.16[b]	0.09[b]	0.17[b]	1.0	0.5[b]	—	—	3.9
314			100.0	64.0[c]	2.82[b]	2.31[b]	1.41[b]	0.78[b]	1.45[b]	8.3	4.3[b]	—	—	34.2

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Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Feed Energy TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Protein Total (%)	Protein Dig. (%)	Cell Walls (%)	Acid Detergent Fiber (%)	Crude Fiber (%)
	Hilaria belangeri. Curly mesquite													
315	browse, fresh, early	2-01-723	23.0	14.0[a]	0.60[b]	0.49[b]	0.30[b]	0.14[b]	0.31[b]	4.0	2.9[b]	—	—	5.9
316	vegetative		100.0	59.0[a]	2.60[b]	2.13[b]	1.28[b]	0.62[b]	1.33[b]	17.2	12.6[b]	—	—	25.6
	Hordeum vulgare. Barley													
317	fresh	2-00-511	21.0	13.0[a]	0.59[b]	0.49[b]	0.30[b]	0.16[b]	0.30[b]	4.3	3.3[b]	—	—	4.7
318			100.0	63.0[a]	2.78[b]	2.28[b]	1.39[b]	0.75[b]	1.42[b]	20.4	15.5[b]	—	—	22.1
	Juniperus ashei. Juniper, ashe													
319	leaves, fresh	2-29-850	52.0	33.0[b]	1.45[b]	1.19[b]	0.73[b]	0.40[b]	0.75[b]	3.3	1.4[b]	18.0	—	—
320			100.0	64.0[b]	2.82[b]	2.31[b]	1.41[b]	0.78[b]	1.45[b]	6.5	2.6[b]	34.0	—	—
	Juniperus pinchotii. Juniper, redberry													
321	leaves, fresh	2-29-851	53.0	32.0[b]	1.39[b]	1.14[b]	0.69[b]	0.34[b]	0.71[b]	3.9	1.9[b]	19.0	—	—
322			100.0	60.0[b]	2.65[b]	2.17[b]	1.31[b]	0.65[b]	1.35[b]	7.5	3.5[b]	35.0	—	—
	Kochia vestita. Summer-cypress, gray													
323	fresh, mature	2-08-844	65.0	36.0[a]	1.61[b]	1.32[b]	0.79[b]	0.33[b]	0.81[b]	5.9	3.2[b]	—	—	15.6
324			100.0	56.0[a]	2.47[b]	2.03[b]	1.21[b]	0.51[b]	1.25[b]	9.0	5.0[b]	—	—	24.0
	Lactuca sativa. Lettuce													
325	fresh	2-02-624	5.0	4.0[a]	0.17[b]	0.14[b]	0.09[b]	0.05[b]	0.09[b]	1.2	0.9[b]	—	—	0.6
326			100.0	70.0[a]	3.09[b]	2.53[b]	1.58[b]	0.97[b]	1.60[b]	22.0	17.0[b]	—	—	11.2
	Lasiurus sindicus. Lasiurus, sindicus													
327	fresh	2-30-173	22.0	9.0	0.40[b]	0.33[b]	0.20[b]	0.00[b]	0.20[b]	1.3	0.7	—	—	8.4
328			100.0	41.0	1.81[b]	1.48[b]	0.91[b]	0.00[b]	0.89[b]	6.0	3.0	—	—	38.0
	Lepidium spp. Pepperweed													
329	fresh, late vegetative	2-03-686	42.0	23.0[b]	1.01[b]	0.83[b]	0.49[b]	0.18[b]	0.51[b]	9.1	7.0[b]	19.0	—	5.0
330			100.0	54.0[b]	2.38[b]	1.95[b]	1.16[b]	0.43[b]	1.20[b]	21.4	16.5[b]	45.0	—	11.9
	Leptochloa dubia. Sprangle-top, green													
331	fresh, late vegetative	2-30-031	52.0	24.0[b]	1.07[b]	0.88[b]	0.52[b]	0.08[b]	0.53[b]	2.9	0.9[b]	39.0	—	—
332			100.0	47.0[b]	2.07[b]	1.70[b]	1.01[b]	0.15[b]	1.03[b]	5.6	1.8[b]	75.0	—	—
	Leptoloma cognatum. Witch-grass, fall													
333	fresh, late vegetative	2-30-039	50.0	23.0[b]	1.01[b]	0.83[b]	0.50[b]	0.05[b]	0.50[b]	2.7	0.8[b]	34.0	—	—
334			100.0	46.0[b]	2.03[b]	1.66[b]	0.99[b]	0.10[b]	1.01[b]	5.5	1.6[b]	68.0	—	—
	Lespedeza striata. Lespedeza, common													
335	fresh, full bloom	2-02-541	35.0	18.0[a]	0.80[b]	0.65[b]	0.39[b]	0.12[b]	0.40[b]	5.1	3.5[b]	—	—	—
336			100.0	52.0[a]	2.29[b]	1.88[b]	1.12[b]	0.36[b]	1.15[b]	14.6	10.2[b]	—	—	—
	Lesquerella gordonii. Bladder-pod, Gordon													
337	fresh, late vegetative	2-29-820	35.0	13.0[b]	0.55[b]	0.45[b]	0.29[b]	0.00[b]	0.26[b]	3.4	1.9[b]	11.0	—	—
338			100.0	36.0[b]	1.59[b]	1.30[b]	0.84[b]	0.00[b]	0.76[b]	9.7	5.6[b]	31.0	—	—

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				TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Total (%)	Dig. (%)			
	Leucaena retusa. Leadtree, littleleaf													
339	browse, fresh, early	2-02-491	27.0	18.0[a]	0.81[b]	0.66[b]	0.41[b]	0.25[b]	0.42[b]	4.8	3.5[b]	—	—	6.6
340	vegetative		100.0	68.0[a]	3.00[b]	2.46[b]	1.52[b]	0.91[b]	1.55[b]	17.6	13.0[b]	—	—	24.4
	Lolium spp. Ryegrass													
341	fresh	2-04-062	24.0	15.0[a]	0.65[b]	0.53[b]	0.32[b]	0.17[b]	0.33[b]	2.5	1.5[b]	—	—	7.0
342			100.0	61.0[a]	2.69[b]	2.21[b]	1.33[b]	0.69[b]	1.38[b]	10.2	6.1[b]	—	—	29.2
	Lonicera albiflora. Honeysuckle, bush													
343	leaves, fresh	2-29-875	33.0	22.0[b]	0.99[b]	0.81[b]	0.51[b]	0.31[b]	0.51[b]	3.3	1.9[b]	6.0	—	—
344			100.0	69.0[b]	3.04[b]	2.50[b]	1.55[b]	0.94[b]	1.57[b]	10.0	5.9[b]	20.0	—	—
	Lotus spp. Trefoil													
345	fresh	2-01-757	15.0	10.0[a]	0.44[b]	0.36[b]	0.22[b]	0.12[b]	0.22[b]	2.7	2.0[b]	—	—	—
346			100.0	64.0[a]	2.82[b]	2.31[b]	1.41[b]	0.78[b]	1.45[b]	17.5	12.9[b]	—	—	—
	Lupinus texensis. Bluebonnet, Texas													
347	fresh, early vegetative	2-29-821	18.0	11.0[b]	0.46[b]	0.38[b]	0.23[b]	0.11[b]	0.24[b]	2.8	2.0[b]	4.0	—	—
348			100.0	59.0[b]	2.60[b]	2.13[b]	1.28[b]	0.62[b]	1.33[b]	16.1	11.5[b]	24.0	—	—
349	fresh, late vegetative	2-29-831	16.0	11.0[b]	0.47[b]	0.38[b]	0.24[b]	0.14[b]	0.24[b]	2.9	2.2[b]	4.0	—	—
350			100.0	66.0[b]	2.91[b]	2.39[b]	1.47[b]	0.85[b]	1.50[b]	18.0	13.4[b]	25.0	—	—
	Medicago sativa. Alfalfa													
351	fresh	2-00-196	24.0	13.0	0.59[b]	0.48[b]	0.29[b]	0.12[b]	0.30[b]	4.8	3.0	—	—	6.4
352			100.0	55.0	2.43[b]	1.99[b]	1.19[b]	0.47[b]	1.23[b]	19.7	12.1	—	—	26.2
353	fresh, late vegetative	2-00-181	21.0	13.0[a]	0.59[b]	0.49[b]	0.30[b]	0.16[b]	0.30[b]	4.3	3.2[b]	8.0	6.0	4.9
354			100.0	63.0[a]	2.78[b]	2.28[b]	1.39[b]	0.75[b]	1.42[b]	20.0	15.2[b]	38.0	29.0	23.0
355	fresh, full bloom	2-00-188	25.0	14.0[a]	0.61[b]	0.50[b]	0.30[b]	0.12[b]	0.31[b]	3.5	2.4[b]	13.0	9.0	7.7
356			100.0	55.0[a]	2.43[b]	1.99[b]	1.19[b]	0.47[b]	1.23[b]	14.0	9.6[b]	52.0	37.0	31.0
	Melia azedarach. Chinaberry													
357	leaves, fresh	2-27-210	21.0	14.0	0.61[b]	0.50[b]	0.31[b]	0.18[b]	0.32[b]	3.9	2.9	—	—	2.5
358			100.0	67.0	2.95[b]	2.42[b]	1.50[b]	0.88[b]	1.52[b]	18.7	13.9	—	—	11.9
	Mimosa spp. Mimosa													
359	browse, fresh, early	2-03-122	26.0	18.0[a]	0.79[b]	0.65[b]	0.40[b]	0.24[b]	0.41[b]	5.4	4.1[b]	—	—	5.5
360	vegetative		100.0	69.0[a]	3.04[b]	2.50[b]	1.55[b]	0.94[b]	1.57[b]	20.6	15.8[b]	—	—	21.1
	Moringa oleifera. Horseradishtree													
361	leaves, fresh	2-30-172	18.0	11.0	0.48[b]	0.40[b]	0.24[b]	0.12[b]	0.25[b]	3.4	2.0	—	—	3.2
362			100.0	61.0	2.69[b]	2.21[b]	1.33[b]	0.69[b]	1.38[b]	19.0	11.0	—	—	17.9
	Morus australis. Mulberry, Japanese													
363	leaves, fresh	2-30-179	15.0	9.0[a]	0.40[b]	0.33[b]	0.20[b]	0.10[b]	0.20[b]	2.3	1.6[a]	—	—	2.3
364			100.0	60.0[a]	2.65[b]	2.17[b]	1.31[b]	0.65[b]	1.35[b]	15.0	10.7[a]	—	—	15.3
	Morus spp. Mulberry													
365	browse, fresh	2-03-150	40.0	29.0[a]	1.26[b]	1.03[b]	0.65[b]	0.40[b]	0.65[b]	7.3	5.4[b]	—	—	4.5
366			100.0	71.0[a]	3.13[b]	2.57[b]	1.61[b]	1.00[b]	1.62[b]	18.1	13.4[b]	—	—	11.2

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Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Feed Energy						Protein		Cell Walls (%)	Acid Detergent Fiber (%)	Crude Fiber (%)
				TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Total (%)	Dig. (%)			
	Musa spp. Banana													
367	leaves, fresh	2-09-902	19.0	9.0	0.41[b]	0.34[b]	0.20[b]	0.05[b]	0.21[b]	2.9	1.3	—	—	4.4
368			100.0	50.0	2.21[b]	1.81[b]	1.07[b]	0.28[b]	1.11[b]	15.7	6.7	—	—	23.3
	Nolina texana. Nolina, Texas													
369	buds, fresh	2-29-855	32.0	20.0[b]	0.89[b]	0.73[b]	0.44[b]	0.24[b]	0.45[b]	6.2	4.7[b]	9.0	—	—
370			100.0	63.0[b]	2.78[b]	2.28[b]	1.39[b]	0.75[b]	1.42[b]	19.4	14.7[b]	28.0	—	—
371	leaves, fresh	2-29-852	57.0	27.0[b]	1.18[b]	0.97[b]	0.58[b]	0.08[b]	0.59[b]	3.2	1.0[b]	36.0	—	—
372			100.0	47.0[b]	2.07[b]	1.70[b]	1.01[b]	0.15[b]	1.03[b]	5.6	1.8[b]	63.0	—	—
	Onobrychis viciifolia. Sainfoin, common													
373	fresh	2-08-503	26.0	16.0[a]	0.72[b]	0.59[b]	0.36[b]	0.20[b]	0.37[b]	3.8	2.7[b]	—	—	6.2
374			100.0	64.0[a]	2.82[b]	2.31[b]	1.41[b]	0.78[b]	1.45[b]	14.8	10.4[b]	—	—	24.2
	Opuntia spp. Pricklypear													
375	fresh, mature	2-01-059	21.0	11.0[b]	0.48[b]	0.40[b]	0.24[b]	0.07[b]	0.24[b]	0.7	0.0[b]	4.0	—	2.9
376			100.0	51.0[b]	2.25[b]	1.84[b]	1.10[b]	0.32[b]	1.13[b]	3.1	0.0[b]	21.0	—	13.7
377	fruit, fresh, immature	4-30-020	26.0	9.0[b]	0.39[b]	0.32[b]	0.21[b]	0.00[b]	0.19[b]	1.8	0.9[b]	14.0	—	—
378			100.0	34.0[b]	1.50[b]	1.23[b]	0.82[b]	0.00[b]	0.71[b]	6.8	3.5[b]	52.0	—	—
	Panicum antidotale. Panicum, blue													
379	fresh	2-03-508	28.0	13.0	0.56[b]	0.46[b]	0.28[b]	0.02[b]	0.28[b]	3.7	1.4	—	—	9.1
380			100.0	45.0	1.98[b]	1.63[b]	0.98[b]	0.06[b]	0.98[b]	13.1	4.8	—	—	32.0
	Panicum hallii. Panicum, Halls													
381	fresh, late vegetative	2-29-998	49.0	23.0[b]	1.02[b]	0.84[b]	0.50[b]	0.07[b]	0.51[b]	3.6	—	32.0	—	—
382			100.0	47.0[b]	2.07[b]	1.70[b]	1.01[b]	0.15[b]	1.03[b]	7.4	—	66.0	—	—
	Panicum maximum. Guinea-grass													
383	fresh, 15 to 28 days' growth	2-09-995	16.0	9.0[a]	0.41[b]	0.33[b]	0.20[b]	0.09[b]	0.21[b]	3.0	2.4	—	—	4.4
384			100.0	58.0[a]	2.56[b]	2.10[b]	1.26[b]	0.58[b]	1.30[b]	18.8	14.9	—	—	27.8
385	fresh, 29 to 42 days' growth	2-09-714	18.0	10.0[a]	0.45[b]	0.37[b]	0.22[b]	0.10[b]	0.23[b]	2.5	1.7	—	—	6.0
386			100.0	57.0[a]	2.51[b]	2.06[b]	1.23[b]	0.55[b]	1.28[b]	13.7	9.7	—	—	33.2
387	fresh, 43 to 56 days' growth	2-09-910	21.0	12.0[a]	0.51[b]	0.42[b]	0.25[b]	0.11[b]	0.26[b]	2.4	1.7	—	—	8.5
388			100.0	56.0[a]	2.47[b]	2.03[b]	1.21[b]	0.51[b]	1.25[b]	11.7	8.1	—	—	41.2
389	fresh, early bloom	2-02-339	24.0	13.0[a]	0.57[b]	0.46[b]	0.28[b]	0.10[b]	0.29[b]	1.4	0.4[b]	—	—	10.1
390			100.0	53.0[a]	2.34[b]	1.92[b]	1.14[b]	0.40[b]	1.18[b]	5.6	1.8[b]	—	—	41.8
391	fresh, full bloom	2-02-341	30.0	15.0[a]	0.68[b]	0.56[b]	0.33[b]	0.11[b]	0.34[b]	2.0	0.8[b]	—	—	10.2
392			100.0	52.0[a]	2.29[b]	1.88[b]	1.12[b]	0.36[b]	1.15[b]	6.6	2.7[b]	—	—	34.4
	Panicum obtusum. Vine mesquite													
393	fresh, late vegetative	2-30-009	47.0	24.0[b]	1.04[b]	0.85[b]	0.51[b]	0.13[b]	0.52[b]	3.3	1.5[b]	33.0	—	—
394			100.0	50.0[b]	2.21[b]	1.81[b]	1.07[b]	0.28[b]	1.11[b]	7.0	3.1[b]	70.0	—	—
	Panicum virgatum. Switchgrass													
395	fresh, early vegetative	2-04-795	35.0	21.0[a]	0.93[b]	0.76[b]	0.46[b]	0.24[b]	0.47[b]	3.7	2.3[b]	—	—	10.2
396			100.0	61.0[a]	2.69[b]	2.21[b]	1.33[b]	0.69[b]	1.38[b]	10.8	6.6[b]	—	—	29.7
397	fresh, mature	2-04-798	42.0	21.0[a]	0.91[b]	0.74[b]	0.44[b]	0.10[b]	0.45[b]	2.3	0.7[b]	—	—	18.2
398			100.0	49.0[a]	2.16[b]	1.77[b]	1.05[b]	0.23[b]	1.08[b]	5.5	1.7[b]	—	—	43.3

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				TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Total (%)	Dig. (%)			
	Paspalum dilatatum. Dallisgrass													
399	fresh, early vegetative	2-01-738	26.0	16.0[a]	0.71[b]	0.58[b]	0.35[b]	0.19[b]	0.36[b]	5.9	4.6[b]	—	—	7.7
400			100.0	63.0[a]	2.78[b]	2.28[b]	1.39[b]	0.75[b]	1.42[b]	23.2	18.2[b]	—	—	30.1
401	fresh, full bloom	2-01-739	30.0	17.0[a]	0.77[b]	0.63[b]	0.38[b]	0.18[b]	0.39[b]	2.1	1.0[b]	—	—	9.7
402			100.0	58.0[a]	2.56[b]	2.10[b]	1.26[b]	0.58[b]	1.30[b]	7.1	3.2[b]	—	—	32.2
	Pennisetum incomptum. Pennisetum, incomptum													
403	fresh	2-30-104	30.0	5.0[a]	0.24[b]	0.20[b]	0.24[b]	0.00[b]	0.10[b]	2.0	0.9[b]	—	—	10.1
404			100.0	18.0[a]	0.79[b]	0.65[b]	0.78[b]	0.00[b]	0.32[b]	6.7	2.8[b]	—	—	33.2
	Pennisetum purpureum. Napiergrass													
405	fresh	2-03-166	21.0	12.0[a]	0.51[b]	0.42[b]	0.25[b]	0.10[b]	0.26[b]	2.0	1.1[b]	—	—	7.2
406			100.0	55.0[a]	2.43[b]	1.99[b]	1.19[b]	0.47[b]	1.23[b]	9.2	5.2[b]	—	—	33.9
407	fresh, 15 to 28 days' growth	2-09-412	15.0	9.0	0.38[b]	0.32[b]	0.19[b]	0.09[b]	0.20[b]	1.7	1.3	—	—	4.7
408			100.0	60.0	2.65[b]	2.17[b]	1.31[b]	0.65[b]	1.35[b]	11.9	9.2	—	—	32.4
409	fresh, 29 to 42 days' growth	2-10-095	21.0	12.0	0.53[b]	0.44[b]	0.26[b]	0.12[b]	0.27[b]	2.1	1.6	—	—	8.9
410			100.0	58.0	2.56[b]	2.10[b]	1.26[b]	0.58[b]	1.30[b]	9.9	7.5	—	—	42.8
411	fresh, early bloom	2-03-159	15.0	9.0[a]	0.39[b]	0.32[b]	0.20[b]	0.10[b]	0.20[b]	1.6	1.0[b]	—	—	4.7
412			100.0	60.0[a]	2.65[b]	2.17[b]	1.31[b]	0.65[b]	1.35[b]	11.0	6.8[b]	—	—	31.5
	Pennisetum purpureum. Napiergrass													
413	fresh, post ripe	2-03-165	30.0	16.0[a]	0.71[b]	0.58[b]	0.35[b]	0.12[b]	0.36[b]	1.2	0.1[b]	—	—	12.0
414			100.0	53.0[a]	2.34[b]	1.92[b]	1.14[b]	0.40[b]	1.18[b]	4.1	0.4[b]	—	—	39.6
	Phalaris arundinacea. Canarygrass, reed													
415	fresh	2-01-113	27.0	17.0[a]	0.76[b]	0.62[b]	0.38[b]	0.22[b]	0.39[b]	3.1	2.0[b]	12.0	8.0	7.8
416			100.0	65.0[a]	2.87[b]	2.35[b]	1.44[b]	0.82[b]	1.47[b]	11.6	7.4[b]	46.0	28.0	29.5
	Phalaris tuberosa stenoptera. Hardinggrass													
417	fresh	2-02-354	27.0	16.0[a]	0.69[b]	0.57[b]	0.34[b]	0.16[b]	0.35[b]	4.6	3.4[b]	—	—	—
418			100.0	58.0[a]	2.56[b]	2.10[b]	1.26[b]	0.58[b]	1.30[b]	17.0	12.4[b]	—	—	—
	Phaseolus atropurpureus. Bean, purple													
419	leaves, fresh	2-30-175	15.0	8.0	0.35[b]	0.29[b]	0.17[b]	0.06[b]	0.18[b]	3.5	1.4	—	—	4.6
420			100.0	53.0	2.34[b]	1.92[b]	1.14[b]	0.40[b]	1.18[b]	23.0	9.2	—	—	30.4
	Pisum sativum sativum. Pea, garden													
421	fresh	2-27-582	16.0	11.0[a]	0.48[b]	0.39[b]	0.24[b]	0.15[b]	0.25[b]	2.4	1.7	—	—	—
422			100.0	68.0[a]	3.00[b]	2.46[b]	1.52[b]	0.91[b]	1.55[b]	14.8	10.4	—	—	—
	Pisum spp. Pea													
423	fresh, late vegetative	2-03-580	14.0	9.0[a]	0.40[b]	0.33[b]	0.20[b]	0.12[b]	0.21[b]	3.7	3.0[b]	—	—	3.0
424			100.0	67.0[a]	2.95[b]	2.42[b]	1.50[b]	0.88[b]	1.52[b]	27.4	22.1[b]	—	—	22.2
	Plantago rhodosperma. Plantain, redseed													
425	leaves, fresh	2-29-870	28.0	12.0[b]	0.54[b]	0.44[b]	0.27[b]	0.00[b]	0.26[b]	2.2	1.1[b]	6.0	—	—
426			100.0	43.0[b]	1.90[b]	1.56[b]	0.94[b]	0.00[b]	0.93[b]	7.7	3.7[b]	20.0	—	—

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				TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Total (%)	Dig. (%)			
	Prosopis glandulosa. Mesquite, honey													
427	browse, fresh, late	2-29-999	48.0	22.0[b]	0.95[b]	0.78[b]	0.47[b]	0.03[b]	0.47[b]	7.8	5.6[b]	22.0	—	—
428	vegetative		100.0	45.0[b]	1.98[b]	1.63[b]	0.98[b]	0.06[b]	0.98[b]	16.2	11.7[b]	47.0	—	—
	Quercus sinuata breviloba. Oak, shin													
429	browse, fresh, early	2-29-826	32.0	23.0[b]	1.00[b]	0.82[b]	0.52[b]	0.32[b]	0.52[b]	5.5	4.0[b]	7.0	—	—
430	vegetative		100.0	72.0[b]	3.17[b]	2.60[b]	1.64[b]	1.03[b]	1.64[b]	17.4	12.8[b]	23.0	—	—
	Quercus virginiana. Oak, live													
431	browse, fresh, early	2-29-815	36.0	19.0[b]	0.85[b]	0.69[b]	0.41[b]	0.15[b]	0.43[b]	7.2	5.5[b]	12.0	—	—
432	vegetative		100.0	54.0[b]	2.38[b]	1.95[b]	1.16[b]	0.43[b]	1.20[b]	20.3	15.5[b]	34.0	—	—
433	leaves, fresh	2-29-859	50.0	23.0[b]	1.01[b]	0.83[b]	0.50[b]	0.05[b]	0.50[b]	5.1	3.0[b]	23.0	—	—
434			100.0	46.0[b]	2.03[b]	1.66[b]	0.99[b]	0.10[b]	1.01[b]	10.2	6.1[b]	45.0	—	—
	Ratibida columnifera. Prairieconeflower, upright													
435	fresh, early vegetative	2-29-846	18.0	9.0[b]	0.41[b]	0.34[b]	0.20[b]	0.06[b]	0.21[b]	3.6	2.7[b]	5.0	—	—
436			100.0	51.0[b]	2.25[b]	1.84[b]	1.10[b]	0.32[b]	1.13[b]	19.4	14.7[b]	28.0	—	—
	Rhus aromatica. Sumac, fragrant													
437	browse, fresh, early	2-29-827	40.0	30.0[b]	1.35[b]	1.10[b]	0.71[b]	0.46[b]	0.70[b]	5.4	3.7[b]	6.0	—	—
438	vegetative		100.0	77.0[b]	3.40[b]	2.78[b]	1.79[b]	1.17[b]	1.77[b]	13.7	9.3[b]	15.0	—	—
	Sarcobatus vermiculatus. Greasewood, black													
439	browse, fresh	2-20-083	35.0	19.0[a]	0.85[b]	0.70[b]	0.42[b]	0.17[b]	0.43[b]	5.4	3.8[b]	—	—	5.8
440			100.0	55.0[a]	2.43[b]	1.99[b]	1.19[b]	0.47[b]	1.23[b]	15.3	10.8[b]	—	—	16.5
	Schrankia roemeriana. Sensitivebrier, Roemer													
441	browse, fresh, late	2-29-860	32.0	23.0[b]	1.03[b]	0.84[b]	0.53[b]	0.34[b]	0.53[b]	10.3	8.5[b]	8.0	—	—
442	vegetative		100.0	73.0[b]	3.22[b]	2.64[b]	1.67[b]	1.06[b]	1.67[b]	32.3	26.7[b]	25.0	—	—
	Secale cereale. Rye													
443	fresh	2-04-018	24.0	17.0[a]	0.73[b]	0.60[b]	0.37[b]	0.23[b]	0.38[b]	3.8	2.7[b]	—	—	6.8
444			100.0	69.0[a]	3.04[b]	2.50[b]	1.55[b]	0.94[b]	1.57[b]	15.9	11.4[b]	—	—	28.5
	Sedum nuttallianum. Stonecrop, Nuttall													
445	fresh, early vegetative	2-29-836	10.0	4.0[b]	0.19[b]	0.16[b]	0.10[b]	0.00[b]	0.10[b]	0.6	0.2[b]	1.0	—	—
446			100.0	44.0[b]	1.94[b]	1.59[b]	0.96[b]	0.01[b]	0.96[b]	6.2	2.3[b]	11.0	—	—
	Sesbania cannabina. Sesbania, pea													
447	browse, fresh	2-27-161	19.0	12.0	0.51[b]	0.41[b]	0.25[b]	0.12[b]	0.26[b]	5.3	4.3	—	—	3.1
448			100.0	60.0	2.65[b]	2.17[b]	1.31[b]	0.65[b]	1.35[b]	27.5	22.3	—	—	16.0
	Setaria macrostachya. Bristlegrass, plains													
449	fresh, late vegetative	2-29-882	43.0	15.0[b]	0.68[b]	0.55[b]	0.36[b]	0.00[b]	0.32[b]	5.4	—	28.0	—	—
450			100.0	36.0[b]	1.59[b]	1.30[b]	0.84[b]	0.00[b]	0.76[b]	12.7	—	66.0	—	—
	Setaria spp. Millet													
451	fresh	2-20-742	22.0	14.0[a]	0.61[b]	0.50[b]	0.31[b]	0.17[b]	0.31[b]	6.0	4.8[b]	—	—	5.0
452			100.0	63.0[a]	2.78[b]	2.28[b]	1.39[b]	0.75[b]	1.42[b]	27.1	21.9[b]	—	—	22.9

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http://www.nap.edu/catalog/30.html

Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Feed Energy TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Protein Total (%)	Protein Dig. (%)	Cell Walls (%)	Acid Detergent Fiber (%)	Crude Fiber (%)
	Sorghum bicolor. Sorghum													
453	fresh	2-04-317	35.0	23.0	1.02[b]	0.84[b]	0.51[b]	0.30[b]	0.52[b]	1.4	0.8	—	—	11.9
454			100.0	66.0	2.91[b]	2.39[b]	1.47[b]	0.85[b]	1.50[b]	4.0	2.4	—	—	34.0
455	fresh, mature	2-04-315	39.0	24.0[a]	1.05[b]	0.87[b]	0.52[b]	0.27[b]	0.54[b]	1.4	0.0[b]	—	—	10.7
456			100.0	61.0[a]	2.69[b]	2.21[b]	1.33[b]	0.69[b]	1.38[b]	3.6	0.0[b]	—	—	27.3
	Sorghum bicolor sudanense. Sorghum, Sudangrass													
457	fresh, early vegetative	2-04-484	18.0	12.0[a]	0.55[b]	0.45[b]	0.28[b]	0.17[b]	0.28[b]	3.0	2.2[b]	—	—	5.5
458			100.0	70.0[a]	3.09[b]	2.53[b]	1.58[b]	0.97[b]	1.60[b]	16.8	12.2[b]	—	—	30.9
459	fresh, midbloom	2-04-485	23.0	14.0[a]	0.63[b]	0.52[b]	0.32[b]	0.17[b]	0.32[b]	2.0	1.1[b]	—	—	8.2
460			100.0	63.0[a]	2.78[b]	2.28[b]	1.39[b]	0.75[b]	1.42[b]	8.8	4.7[b]	—	—	36.1
	Sorghum halepense. Sorghum, Johnsongrass													
461	fresh	2-04-412	24.0	15.0[a]	0.66[b]	0.54[b]	0.33[b]	0.18[b]	0.34[b]	2.9	1.9[b]	—	—	7.1
462			100.0	63.0[a]	2.78[b]	2.28[b]	1.39[b]	0.75[b]	1.42[b]	12.3	8.1[b]	—	—	29.9
	Stipa leucotricha. Needlegrass, Texas													
463	fresh, late vegetative	2-29-822	55.0	23.0[b]	0.99[b]	0.81[b]	0.50[b]	0.00[b]	0.48[b]	5.9	3.7[b]	36.0	—	—
464			100.0	41.0[b]	1.81[b]	1.48[b]	0.91[b]	0.00[b]	0.89[b]	10.8	6.7[b]	67.0	—	—
	Syzygium cumini. Java plum													
365	leaves, fresh	2-26-570	30.0	13.0	0.56[b]	0.46[b]	0.28[b]	0.00[b]	0.28[b]	2.3	0.0	—	—	4.7
466			100.0	43.0	1.90[b]	1.56[b]	0.94[b]	0.00[b]	0.93[b]	7.8	0.1	—	—	15.9
	Tillandsia usneoides. Spanish moss													
467	whole, fresh	2-04-648	41.0	24.0[a]	1.09[b]	0.89[b]	0.54[b]	0.27[b]	0.55[b]	2.6	1.0[b]	—	—	12.3
468			100.0	60.0[a]	2.65[b]	2.17[b]	1.31[b]	0.65[b]	1.35[b]	6.4	2.5[b]	—	—	29.9
	Tribulus terrestris. Punctureving													
469	fresh	2-27-107	22.0	11.0[a]	0.48[b]	0.40[b]	0.24[b]	0.06[b]	0.24[b]	4.1	3.0[b]	—	—	8.1
470			100.0	50.0[a]	2.21[b]	1.81[b]	1.07[b]	0.28[b]	1.11[b]	18.5	13.8[b]	—	—	37.0
	Trifolium alexandrinum. Clover, Egyptian													
471	fresh	2-01-349	18.0	11.0	0.50[b]	0.41[b]	0.25[b]	0.14[b]	0.25[b]	3.0	2.4	—	—	4.3
472			100.0	64.0	2.82[b]	2.31[b]	1.41[b]	0.78[b]	1.45[b]	16.9	13.7	—	—	24.6
	Triodia albescens. Triodia, white													
473	fresh, late vegetative	2-30-011	43.0	23.0[b]	1.02[b]	0.84[b]	0.50[b]	0.19[b]	0.52[b]	3.3	—	30.0	—	—
474			100.0	54.0[b]	2.38[b]	1.95[b]	1.16[b]	0.43[b]	1.20[b]	7.7	—	70.0	—	—
	Vicia sativa. Vetch, common													
475	fresh	2-05-123	20.0	12.0[a]	0.53[b]	0.44[b]	0.26[b]	0.13[b]	0.27[b]	3.8	2.8[b]	—	—	5.5
476			100.0	59.0[a]	2.60[b]	2.13[b]	1.28[b]	0.62[b]	1.33[b]	18.6	13.9[b]	—	—	27.0
	Vigna sinensis. Cowpea, common													
477	fresh	2-01-655	15.0	10.0[a]	0.43[b]	0.35[b]	0.21[b]	0.12[b]	0.22[b]	2.4	1.8[b]	—	—	3.5
478			100.0	64.0[a]	2.82[b]	2.31[b]	1.41[b]	0.78[b]	1.45[b]	16.2	11.7[b]	—	—	23.3

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Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Feed Energy						Protein		Cell Walls (%)	Acid Detergent Fiber (%)	Crude Fiber (%)
				TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Total (%)	Dig. (%)			
	Yucca spp. Yucca													
479	flowers, fresh	2-05-536	15.0	11.0[b]	0.47[b]	0.39[b]	0.24[b]	0.15[b]	0.25[b]	3.0	2.3[b]	2.0	—	2.0
480			100.0	70.0[b]	3.09[b]	2.53[b]	1.58[b]	0.97[b]	1.60[b]	19.7	14.9[b]	13.0	—	13.3
481	leaves, fresh, immature	2-30-050	41.0	18.0[b]	0.78[b]	0.64[b]	0.39[b]	0.00[b]	0.38[b]	3.0	1.4[b]	29.0	—	—
482			100.0	43.0[b]	1.90[b]	1.56[b]	0.94[b]	0.00[b]	0.93[b]	7.3	3.4[b]	69.0	—	—
	Zexmenia hispida. Zexmenia, orange													
483	leaves, fresh	2-30-051	39.0	17.0[b]	0.73[b]	0.60[b]	0.36[b]	0.00[b]	0.36[b]	4.5	2.9[b]	11.0	—	—
484			100.0	43.0[b]	1.90[b]	1.56[b]	0.94[b]	0.00[b]	0.93[b]	11.7	7.5[b]	27.0	—	—
	Ziziphus jujuba. Jujube, common													
485	browse, fresh	2-30-091	32.0	10.0	0.44[b]	0.36[b]	0.25[b]	0.00[b]	0.20[b]	2.7	1.0	—	—	9.6
486			100.0	31.0	1.37[b]	1.12[b]	0.79[b]	0.00[b]	0.64[b]	8.6	3.1	—	—	30.1
	SILAGES													
	Avena sativa. Oats													
487	silage	3-03-298	31.0	19.0[a]	0.84[b]	0.69[b]	0.42[b]	0.22[b]	0.43[b]	3.0	1.2[a]	—	—	9.7
488			100.0	62.0[a]	2.73[b]	2.24[b]	1.36[b]	0.72[b]	1.40[b]	9.6	3.8[a]	—	—	31.5
489	silage, milk stage	3-10-556	23.0	14.0[a]	0.63[b]	0.51[b]	0.31[b]	0.17[b]	0.32[b]	3.1	2.0[b]	—	—	6.9
490			100.0	63.0[a]	2.78[b]	2.28[b]	1.39[b]	0.75[b]	1.42[b]	14.0	8.9[b]	—	—	30.6
	Beta vulgaris altissima. Beet, sugar													
491	aerial part with crowns,	3-00-660	22.0	11.0[a]	0.50[b]	0.41[b]	0.25[b]	0.07[b]	0.25[b]	3.0	1.9[b]	—	—	3.1
492	silage		100.0	51.0[a]	2.25[b]	1.84[b]	1.10[b]	0.32[b]	1.13[b]	13.4	8.4[b]	—	—	13.7
	Digitaria decumbens. Pangolagrass													
493	silage, mature	3-03-494	32.0	18.0[a]	0.79[b]	0.65[b]	0.39[b]	0.16[b]	0.40[b]	2.9	1.4[b]	—	—	—
494			100.0	56.0[a]	2.47[b]	2.03[b]	1.21[b]	0.51[b]	1.25[b]	8.9	4.3[b]	—	—	—
	Glycine max. Soybean													
495	silage wilted	3-04-584	35.0	19.0[a]	0.84[b]	0.69[b]	0.41[b]	0.16[b]	0.43[b]	6.2	4.3[b]	—	—	9.5
496			100.0	55.0[a]	2.43[b]	1.99[b]	1.19[b]	0.47[b]	1.23[b]	18.0	12.5[b]	—	—	27.5
	Medicago sativa. Alfalfa													
497	silage, late vegetative	3-00-204	21.0	13.0[a]	0.59[b]	0.48[b]	0.29[b]	0.16[b]	0.30[b]	4.2	3.0[b]	12.0	10.0	7.3
498			100.0	63.0[a]	2.78[b]	2.28[b]	1.39[b]	0.75[b]	1.42[b]	20.0	14.4[b]	55.0	47.0	34.6
499	silage, full bloom	3-00-207	26.0	15.0[a]	0.68[b]	0.55[b]	0.33[b]	0.15[b]	0.34[b]	4.6	3.2[b]	—	10.0	9.2
500			100.0	58.0[a]	2.56[b]	2.10[b]	1.26[b]	0.58[b]	1.30[b]	17.5	12.1[b]	—	38.0	34.9
	Pennisetum purpureum. Napiergrass													
501	silage	3-03-170	26.0	11.0[a]	0.49[b]	0.40[b]	0.24[b]	0.00[b]	0.24[b]	1.2	0.1[b]	—	—	10.0
502			100.0	43.0[a]	1.90[b]	1.56[b]	0.94[b]	0.00[b]	0.93[b]	4.8	0.5[b]	—	—	39.1
	Pisum spp. Pea													
503	silage	3-03-590	24.0	13.0[a]	0.57[b]	0.47[b]	0.28[b]	0.10[b]	0.29[b]	6.2	4.7[b]	—	—	15.4
504			100.0	54.0[a]	2.38[b]	1.95[b]	1.16[b]	0.43[b]	1.20[b]	25.7	19.6[b]	—	—	64.0

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				TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Total (%)	Dig. (%)			
	Sorghum bicolor saccharatum. Sorghum, sorgo													
505	silage, dough stage	3-04-466	26.0	15.0[a]	0.66[b]	0.54[b]	0.32[b]	0.15[b]	0.34[b]	1.5	0.4[b]	—	—	7.9
506			100.0	58.0[a]	2.56[b]	2.10[b]	1.26[b]	0.58[b]	1.30[b]	5.8	1.5[b]	—	—	30.6
507	silage, mature	3-04-467	27.0	17.0[a]	0.74[b]	0.60[b]	0.37[b]	0.20[b]	0.38[b]	1.7	0.6[b]	—	—	7.3
508			100.0	63.0[a]	2.78[b]	2.28[b]	1.39[b]	0.75[b]	1.42[b]	6.6	2.2[b]	—	—	27.6
	Zea mays. Corn													
509	silage, milk stage	3-02-818	22.0	14.0[a]	0.63[b]	0.51[b]	0.31[b]	0.17[b]	0.32[b]	2.0	1.0[b]	—	8.0	6.8
510			100.0	64.0[a]	2.82[b]	2.31[b]	1.41[b]	0.78[b]	1.45[b]	8.9	4.3[b]	—	37.0	30.5
511	silage, dough stage	3-02-819	26.0	19.0[a]	0.82[b]	0.67[b]	0.42[b]	0.26[b]	0.42[b]	2.1	0.9[b]	—	8.0	6.5
512			100.0	70.0[a]	3.09[b]	2.53[b]	1.58[b]	0.97[b]	1.60[b]	7.8	3.3[b]	—	31.0	24.5
	ENERGY FEEDS													
	Animal													
513	tallow, bleached stabilized	4-07-880	99.0	193.0[a]	8.51[b]	6.98[b]	5.20[b]	3.98[b]	4.61[b]	—	—	—	—	—
514			100.0	195.0[a]	8.60[b]	7.05[b]	5.25[b]	4.02[b]	4.66[b]	—	—	—	—	—
	Avena sativa. Oats													
515	grain	4-03-309	89.0	68.0[a]	3.02[b]	2.47[b]	1.59[b]	1.04[b]	1.57[b]	11.8	8.4[b]	28.0	14.0	10.8
516			100.0	77.0[a]	3.40[b]	2.78[b]	1.79[b]	1.17[b]	1.77[b]	13.3	9.4[b]	32.0	16.0	12.1
	Beta vulgaris altissima. Beet, sugar													
517	molasses, more than 48% invert sugar, more than	4-00-668	78.0	61.0[a]	2.71[b]	2.22[b]	1.44[b]	0.95[b]	1.41[b]	6.6	3.9[b]	—	—	—
518	79.5 degrees brix		100.0	79.0[a]	3.48[b]	2.86[b]	1.85[b]	1.22[b]	1.82[b]	8.5	5.0[b]	—	—	—
519	pulp, dehydrated	4-00-669	91.0	67.0[a]	2.96[b]	2.43[b]	1.54[b]	0.98[b]	1.54[b]	8.8	5.5[b]	49.0	30.0	18.0
520			100.0	74.0[a]	3.26[b]	2.68[b]	1.70[b]	1.08[b]	1.69[b]	9.7	6.1[b]	54.0	33.0	19.8
521	roots, fresh	4-00-677	20.0	17.0[a]	0.76[b]	0.62[b]	0.42[b]	0.28[b]	0.40[b]	1.3	0.7[b]	—	—	1.1
522			100.0	88.0[a]	3.88[b]	3.18[b]	2.12[b]	1.45[b]	2.04[b]	6.8	3.5[b]	—	—	5.9
	Bos taurus. Cattle													
523	whey, dehydrated	4-01-182	93.0	76.0	3.33[b]	2.73[b]	1.78[b]	1.19[b]	1.74[b]	13.3	9.6[b]	—	—	0.2
524			100.0	81.0	3.57[b]	2.93[b]	1.91[b]	1.27[b]	1.87[b]	14.2	10.2[b]	—	—	0.2
	Brassica oleracea capitata. Cabbage													
525	fresh	4-01-046	9.0	8.0[a]	0.35[b]	0.28[b]	0.19[b]	0.13[b]	0.18[b]	1.9	1.5[b]	—	—	1.0
526			100.0	84.0[a]	3.70[b]	3.04[b]	2.00[b]	1.35[b]	1.94[b]	20.6	16.1[b]	—	—	10.5
	Brassica rapa rapa. Turnip													
527	roots, fresh	4-05-067	9.0	8.0[a]	0.35[b]	0.29[b]	0.19[b]	0.13[b]	0.19[b]	1.1	0.8[b]	4.0	3.0	1.1
528			100.0	86.0[a]	3.79[b]	3.11[b]	2.06[b]	1.40[b]	1.99[b]	11.8	8.1[b]	44.0	34.0	11.5
	Ceratonia siliqua. Carob bean													
529	pods with seeds	4-08-370	88.0	69.0[a]	3.06[b]	2.51[b]	1.62[b]	1.07[b]	1.59[b]	5.5	2.6[b]	—	—	8.7
530			100.0	79.0[a]	3.48[b]	2.86[b]	1.85[b]	1.22[b]	1.82[b]	6.3	3.0[b]	—	—	9.9
	Citrus spp. Citrus													
531	pomace, dehydrated or	4-08-652	90.0	66.0[a]	2.90[b]	2.38[b]	1.50[b]	0.95[b]	1.50[b]	6.2	3.2[b]	—	—	12.8
532	sun-cured (pulp)		100.0	73.0[a]	3.22[b]	2.64[b]	1.67[b]	1.06[b]	1.67[b]	6.9	3.5[b]	—	—	14.2
	Daucus spp. Carrot													
533	roots, fresh	4-01-145	12.0	10.0[a]	0.44[b]	0.36[b]	0.24[b]	0.16[b]	0.23[b]	1.2	0.7[b]	1.0	1.0	1.2
534			100.0	84.0[a]	3.70[b]	3.04[b]	2.00[b]	1.35[b]	1.94[b]	9.9	6.3[b]	9.0	8.0	9.7

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Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Feed Energy						Protein		Cell Walls (%)	Acid Detergent Fiber (%)	Crude Fiber (%)
				TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Total (%)	Dig. (%)			
	Hordeum vulgare. Barley													
535	grain	4-00-549	88.0	74.0	3.27[b]	2.68[b]	1.76[b]	1.19[b]	1.71[b]	11.9	8.5[b]	—	—	5.0
536			100.0	84.0	3.70[b]	3.04[b]	2.00[b]	1.35[b]	1.94[b]	13.5	9.6[b]	—	—	5.7
	Ipomoea batatas. Sweetpotato													
537	tubers, fresh	4-04-788	33.0	27.0[a]	1.19[b]	0.98[b]	0.64[b]	0.42[b]	0.62[b]	1.7	0.6[b]	—	—	1.2
538			100.0	81.0[a]	3.57[b]	2.93[b]	1.91[b]	1.27[b]	1.87[b]	5.0	1.9[b]	—	—	3.6
	Laminariales (order)-fucales (order). Seaweed, kelp													
539	whole, sun-cured	4-04-190	89.0	29.0[a]	1.26[b]	1.03[b]	0.71[b]	0.00[b]	0.59[b]	8.8	5.6[b]	—	—	5.4
540			100.0	32.0[a]	1.41[b]	1.16[b]	0.80[b]	0.00[b]	0.66[b]	9.8	6.2[b]	—	—	6.1
	Malus spp. Apple													
541	pomace, wet	4-00-424	20.0	15.0[a]	0.67[b]	0.55[b]	0.35[b]	0.22[b]	0.35[b]	1.2	0.5[b]	—	—	3.5
542			100.0	74.0[a]	3.26[b]	2.68[b]	1.70[b]	1.08[b]	1.69[b]	5.6	2.4[b]	—	—	16.9
	Manihot esculenta. Cassava, common													
543	peelings, dehydrated	4-11-937	88.0	76.0[a]	3.35[b]	2.75[b]	1.82[b]	1.23[b]	1.76[b]	1.9	0.0[b]	—	—	3.0
544			100.0	86.0[a]	3.79[b]	3.11[b]	2.06[b]	1.40[b]	1.99[b]	2.2	0.0[b]	—	—	3.4
545	tubers, fresh	4-09-599	37.0	30.0[a]	1.31[b]	1.07[b]	0.70[b]	0.46[b]	0.68[b]	1.3	0.2[b]	—	—	1.7
546			100.0	80.0[a]	3.53[b]	2.89[b]	1.88[b]	1.24[b]	1.84[b]	3.6	0.5[b]	—	—	4.6
	Oryza sativa. Rice													
547	bran with germs	4-03-928	91.0	63.0[a]	2.80[b]	2.29[b]	1.43[b]	0.88[b]	1.45[b]	12.7	9.2[b]	30.0	16.0	11.6
548			100.0	70.0[a]	3.09[b]	2.53[b]	1.58[b]	0.97[b]	1.60[b]	14.1	10.1[b]	33.0	18.0	12.8
549	grain	4-03-939	89.0	71.0[a]	3.13[b]	2.57[b]	1.67[b]	1.11[b]	1.63[b]	8.0	4.9[b]	—	—	9.0
550			100.0	80.0[a]	3.53[a]	2.89[b]	1.88[b]	1.24[b]	1.84[b]	9.0	5.5[b]	—	—	10.2
	Pennisetum glaucum. Pearl-millet													
551	grain	4-03-118	90.0	84.0	3.71[b]	3.05[b]	2.07[b]	1.42[b]	1.96[b]	15.7	8.8	—	—	3.7
552			100.0	94.0	4.14[b]	3.40[b]	2.31[b]	1.59[b]	2.18[b]	17.5	9.8	—	—	4.2
	Quercus spp. Oak													
553	fruit, fresh	4-07-755	64.0	30.0[a]	1.32[b]	1.08[b]	0.65[b]	0.09[b]	0.66[b]	3.1	1.1[b]	—	—	8.8
554			100.0	47.0[a]	2.07[b]	1.70[b]	1.01[b]	0.15[b]	1.03[b]	4.8	1.7[b]	—	—	13.9
	Saccharum officinarum. Sugarcane													
555	molasses, more than 46% invert sugar, more than	4-04-696	75.0	54.0[a]	2.37[b]	1.94[b]	1.22[a]	0.77[b]	1.23[b]	4.4	1.9[b]	—	—	—
556	79.5 degrees brix		100.0	72.0[a]	3.17[b]	2.60[b]	1.64[b]	1.03[b]	1.64[b]	5.8	2.6[b]	—	—	—
	Secale cereale. Rye													
557	bran	4-04-022	91.0	56.0[a]	2.44[b]	2.00[b]	1.21[b]	0.62[b]	1.25[b]	15.9	12.0[b]	—	—	6.9
558			100.0	61.0[a]	2.69[b]	2.21[b]	1.33[b]	0.69[b]	1.38[b]	17.5	13.3[b]	—	—	7.6
559	grain	4-04-047	88.0	74.0[a]	3.24[b]	2.66[b]	1.75[b]	1.18[b]	1.70[b]	12.1	8.7[b]	—	—	2.2
560			100.0	84.0[a]	3.70[b]	3.04[b]	2.00[b]	1.35[b]	1.94[b]	13.8	9.9[b]	—	—	2.5
	Solanum tuberosum. Potato													
561	starch process residue,	4-03-778	86.0	70.0[a]	3.11[b]	2.55[b]	1.67[b]	1.11[a]	1.63[b]	3.7	1.1[b]	—	—	10.7
562	dehydrated		100.0	82.0[a]	3.62[b]	2.97[b]	1.94[b]	1.30[b]	1.89[b]	4.4	1.2[b]	—	—	12.4
563	tubers, fresh	4-03-787	23.0	19.0[a]	0.84[b]	0.69[b]	0.45[b]	0.30[b]	0.44[b]	2.2	1.4[b]	—	—	0.6
564			100.0	81.0[a]	3.57[b]	2.93[b]	1.91[b]	1.27[b]	1.87[b]	9.5	5.9[b]	—	—	2.4

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Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Feed Energy						Protein		Cell Walls (%)	Acid Detergent Fiber (%)	Crude Fiber (%)
				TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Total (%)	Dig. (%)			
565	tubers, silage	4-03-768	25.0	20.0[a]	0.89[b]	0.73[b]	0.48[b]	0.32[b]	0.47[b]	1.9	1.0[b]	—	—	1.0
566			100.0	82.0[a]	3.62[b]	2.97[b]	1.94[b]	1.30[b]	1.89[b]	7.6	4.2[b]	—	—	4.0
	Sorghum bicolor subglabrescens. Sorghum, milo													
567	grain	4-04-444	89.0	78.0[a]	3.46[b]	2.84[b]	1.90[b]	1.29[b]	1.82[b]	10.2	6.8[b]	21.0	5.0	2.2
568			100.0	88.0[a]	3.88[b]	3.18[b]	2.12[b]	1.45[b]	2.04[b]	11.4	7.7[b]	23.0	5.0	2.5
	Triticum aestivum. Wheat													
569	bran	4-05-190	89.0	62.0	2.74[b]	2.25[b]	1.40[b]	0.86[b]	1.42[b]	15.2	11.9	46.0	14.0	10.0
570			100.0	70.0	3.09[b]	2.53[b]	1.58[b]	0.97[b]	1.60[b]	17.1	13.4	51.0	15.0	11.3
571	grain	4-05-211	89.0	78.0[a]	3.45[b]	2.83[b]	1.89[b]	1.28[b]	1.81[b]	14.2	10.6[b]	—	7.0	2.6
572			100.0	88.0[a]	3.88[b]	3.18[b]	2.12[b]	1.45[b]	2.04[b]	16.0	11.9[b]	—	8.0	2.9
	Zea mays. Corn													
573	ears, ground	4-02-849	87.0	71.0[a]	3.17[b]	2.60[b]	1.70[b]	1.14[b]	1.66[b]	7.8	4.8[b]	—	—	8.2
574			100.0	83.0[a]	3.66[b]	3.00[b]	1.97[b]	1.32[b]	1.91[b]	9.0	5.5[b]	—	—	9.4
575	grain	4-02-879	87.0	77.0	3.43[b]	2.81[b]	1.88[b]	1.28[b]	1.80[b]	9.2	7.5	—	—	2.1
576			100.0	89.0	3.92[b]	3.22[b]	2.15[b]	1.47[b]	2.06[b]	10.6	8.6	—	—	2.4
	Zea mays indentata. Corn, dent yellow													
577	grain	4-02-935	89.0	77.0[a]	3.40[b]	2.79[b]	1.85[b]	1.26[b]	1.78[b]	9.6	—	8.0	3.0	2.6
578			100.0	87.0[a]	3.84[b]	3.15[b]	2.09[b]	1.42[b]	2.01[b]	10.9	—	9.0	3.0	2.9
	PROTEIN SUPPLEMENTS													
	Arachis hypogaea. Peanut													
579	kernels	5-03-657	95.0	127.0[a]	5.60[b]	4.59[b]	3.32[b]	2.40[b]	3.00[b]	28.4	23.6[a]	—	—	2.8
580			100.0	134.0[a]	5.91[b]	4.85[b]	3.51[b]	2.54[b]	3.16[b]	29.9	24.9[a]	—	—	3.0
581	kernels, mechanical	5-03-648	94.0	80.0	3.55[b]	2.91[b]	1.93[b]	1.31[b]	1.86[b]	41.4	37.3	—	—	5.9
582	extracted caked		100.0	86.0	3.79[b]	3.11[b]	2.06[b]	1.40[b]	1.99[b]	44.3	39.8	—	—	6.3
583	kernels, meal solvent	5-03-650	92.0	70.0[a]	3.12[b]	2.56[b]	1.64[b]	1.07[b]	1.62[b]	48.1	—	—	—	9.9
584	extracted		100.0	77.0[a]	3.40[b]	2.78[b]	1.79[b]	1.17[b]	1.77[b]	52.3	—	—	—	10.8
	Blood. Meal spray dehy													
585	(blood flour)	5-00-381	93.0	85.0[a]	3.73[b]	3.06[b]	2.06[b]	1.41[b]	1.96[b]	82.8	78.9[a]	—	—	1.2
586			100.0	91.0[a]	4.01[b]	3.29[b]	2.22[b]	1.52[b]	2.11[b]	89.0	84.8[a]	—	—	1.3
	Bos Taurus. Cattle													
587	milk, fresh	5-01-168	12.0	16.0[a]	0.70[b]	0.58[b]	0.42[b]	0.30[b]	0.38[b]	3.3	3.1[a]	—	—	—
588			100.0	129.0[a]	5.69[b]	4.66[b]	3.37[b]	2.41[b]	3.04[b]	26.7	25.4[a]	—	—	—
	Brassica spp. Rape													
589	seeds, meal solvent	5-03-871	91.0	63.0[a]	2.77[b]	2.27[b]	1.41[b]	0.86[b]	1.43[b]	37.0	—	—	—	12.0
590	extracted		100.0	69.0[a]	3.04[b]	2.50[b]	1.55[b]	0.94[b]	1.57[b]	40.6	—	—	—	13.2
	Brevoortia tyrannus. Fish, menhaden													
591	meal mechanical extracted	5-02-009	92.0	67.0[a]	2.95[b]	2.42[b]	1.53[b]	0.97[b]	1.53[b]	61.1	49.4[a]	—	—	0.9
592			100.0	73.0[a]	3.22[b]	2.64[b]	1.67[b]	1.06[b]	1.67[b]	66.7	54.0[a]	—	—	1.0
	Carthamus tinctorius. Safflower													
593	seeds without hulls, meal	5-07-959	92.0	67.0[a]	2.95[b]	2.42[b]	1.53[b]	0.97[b]	1.53[b]	43.0	—	—	—	13.5
594	solvent extracted		100.0	73.0[a]	3.22[b]	2.64[b]	1.67[b]	1.06[b]	1.67[b]	46.9	—	—	—	14.7

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				TDN (%)	DE (Mcal/kg)	ME (Mcal/kg)	NE_m (Mcal/kg)	NE_g (Mcal/kg)	NE_l (Mcal/kg)	Total (%)	Dig. (%)			
	Cereals													
595	brewers grains, dehydrated	5-02-141	92.0	65.0[a]	2.84[b]	2.33[b]	1.46[b]	0.89[b]	1.47[b]	27.1	19.7[a]	42.0	22.0	13.2
596			100.0	70.0[a]	3.09[b]	2.53[b]	1.58[b]	0.97[b]	1.60[b]	29.4	21.4[a]	46.0	24.0	14.4
	Cicer arietinum. Chickpea													
597	seeds	5-01-218	91.0	69.0	3.04[b]	2.49[b]	1.59[b]	1.03[b]	1.58[b]	19.7	13.8	—	—	7.0
598			100.0	76.0	3.35[b]	2.75[b]	1.76[b]	1.14[b]	1.74[b]	21.7	15.2	—	—	7.7
	Cocos nucifera. Coconut													
599	meats oil residue, meal	5-01-573	91.0	69.0[a]	3.01[b]	2.47[b]	1.57[b]	1.01[b]	1.56[b]	21.3	—	—	—	14.0
600	solvent extracted		100.0	75.0[a]	3.31[b]	2.71[b]	1.73[b]	1.11[b]	1.72[b]	23.4	—	—	—	15.4
	Cyamopsis tetragonoloba. Guar													
601	seeds without endosperm,	5-05-687	88.0	73.0	3.24[b]	2.66[b]	1.75[b]	1.18[b]	1.70[b]	38.0	34.6	—	—	10.5
602	ground		100.0	84.0	3.70[b]	3.04[b]	2.00[b]	1.35[b]	1.94[b]	43.5	39.5	—	—	12.0
	Glycine max. Soybean													
603	seeds, meal solvent	5-04-604	90.0	79.0[a]	3.48[b]	2.85[b]	1.90[b]	1.30[b]	1.83[b]	44.8	41.5[a]	—	—	5.8
604	extracted		100.0	88.0[a]	3.88[b]	3.18[b]	2.12[b]	1.45[b]	2.04[b]	49.9	46.3[a]	—	—	6.5
	Gossypium spp. Cotton													
605	seeds, meal solvent ex-	5-01-621	91.0	69.0[a]	3.06[b]	2.51[b]	1.60[b]	1.04[b]	1.59[b]	41.2	—	—	16.0	12.1
606	tracted, 41% protein		100.0	76.0[a]	3.35[b]	2.75[b]	1.76[b]	1.14[b]	1.74[b]	45.2	—	—	17.0	13.3
	Helianthus annuus. Sunflower, common													
607	seeds without hulls, meal	5-04-739	93.0	60.0[a]	2.67[b]	2.19[b]	1.34[b]	0.76[b]	1.37[b]	46.3	—	—	—	11.4
608	solvent extracted		100.0	65.0[a]	2.87[b]	2.35[b]	1.44[b]	0.82[b]	1.47[b]	49.8	—	—	—	12.2
	Linum usitatissimum. Flax, common													
609	seeds, mechanical extracted	5-02-043	92.0	83.0	3.67[b]	3.01[b]	2.02[b]	1.38[b]	1.93[b]	32.3	27.5	—	—	9.2
610	caked		100.0	90.0	3.97[b]	3.25[b]	2.19[b]	1.49[b]	2.09[b]	35.0	29.8	—	—	10.0
611	seeds, meal solvent	5-02-048	90.0	70.0[a]	3.10[b]	2.54[b]	1.64[b]	1.08[b]	1.62[b]	34.6	29.6[a]	23.0	17.0	9.1
612	extracted		100.0	78.0[a]	3.44[b]	2.82[b]	1.82[b]	1.19[b]	1.79[b]	38.3	32.8[a]	25.0	19.0	10.1
	Lycopersicon esculentum. Tomato													
613	pomace, dehydrated	5-05-041	92.0	53.0[a]	2.35[b]	1.93[b]	1.16[b]	0.53[b]	1.19[b]	21.6	—	50.0	46.0	24.2
614			100.0	58.0[a]	2.56[b]	2.10[b]	1.26[b]	0.58[b]	1.30[b]	23.5	—	55.0	50.0	26.4
615	pomace, wet	5-05-042	13.0	8.0[a]	0.35[b]	0.29[b]	0.18[b]	0.09[b]	0.18[b]	2.8	—	—	—	3.5
616			100.0	62.0[a]	2.73[b]	2.24[b]	1.36[b]	0.72[b]	1.40[b]	21.7	—	—	—	27.3
	Meat, with bone, meal													
617	rendered	5-00-388	93.0	66.0[a]	2.92[b]	2.39[b]	1.50[b]	0.93[b]	1.51[b]	50.4	—	—	—	2.2
618			100.0	71.0[a]	3.13[b]	2.57[b]	1.61[b]	1.00[b]	1.62[b]	54.1	—	—	—	2.4
	Phaseolus vulgaris. Bean, navy													
619	seeds	5-00-623	89.0	75.0[a]	3.31[b]	2.72[b]	1.79[b]	1.21[b]	1.73[b]	22.6	20.2[a]	—	—	4.5
620			100.0	84.0[a]	3.70[b]	3.04[b]	2.00[b]	1.35[b]	1.94[b]	25.3	22.5[a]	—	—	5.0
	Poultry													
621	feathers, meal hydrolyzed	5-03-795	91.0	64.0[a]	2.82[b]	2.31[b]	1.44[b]	0.88[b]	1.46[b]	83.2	—	—	—	1.4
622			100.0	70.0[a]	3.09[b]	2.53[b]	1.58[b]	0.97[b]	1.60[b]	91.1	—	—	—	1.5

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	Secale cereale. Rye													
623	distillers grains, dehy-	5-04-023	92.0	56.0[a]	2.47[b]	2.03[b]	1.23[b]	0.63[b]	1.26[b]	21.6	12.9[a]	—	—	12.3
624	drated		100.0	61.0[a]	2.69[b]	2.21[b]	1.33[b]	0.69[b]	1.38[b]	23.5	14.1[a]	—	—	13.4
	Sesamum indicum. Sesame													
625	seeds, meal mechanical	5-04-220	93.0	71.0[a]	3.15[b]	2.58[b]	1.66[b]	1.08[b]	1.64[b]	45.5	—	16.0	16.0	5.7
626	extracted		100.0	77.0[a]	3.40[b]	2.78[b]	1.79[b]	1.17[b]	1.77[b]	49.1	—	17.0	17.0	6.1
	Sorghum bicolor. Sorghum													
627	distillers grains, dehy-	5-04-374	94.0	78.0[a]	3.43[b]	2.81[b]	1.85[b]	1.24[b]	1.79[b]	32.2	—	—	—	11.9
628	drated		100.0	83.0[a]	3.66[b]	3.00[b]	1.97[b]	1.32[b]	1.91[b]	34.4	—	—	—	12.7
	Triticum aestivum. Wheat													
629	germs, ground	5-05-218	88.0	83.0[a]	3.66[b]	3.00[b]	2.04[b]	1.40[b]	1.93[b]	24.8	—	—	—	3.1
630			100.0	94.0[a]	4.14[b]	3.40[b]	2.31[b]	1.59[b]	2.18[b]	28.1	—	—	—	3.5
	Urea													
631	45% nitrogen 281% pro-	5-05-070	99.0	—	0.00[b]	0.00[b]	0.00[b]	0.00[b]	0.00[b]	275.8	—	—	—	—
632	tein equivalent		100.0	—	0.00[b]	0.00[b]	0.00[b]	0.00[b]	0.00[b]	279.6	—	—	—	—

[a] Data derived with sheep.
[b] Calculated value (see p. 24).

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TABLE 3 Composition of Goat Feeds: Dry Matter, Minerals, and Carotene Content; Data Expressed As-Fed and Dry (100% Dry Matter)

Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Calcium (%)	Chlorine (%)	Magnesium (%)	Phosphorus (%)	Potassium (%)	Sodium (%)	Sulfur (%)	Cobalt (mg/kg)	Copper (mg/kg)	Iodine (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Selenium (mg/kg)	Zinc (mg/kg)	Carotene (mg/kg)
	DRY FORAGES AND ROUGHAGES																	
	Agropyron desertorum. Wheatgrass, crested																	
001	hay, sun-cured	1-05-418	93.0	0.31	—	0.15	0.20	1.85	—	—	0.221	15.2	—	165.0	33.7	0.4	29.6	20.7
002			100.0	0.33	—	0.16	0.21	2.00	—	—	0.238	16.5	—	178.0	36.4	0.4	31.9	22.5
	Andropogon spp. Bluestem																	
003	hay, sun-cured	1-00-819	30.0	—	0.04	—	—	—	0.01	—	—	—	—	—	—	—	—	37.4
004			100.0	—	0.04	—	—	—	0.01	—	—	—	—	—	—	—	—	41.7
	Arachis hypogaea. Peanut																	
005	hay, sun-cured	1-03-619	91.0	1.12	—	0.45	0.14	1.95	—	0.21	0.072	—	—	—	—	—	—	31.6
006			100.0	1.23	—	0.49	0.15	1.35	—	0.23	0.079	—	—	—	—	—	—	34.6
007	hay with fruit, sun-cured	1-03-620	92.0	1.13	—	0.33	0.11	0.85	—	—	—	—	—	—	—	—	—	—
008			100.0	1.24	—	0.36	0.15	0.92	—	—	—	—	—	—	—	—	—	—
009	pods	1-08-028	91.0	0.24	—	0.15	0.06	0.87	0.12	0.09	0.108	16.3	—	285.0	62.6	—	22.0	0.8
010			100.0	0.26	—	0.17	0.07	0.95	0.13	0.10	0.119	17.8	—	312.0	68.7	—	24.1	0.9
	Avena sativa. Oats																	
011	hay, sun-cured	1-03-280	91.0	0.22	0.48	0.24	0.20	1.38	0.17	0.22	0.066	14.1	—	142.0	58.6	0.2	35.8	25.3
012			100.0	0.24	0.52	0.26	0.22	1.51	0.18	0.25	0.073	15.5	—	155.0	64.1	0.2	39.2	27.7
013	straw	1-03-283	92.0	0.22	0.71	0.17	0.06	2.37	0.39	0.21	—	9.5	—	161.0	33.7	—	5.7	3.5
014			100.0	0.24	0.78	0.18	0.06	2.57	0.42	0.23	—	10.3	—	175.0	36.6	—	6.2	3.8
	Brachiaria mutica. Paragrass																	
015	hay, sun-cured	1-05-517	90.0	0.32	—	—	0.29	1.43	—	—	—	—	—	—	—	—	—	—
016			100.0	0.35	—	—	0.32	1.60	—	—	—	—	—	—	—	—	—	—
	Bromus inermis. Brome, smooth																	
017	hay, sun-cured, early	1-00-941	91.0	0.24	—	0.16	0.20	2.11	0.01	—	0.255	14.1	—	112.0	54.5	0.5	26.2	—
018	bloom		100.0	0.27	—	0.18	0.22	2.31	0.01	—	0.280	15.4	—	123.0	59.7	0.5	28.8	—
019	hay, sun-cured, mature	1-00-944	93.0	0.29	0.12	0.12	0.20	1.85	0.01	—	0.133	6.3	—	93.0	98.0	—	22.2	—
020			100.0	0.32	0.13	0.13	0.22	2.00	0.01	—	0.143	6.8	—	100.0	105.8	—	24.0	—
	Carthamus tinctorius. Safflower																	
021	hay, sun-cured	1-30-127	85.0	1.19	—	0.37	0.18	—	—	—	—	—	—	—	—	—	—	—
022			100.0	1.40	—	0.43	0.21	—	—	—	—	—	—	—	—	—	—	—
	Chloris gayana. Rhodesgrass																	
023	hay, sun-cured, early	1-03-910	88.0	0.52	—	0.31	0.36	2.00	—	—	—	—	—	—	—	—	—	—
024	vegetative		100.0	0.59	—	0.35	0.41	2.27	—	—	—	—	—	—	—	—	—	—
	Cynodon dactylon. Bermudagrass																	
025	hay, sun-cured	1-00-703	91.0	0.43	—	0.16	0.15	1.40	0.07	0.19	0.111	—	0.11	255.0	—	—	—	52.7
026			100.0	0.47	—	0.17	0.17	1.53	0.08	0.21	0.121	—	0.12	280.0	—	—	—	57.6
	Cynodon dactylon. Bermudagrass, coastal																	
027	hay, sun-cured, late	1-30-900	91.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	116.0
028	vegetative		100.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	127.5
	Dactylis glomerata. Orchardgrass																	
029	hay, sun-cured, cut 1	1-03-433	82.0	0.31	—	0.12	0.31	3.31	0.07	—	0.427	11.5	—	113.0	95.7	—	24.9	—
030			100.0	0.34	—	0.13	0.34	3.58	0.08	—	0.463	12.5	—	121.0	103.7	—	27.0	—
031	hay, sun-cured, cut 2	1-03-434	89.0	0.41	—	0.17	0.42	3.28	0.04	—	0.455	11.8	—	68.0	118.7	—	22.3	—
032			100.0	0.46	—	0.19	0.47	3.69	0.04	—	0.511	13.3	—	77.0	113.4	—	25.1	—

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Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Calcium (%)	Chlorine (%)	Magnesium (%)	Phosphorus (%)	Potassium (%)	Sodium (%)	Sulfur (%)	Cobalt (mg/kg)	Copper (mg/kg)	Iodine (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Selenium (mg/kg)	Zinc (mg/kg)	Carotene (mg/kg)
	Echinochloa crusgalli. Barnyardgrass																	
033	hay, sun-cured	1-03-105	88.0	0.38	—	—	0.21	2.13	—	—	—	—	—	—	—	—	—	—
034			100.0	0.43	—	—	0.24	2.42	—	—	—	—	—	—	—	—	—	—
	Eragrostis spp. Lovegrass																	
035	hay, sun-cured, full	1-02-644	92.0	0.28	—	0.06	0.11	—	—	—	—	—	—	—	—	—	—	—
036	bloom		100.0	0.30	—	0.06	0.12	—	—	—	—	—	—	—	—	—	—	—
	Festuca arundinacea. Fescue, Kentucky 31																	
037	hay, sun-cured, early	1-09-186	91.0	0.35	—	0.11	0.24	1.78	0.02	—	—	15.5	—	221.0	73.7	—	31.9	—
038	bloom		100.0	0.38	—	0.12	0.26	1.96	0.02	—	—	17.0	—	243.0	81.0	—	35.0	—
	Glycine max. Soybean																	
039	hay, sun-cured, mid-	1-04-538	94.0	1.18	—	0.74	0.25	0.91	0.11	0.24	—	—	—	281.0	—	—	—	31.2
040	bloom		100.0	1.26	—	0.79	0.27	0.97	0.12	0.26	—	—	—	300.0	—	—	—	33.3
041	hay, sun-cured, mature	1-04-543	90.0	0.94	—	—	0.25	0.73	—	—	—	—	—	—	—	—	—	6.7
042			100.0	1.04	—	—	0.28	0.81	—	—	—	—	—	—	—	—	—	7.4
	Gossypium spp. Cotton																	
043	gin by-product	1-08-413	90.0	0.83	—	—	0.18	—	—	—	—	—	—	—	—	—	—	—
044			100.0	0.92	—	—	0.20	—	—	—	—	—	—	—	—	—	—	—
045	hulls	1-01-599	91.0	0.13	0.02	0.13	0.09	0.79	0.02	0.08	0.018	12.0	—	119.0	108.0	—	19.9	—
046			100.0	0.15	0.02	0.14	0.09	0.87	0.02	0.09	0.019	13.3	—	131.0	119.2	—	22.0	—
	Hordeum vulgare. Barley																	
047	straw	1-00-498	91.0	0.27	0.61	0.21	0.07	2.16	0.13	0.16	0.060	4.9	—	183.0	15.1	—	6.8	2.1
048			100.0	0.30	0.67	0.23	0.07	2.37	0.14	0.17	0.066	5.4	—	201.0	16.6	—	7.4	2.3
	Lespedeza striata. Lespedeza, common																	
049	hay, sun-cured, full bloom	1-20-887	89.0	1.02	—	0.20	0.19	0.93	—	—	—	—	—	268.0	101.9	—	36.3	—
050			100.0	1.14	—	0.23	0.21	1.04	—	—	—	—	—	300.0	114.1	—	40.7	—
	Lolium multiflorum. Ryegrass, Italian																	
051	hay, sun-cured, late	1-04-065	86.0	0.53	—	—	0.29	1.34	—	—	—	—	—	274.0	—	—	—	248.2
052	vegetative		100.0	0.62	—	—	0.34	1.56	—	—	—	—	—	320.0	—	—	—	290.0
	Medicago sativa. Alfalfa																	
053	meal, 17% protein	1-00-023	92.0	1.40	0.47	0.29	0.23	2.39	0.10	0.22	0.302	9.7	0.15	405.0	31.0	0.3	19.3	120.2
054			100.0	1.52	0.52	0.32	0.25	2.60	0.11	0.24	0.329	10.6	0.16	441.0	33.8	0.4	21.1	131.1
055	hay, sun-cured, early	1-00-050	90.0	1.62	0.31	0.23	0.32	1.99	0.20	0.57	0.090	9.5	—	228.0	40.9	—	21.6	180.9
056	vegetative		100.0	1.80	0.34	0.26	0.35	2.21	0.22	0.63	0.100	10.6	—	253.0	45.4	—	24.0	201.0
057	hay, sun-cured, late	1-00-054	90.0	1.38	0.31	0.22	0.26	2.29	0.13	0.28	0.081	7.9	—	204.0	30.5	—	24.6	181.2
058	vegetative		100.0	1.54	0.34	0.24	0.29	2.56	0.15	0.31	0.090	8.8	—	227.0	34.0	—	27.4	202.0
059	hay, sun-cured, early	1-00-059	90.0	1.27	0.34	0.29	0.20	2.27	0.13	0.25	0.145	9.9	—	173.0	27.5	0.5	22.2	126.1
060	bloom		100.0	1.41	0.38	0.33	0.22	2.52	0.14	0.28	0.161	10.9	—	192.0	30.5	0.5	24.6	140.1
061	hay, sun-cured, full	1-00-068	90.0	1.13	—	0.28	0.20	1.38	0.10	0.25	0.293	12.6	—	135.0	33.6	—	22.3	58.5
062	bloom		100.0	1.25	—	0.31	0.22	1.53	0.11	0.27	0.325	14.0	—	150.0	37.3	—	24.8	65.0
063	hay, sun-cured, mature	1-00-071	91.0	1.03	—	0.24	0.17	1.62	0.08	0.23	0.082	12.8	—	139.0	40.2	—	21.5	10.6
064			100.0	1.13	—	0.27	0.18	1.78	0.08	0.25	0.090	14.0	—	153.0	44.1	—	23.6	11.6
	Oryza sativa. Rice																	
065	straw	1-03-925	91.0	0.19	—	0.10	0.07	1.19	0.28	—	—	—	—	—	313.0	—	—	—
066			100.0	0.21	—	0.11	0.08	1.32	0.31	—	—	—	—	—	345.8	—	—	—
	Panicum maximum. Guineagrass																	
067	dehydrated pelleted, 15	1-30-084	92.0	0.44	—	0.23	0.19	—	—	—	—	—	—	—	—	—	—	—
068	to 28 days' growth		100.0	0.48	—	0.25	0.21	—	—	—	—	—	—	—	—	—	—	—

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Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Calcium (%)	Chlorine (%)	Magnesium (%)	Phosphorus (%)	Potassium (%)	Sodium (%)	Sulfur (%)	Cobalt (mg/kg)	Copper (mg/kg)	Iodine (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Selenium (mg/kg)	Zinc (mg/kg)	Carotene (mg/kg)
	Paspalum dilatatum. Dallisgrass																	
069	hay, sun-cured, mid-	1-01-734	91.0	0.39	—	—	0.15	—	—	—	—	—	—	—	—	—	—	—
070	bloom		100.0	0.43	—	—	0.17	—	—	—	—	—	—	—	—	—	—	—
	Paspalum notatum. Bahiagrass																	
071	hay, sun-cured	1-00-462	91.0	0.46	—	0.17	0.20	—	—	—	—	—	—	55.0	—	—	—	—
072			100.0	0.50	—	0.19	0.22	—	—	—	—	—	—	60.0	—	—	—	—
	Phalaris arundinacea. Canarygrass, reed																	
073	hay, sun-cured	1-01-104	91.0	0.35	—	0.27	0.23	2.51	0.13	—	0.020	10.8	—	137.0	107.7	—	—	23.4
074			100.0	0.38	—	0.29	0.25	2.76	0.14	—	0.022	11.9	—	150.0	118.3	—	—	25.7
	Phleum pratense. Timothy																	
075	hay, sun-cured, late	1-04-881	89.0	0.59	—	0.13	0.30	1.50	0.16	—	—	23.0	—	179.0	79.5	—	59.8	111.6
076	vegetative		100.0	0.66	—	0.14	0.34	1.68	0.18	—	—	25.8	—	200.0	89.0	—	67.0	125.0
077	hay, sun-cured, full	1-04-884	89.0	0.38	0.55	0.12	0.18	1.45	0.16	—	—	4.4	—	139.0	—	—	47.9	—
078	bloom		100.0	0.43	0.62	0.14	0.20	1.64	0.18	—	—	5.0	—	157.0	—	—	54.0	—
	Poa pratensis. Bluegrass, Kentucky																	
079	hay, sun-cured	1-00-776	89.0	0.29	0.47	0.14	0.22	1.51	0.12	0.14	—	8.8	—	261.0	61.9	—	—	—
080			100.0	0.33	0.53	0.16	0.25	1.69	0.13	0.16	—	9.9	—	293.0	69.5	—	—	—
	Prosopis spicigera. Mesquite, spicigera																	
081	hay, sun-cured	1-30-160	86.0	1.54	—	—	0.14	—	—	—	—	—	—	—	—	—	—	—
082			100.0	1.80	—	—	0.16	—	—	—	—	—	—	—	—	—	—	—
	Pueraria spp. Kudzu																	
083	hay, sun-cured	1-02-478	91.0	2.15	—	0.73	0.32	—	—	—	—	—	—	—	—	—	—	40.1
084			100.0	2.35	—	0.80	0.35	—	—	—	—	—	—	—	—	—	—	43.9
	Saccharum officinarum. Sugarcane																	
085	bagasse, dehydrated	1-04-686	91.0	0.82	—	0.09	0.27	0.46	0.18	0.09	—	—	—	91.0	—	—	—	—
086			100.0	0.90	—	0.10	0.29	0.50	0.20	0.10	—	—	—	100.0	—	—	—	—
	Secale cereale. Rye																	
087	hay, sun-cured	1-04-004	93.0	0.31	—	0.12	0.18	1.26	0.03	—	—	—	—	—	—	—	31.7	6.1
088			100.0	0.33	—	0.13	0.19	1.35	0.03	—	—	—	—	—	—	—	33.9	6.5
089	straw	1-04-007	90.0	0.22	0.21	0.07	0.08	0.87	0.12	0.10	—	3.6	—	—	6.0	—	—	—
090			100.0	0.24	0.24	0.08	0.09	0.97	0.13	0.11	—	4.0	—	—	6.6	—	—	—
	Sorghum bicolor. Sorghum																	
091	hay, sun-cured, full	1-04-371	90.0	0.56	—	0.27	0.17	1.11	0.02	—	—	—	—	—	—	—	—	—
092	bloom		100.0	0.62	—	0.30	0.19	1.24	0.02	—	—	—	—	—	—	—	—	—
093	aerial part, sun-cured,	1-04-301	90.0	0.56	—	0.27	0.17	1.12	0.02	—	—	—	—	181.0	—	—	—	—
094	mature		100.0	0.62	—	0.30	0.19	1.24	0.02	—	—	—	—	200.0	—	—	—	—
	Sorghum bicolor sudanense. Sorghum, Sudangrass																	
095	hay, sun-cured, early	1-04-473	90.0	0.69	—	0.27	0.32	1.92	0.01	—	—	31.4	—	565.0	71.0	—	44.9	—
096	vegetative		100.0	0.77	—	0.31	0.36	2.14	0.01	—	—	35.0	—	629.0	79.0	—	50.0	—
097	hay, sun-cured, late	1-04-474	88.0	0.38	—	0.12	0.26	2.83	0.01	—	—	44.8	—	367.0	43.1	—	53.6	—
098	vegetative		100.0	0.43	—	0.14	0.30	3.22	0.01	—	—	51.0	—	417.0	49.0	—	61.0	—
	Sorghum halepense. Sorghum, Johnsongrass																	
099	hay, sun-cured	1-04-407	89.0	0.75	—	0.31	0.25	1.21	0.01	0.09	—	—	—	527.0	—	—	—	34.8
100			100.0	0.84	—	0.35	0.28	1.35	0.01	0.10	—	—	—	590.0	—	—	—	38.9

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Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Calcium (%)	Chlorine (%)	Magnesium (%)	Phosphorus (%)	Potassium (%)	Sodium (%)	Sulfur (%)	Cobalt (mg/kg)	Copper (mg/kg)	Iodine (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Selenium (mg/kg)	Zinc (mg/kg)	Carotene (mg/kg)
	Trifolium alexandrinum. Clover, Egyptian																	
101	hay, sun-cured	1-01-340	88.0	2.25	—	0.35	0.26	2.00	—	—	—	—	—	—	—	—	—	—
102			100.0	2.54	—	0.40	0.30	2.26	—	—	—	—	—	—	—	—	—	—
	Trifolium pratense. Clover, red																	
103	hay, sun-cured	1-01-415	89.0	1.35	0.28	0.38	0.22	1.44	0.16	0.15	0.138	9.7	0.22	163.0	64.8	—	15.2	17.6
104			100.0	1.53	0.32	0.43	0.25	1.62	0.19	0.17	0.156	10.9	0.25	184.0	73.3	—	17.2	19.8
	Triticum aestivum. Wheat																	
105	straw	1-05-175	89.0	0.16	0.28	0.11	0.04	1.26	0.13	0.17	0.040	3.2	—	140.0	36.3	—	5.7	2.0
106			100.0	0.18	0.32	0.12	0.05	1.42	0.14	0.19	0.045	3.6	—	157.0	40.9	—	6.5	2.2
	Vicia spp. Vetch																	
107	hay, sun-cured	1-05-106	89.0	1.05	—	0.22	0.29	2.07	0.46	0.13	0.316	8.8	0.44	374.0	65.0	—	—	410.5
108			100.0	1.18	—	0.25	0.32	2.32	0.52	0.15	0.355	9.9	0.49	420.0	72.9	—	—	460.5
	Vigna sinensis. Cowpea, common																	
109	hay, sun-cured	1-01-645	90.0	1.26	0.15	0.41	0.31	2.03	0.24	0.32	0.063	—	—	270.0	—	—	—	31.5
110			100.0	1.40	0.17	0.45	0.35	2.26	0.27	0.35	0.070	—	—	300.0	—	—	—	35.0
	Zea mays. Corn																	
111	cobs, ground	1-02-782	90.0	0.11	—	0.06	0.04	0.79	0.42	0.42	0.117	6.6	—	208.0	5.6	—	—	0.6
112			100.0	0.12	—	0.07	0.04	0.87	0.47	0.47	0.130	7.3	—	230.0	6.2	—	—	0.7
	Ziziphus nummularia. Jujube, wild																	
113	hay, sun-cured	1-30-170	91.0	3.48	—	—	0.14	—	—	—	—	—	—	—	—	—	—	—
114			100.0	3.82	—	—	0.15	—	—	—	—	—	—	—	—	—	—	—
	PASTURE, RANGE PLANTS, AND FORAGES FED GREEN																	
	Agave spp. Agave																	
115	browse, fresh	2-00-014	12.0	0.52	—	0.04	0.01	0.09	—	—	—	—	—	—	—	—	—	—
116			100.0	4.31	—	0.29	0.11	0.74	—	—	—	—	—	—	—	—	—	—
	Agropyron desertorum. Wheatgrass, crested																	
117	fresh, early vegetative	2-05-420	28.0	0.13	—	0.08	0.10	—	—	—	—	—	—	—	—	—	—	126.0
118			100.0	0.46	—	0.28	0.34	—	—	—	—	—	—	—	—	—	—	451.0
119	fresh, post ripe	2-05-428	80.0	0.22	—	—	0.06	—	—	—	0.199	6.7	—	—	42.3	—	—	0.2
120			100.0	0.27	—	—	0.07	—	—	—	0.249	8.4	—	—	52.9	—	—	0.2
	Agropyron smithii. Wheatgrass, western																	
121	fresh, mature	2-05-407	63.0	0.31	—	0.06	0.10	0.78	—	—	0.467	8.8	—	438.0	44.2	—	23.3	39.2
122			100.0	0.50	—	0.09	0.16	1.24	—	—	0.740	14.0	—	695.0	70.0	—	37.0	62.2
	Agrostis alba. Redtop																	
123	fresh, midbloom	2-03-890	39.0	0.13	—	0.07	0.09	0.83	—	0.10	—	—	—	—	—	—	—	—
124			100.0	0.33	—	0.18	0.23	2.13	—	0.26	—	—	—	—	—	—	—	—
	Ailanthus excelsa. Ailanthus, excelsa																	
125	browse, fresh	2-30-096	26.0	0.39	—	—	0.04	—	—	—	—	—	—	—	—	—	—	—
126			100.0	1.48	—	—	0.17	—	—	—	—	—	—	—	—	—	—	—
	Ambrosia spp. Ragweed																	
127	fresh, early vegetative	2-03-851	27.0	0.45	—	—	0.04	—	—	—	—	—	—	—	—	—	—	—
128			100.0	1.68	—	—	0.16	—	—	—	—	—	—	—	—	—	—	—

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	Andropogon barbinodis. Bluestem, cane																	
129	fresh, late vegetative	2-30-195	46.0	—	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—
130			100.0	—	—	—	0.10	—	—	—	—	—	—	—	—	—	—	—
131	fresh, mature	2-30-057	89.0	—	—	—	0.03	—	—	—	—	—	—	—	—	—	—	—
132			100.0	—	—	—	0.03	—	—	—	—	—	—	—	—	—	—	—
	Andropogon scoparius. Bluestem, little																	
133	fresh, late vegetative	2-29-994	72.0	—	—	—	0.08	—	—	—	—	—	—	—	—	—	—	—
134			100.0	—	—	—	0.11	—	—	—	—	—	—	—	—	—	—	—
	Anemone heterophylla. Amemone, heterophylla																	
135	fresh, late vegetative	2-30-072	23.0	—	—	—	0.04	—	—	—	—	—	—	—	—	—	—	—
136			100.0	—	—	—	0.19	—	—	—	—	—	—	—	—	—	—	—
	Aristida wrightii. Three-awn, Wright																	
137	fresh, late vegetative	2-30-016	63.0	—	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—
138			100.0	—	—	—	0.08	—	—	—	—	—	—	—	—	—	—	—
	Artemisia filifolia. Sage-brush, sand																	
139	browse, fresh, mature	2-04-135	45.0	0.22	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—
140			100.0	0.48	—	—	0.12	—	—	—	—	—	—	—	—	—	—	—
	Artemisia ludoviciana albula. Sagebrush, Mexican																	
141	browse, fresh, mature	2-30-052	44.0	—	—	—	0.07	—	—	—	—	—	—	—	—	—	—	—
142			100.0	—	—	—	0.15	—	—	—	—	—	—	—	—	—	—	—
	Aster spp. Aster																	
143	fresh	2-00-443	32.0	0.47	—	0.09	0.10	0.30	—	—	—	—	—	—	13.8	—	—	—
144			100.0	1.48	—	0.29	0.31	0.94	—	—	—	—	—	—	43.0	—	—	—
	Astragalus nuttallii. Milk-vetch, Nuttall																	
145	fresh, early vegetative	2-29-814	28.0	—	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—
146			100.0	—	—	—	0.18	—	—	—	—	—	—	—	—	—	—	—
	Avena sativa. Oats																	
147	fresh	2-03-292	20.0	0.05	—	0.04	0.34	0.38	—	—	—	—	—	—	—	—	—	—
148			100.0	0.27	—	0.18	1.68	1.87	—	—	—	—	—	—	—	—	—	—
	Azadirachia indica. Margosa																	
149	browse, fresh	2-30-147	21.0	0.79	—	—	0.04	—	—	—	—	—	—	—	—	—	—	—
150			100.0	3.80	—	—	0.19	—	—	—	—	—	—	—	—	—	—	—
	Bouteloua curtipendula. Grama, sideoats																	
151	fresh, late vegetative	2-29-863	62.0	—	—	—	0.07	—	—	—	—	—	—	—	—	—	—	—
152			100.0	—	—	—	0.11	—	—	—	—	—	—	—	—	—	—	—
153	aerial part without	2-30-042	78.0	—	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—
154	heads, fresh, mature		100.0	—	—	—	0.06	—	—	—	—	—	—	—	—	—	—	—
	Bouteloua hirsuta. Grama, hairy																	
155	fresh, late vegetative	2-30-006	55.0	—	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—
156			100.0	—	—	—	0.09	—	—	—	—	—	—	—	—	—	—	—

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	Brachiaria mutica. Paragrass																	
157	fresh	2-03-525	28.0	0.12	—	—	0.10	0.44	—	—	—	—	—	—	—	—	—	—
158			100.0	0.42	—	—	0.34	1.58	—	—	—	—	—	—	—	—	—	—
	Brassica oleracea medullosa. Kale, marrow																	
159	fresh, 71 to 84 days'	2-30-181	11.0	0.29	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—
160	growth		100.0	2.59	—	—	0.43	—	—	—	—	—	—	—	—	—	—	—
161	fresh, 99 to 112 days'	2-30-182	12.0	0.37	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—
162	growth		100.0	3.00	—	—	0.39	—	—	—	—	—	—	—	—	—	—	—
163	leaves, fresh	2-02-457	16.0	0.72	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—
164			100.0	4.61	—	—	0.31	—	—	—	—	—	—	—	—	—	—	—
165	stems, fresh	2-08-449	14.0	0.30	—	—	0.06	—	—	—	—	—	—	—	—	—	—	—
166			100.0	2.14	—	—	0.43	—	—	—	—	—	—	—	—	—	—	—
	Bromus catharticus. Brome, rescue																	
167	fresh, late vegetative	2-08-362	33.0	—	—	—	0.06	—	—	—	—	—	—	—	—	—	—	—
168			100.0	—	—	—	0.19	—	—	—	—	—	—	—	—	—	—	—
	Buchloe dactyloides. Buffalograss																	
169	fresh, late vegetative	2-29-868	61.0	—	0.14	—	0.13	—	—	—	—	—	—	—	—	—	—	—
170			100.0	—	0.22	—	0.21	—	—	—	—	—	—	—	—	—	—	—
171	fresh, mature	2-01-008	72.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	46.4
172			100.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	64.2
	Carex planostachys. Sedge, thicket																	
173	fresh, late vegetative	2-29-865	39.0	—	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—
174			100.0	—	—	—	0.13	—	—	—	—	—	—	—	—	—	—	—
	Carthamus tinctorius. Safflower																	
175	fresh	2-28-574	15.0	0.17	—	0.06	0.06	—	—	—	—	—	—	—	—	—	—	—
176			100.0	1.10	—	0.37	0.38	—	—	—	—	—	—	—	—	—	—	—
177	leaves, fresh	2-30-129	16.0	0.27	—	0.09	0.07	—	—	—	—	—	—	—	—	—	—	—
178			100.0	1.70	—	0.55	0.46	—	—	—	—	—	—	—	—	—	—	—
179	stems, fresh	2-30-130	15.0	0.12	—	—	0.04	—	—	—	—	—	—	—	—	—	—	—
180			100.0	0.80	—	—	0.28	—	—	—	—	—	—	—	—	—	—	—
	Celtis reticulata. Hackberry, netleaf																	
181	leaves, fresh	2-30-045	56.0	—	—	—	0.04	—	—	—	—	—	—	—	—	—	—	—
182			100.0	—	—	—	0.08	—	—	—	—	—	—	—	—	—	—	—
	Celtis tetendra. Hackberry, tetendra																	
183	browse, fresh, mature	2-30-164	53.0	2.10	—	—	0.07	—	—	—	—	—	—	—	—	—	—	—
184			100.0	4.00	—	—	0.13	—	—	—	—	—	—	—	—	—	—	—
	Cichorium intybus. Chicory, bluedaisy																	
185	leaves, fresh	2-19-486	23.0	0.69	—	—	0.25	—	—	—	—	—	—	—	—	—	—	—
186			100.0	2.99	—	—	1.07	—	—	—	—	—	—	—	—	—	—	—
	Commelina spp. Dayflower																	
187	fresh, late vegetative	2-30-040	17.0	—	—	—	0.02	—	—	—	—	—	—	—	—	—	—	—
188			100.0	—	—	—	0.13	—	—	—	—	—	—	—	—	—	—	—
	Croton spp. Croton																	
189	browse, fresh	2-01-694	40.0	0.85	—	0.15	0.06	0.60	—	—	—	—	—	—	—	—	—	—
190			100.0	2.12	—	0.38	0.16	1.51	—	—	—	—	—	—	—	—	—	—

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	Cucurbita foetidissima. Buffalogourd																	
191	leaves, fresh	2-30-038	23.0	—	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—
192			100.0	—	—	—	0.22	—	—	—	—	—	—	—	—	—	—	—
	Cynodon dactylon. Bermudagrass																	
193	fresh	2-00-712	34.0	0.18	—	0.06	0.07	0.57	—	—	0.025	1.9	—	—	—	—	—	104.4
194			100.0	0.53	—	0.17	0.21	1.70	—	—	0.075	5.7	—	—	—	—	—	310.3
195	fresh, late vegetative	2-10-131	38.0	—	—	—	0.08	—	—	—	—	—	—	—	—	—	—	—
196			100.0	—	—	—	0.22	—	—	—	—	—	—	—	—	—	—	—
	Dactylis glomerata. Orchardgrass																	
197	fresh, early bloom	2-03-442	25.0	0.06	—	0.08	0.10	0.84	0.01	0.06	—	8.2	—	194.0	25.8	—	—	—
198			100.0	0.25	—	0.31	0.39	3.38	0.04	0.26	—	33.1	—	785.0	104.1	—	—	—
	Dactyloctenium aegyptium. Crowfootgrass, Durban																	
199	fresh	2-21-442	17.0	0.15	—	—	0.12	—	—	—	—	—	—	—	—	—	—	—
200			100.0	0.91	—	—	0.70	—	—	—	—	—	—	—	—	—	—	—
	Dasylirion texanum. Sotol, Texas																	
201	leaves, fresh	2-04-528	57.0	0.39	—	0.06	0.05	0.43	—	—	—	—	—	—	—	—	—	—
202			100.0	0.69	—	0.11	0.08	0.76	—	—	—	—	—	—	—	—	—	—
	Digera aneensis. Digera, aneensis																	
203	fresh	2-30-149	13.0	0.37	—	—	0.07	—	—	—	—	—	—	—	—	—	—	—
204			100.0	2.91	—	—	0.57	—	—	—	—	—	—	—	—	—	—	—
	Diospyros texana. Persimmon, Texas																	
205	leaves, fresh	2-29-858	48.0	—	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—
206			100.0	—	—	—	0.11	—	—	—	—	—	—	—	—	—	—	—
	Echinochloa crusgalli. Barnyardgrass																	
207	fresh	2-03-108	21.0	0.11	—	—	0.06	0.49	—	—	—	—	—	—	—	—	—	—
208			100.0	0.52	—	—	0.30	2.40	—	—	—	—	—	—	—	—	—	—
	Elymus canadensis. Wildrye, Canada																	
209	fresh, late vegetative	2-29-848	48.0	—	—	—	0.09	—	—	—	—	—	—	—	—	—	—	—
210			100.0	—	—	—	0.19	—	—	—	—	—	—	—	—	—	—	—
	Engelmannia pinnatifida. Engelmann daisy																	
211	fresh	2-29-879	30.0	—	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—
212			100.0	—	—	—	0.17	—	—	—	—	—	—	—	—	—	—	—
	Eriochloa sericea. Cupgrass, Texas																	
213	fresh, late vegetative	2-29-996	40.0	—	—	—	0.06	—	—	—	—	—	—	—	—	—	—	—
214			100.0	—	—	—	0.14	—	—	—	—	—	—	—	—	—	—	—
215	fresh, mature	2-30-059	83.0	—	—	—	0.04	—	—	—	—	—	—	—	—	—	—	—
216			100.0	—	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—
	Eurotia lanata. Winterfat, common																	
217	fresh, stem cured	2-26-142	80.0	1.58	—	—	0.09	—	—	—	—	—	—	—	—	—	—	14.5
218			100.0	1.98	—	—	0.12	—	—	—	—	—	—	—	—	—	—	18.1

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Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Calcium (%)	Chlorine (%)	Magnesium (%)	Phosphorus (%)	Potassium (%)	Sodium (%)	Sulfur (%)	Cobalt (mg/kg)	Copper (mg/kg)	Iodine (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Selenium (mg/kg)	Zinc (mg/kg)	Carotene (mg/kg)
	Evax prolifera. Evax, prolifera																	
219	fresh, early vegetative	2-30-068	38.0	—	—	—	0.08	—	—	—	—	—	—	—	—	—	—	—
220			100.0	—	—	—	0.20	—	—	—	—	—	—	—	—	—	—	—
	Ficus benghalensis. Banyan-tree																	
221	leaves, fresh	2-27-208	32.0	0.81	—	—	0.13	—	—	—	—	—	—	—	—	—	—	—
222			100.0	2.53	—	—	0.40	—	—	—	—	—	—	—	—	—	—	—
	Ficus glomerata. Fig, cluster																	
223	leaves, fresh	2-27-209	30.0	1.13	—	—	0.21	—	—	—	—	—	—	—	—	—	—	—
224			100.0	3.75	—	—	0.71	—	—	—	—	—	—	—	—	—	—	—
	Ficus roxburghii. Fig, Roxburgh																	
225	fresh	2-30-177	33.0	0.44	—	—	0.06	—	—	—	—	—	—	—	—	—	—	—
226			100.0	1.31	—	—	0.17	—	—	—	—	—	—	—	—	—	—	—
	Forestiera pubescens. Forestiera, downy																	
227	browse, fresh, late	2-29-837	38.0	—	—	—	0.06	—	—	—	—	—	—	—	—	—	—	—
228	vegetative		100.0	—	—	—	0.16	—	—	—	—	—	—	—	—	—	—	—
	Grewia oppositifolia roxburghii. Grewia, oppositifolia, roxburghii																	
229	browse, fresh	2-30-097	33.0	0.90	—	0.18	0.08	—	—	—	—	—	—	—	—	—	—	—
230			100.0	2.74	—	0.54	0.24	—	—	—	—	—	—	—	—	—	—	—
	Gutierrezia texana. Snakeweed, Texas																	
231	fresh, late vegetative	2-04-245	30.0	0.20	—	0.06	0.05	0.89	—	—	—	—	—	—	—	—	—	—
232			100.0	0.65	—	0.21	0.17	2.98	—	—	—	—	—	—	—	—	—	—
	Hilaria belangeri. Curly mesquite																	
233	browse, fresh, early	2-01-723	23.0	0.24	—	0.07	0.06	0.18	—	—	—	—	—	—	—	—	—	—
234	vegetative		100.0	1.04	—	0.31	0.26	0.79	—	—	—	—	—	—	—	—	—	—
	Hordeum vulgare. Barley																	
235	fresh	2-00-511	21.0	0.13	—	—	0.09	—	—	—	—	—	—	—	—	—	—	49.1
236			100.0	0.60	—	—	0.40	—	—	—	—	—	—	—	—	—	—	230.4
	Juniperus ashei. Juniper, ashe																	
237	leaves, fresh	2-29-850	52.0	—	—	—	0.04	—	—	—	—	—	—	—	—	—	—	—
238			100.0	—	—	—	0.08	—	—	—	—	—	—	—	—	—	—	—
	Juniperus pinchotii. Juniper, redberry																	
239	leaves, fresh	2-29-851	53.0	—	—	—	0.06	—	—	—	—	—	—	—	—	—	—	—
240			100.0	—	—	—	0.11	—	—	—	—	—	—	—	—	—	—	—
	Lactuca sativa. Lettuce																	
241	fresh	2-02-624	5.0	0.05	—	—	0.03	0.24	0.01	—	—	—	—	13.0	—	—	—	—
242			100.0	0.86	—	—	0.46	4.52	0.17	—	—	—	—	246.0	—	—	—	—
	Lepidium spp. Pepperweed																	
243	fresh, late vegetative	2-03-686	42.0	0.83	—	0.21	0.17	1.35	—	—	—	—	—	—	—	—	—	—
244			100.0	1.95	—	0.49	0.41	3.18	—	—	—	—	—	—	—	—	—	—

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	Leptochloa dubia. Sprangletop, green																	
245	fresh, late vegetative	2-30-031	52.0	—	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—
246			100.0	—	—	—	0.09	—	—	—	—	—	—	—	—	—	—	—
	Leptoloma cognatum. Witchgrass, fall																	
247	fresh, late vegetative	2-30-039	50.0	—	—	—	0.04	—	—	—	—	—	—	—	—	—	—	—
248			100.0	—	—	—	0.07	—	—	—	—	—	—	—	—	—	—	—
	Lespedeza striata. Lespedeza, common																	
249	fresh, full bloom	2-02-541	35.0	0.42	—	0.09	0.09	0.35	—	—	—	—	—	94.0	61.4	—	—	—
250			100.0	1.21	—	0.25	0.27	1.01	—	—	—	—	—	270.0	176.4	—	—	—
	Lesquerella gordonii. Bladderpod, Gordon																	
251	fresh, late vegetative	2-29-820	35.0	—	—	—	0.06	—	—	—	—	—	—	—	—	—	—	—
252			100.0	—	—	—	0.17	—	—	—	—	—	—	—	—	—	—	—
	Lonicera albiflora. Honeysuckle, bush																	
253	leaves, fresh	2-29-875	33.0	—	—	—	0.04	—	—	—	—	—	—	—	—	—	—	—
254			100.0	—	—	—	0.11	—	—	—	—	—	—	—	—	—	—	—
	Lotus spp. Trefoil																	
255	fresh	2-01-757	15.0	0.32	—	—	0.04	0.32	—	—	—	—	—	—	—	—	—	—
256			100.0	2.07	—	—	0.26	2.09	—	—	—	—	—	—	—	—	—	—
	Lupinus texensis. Bluebonnet, Texas																	
257	fresh, early vegetative	2-29-821	18.0	—	—	—	0.02	—	—	—	—	—	—	—	—	—	—	—
258			100.0	—	—	—	0.14	—	—	—	—	—	—	—	—	—	—	—
259	fresh, late vegetative	2-29-831	16.0	—	—	—	0.03	—	—	—	—	—	—	—	—	—	—	—
260			100.0	—	—	—	0.17	—	—	—	—	—	—	—	—	—	—	—
	Medicago sativa. Alfalfa																	
261	fresh	2-00-196	24.0	0.48	0.11	0.07	0.07	0.51	0.05	0.09	0.032	2.4	—	70.0	10.4	—	4.3	45.0
262			100.0	1.96	0.47	0.27	0.30	2.09	0.19	0.37	0.133	9.9	—	286.0	42.6	—	17.6	185.0
263	fresh, late vegetative	2-00-181	21.0	0.47	0.09	0.06	0.07	0.46	0.05	0.10	0.036	2.3	—	24.0	8.7	—	—	—
264			100.0	2.19	0.44	0.27	0.33	2.14	0.21	0.48	0.167	10.8	—	111.0	40.8	—	—	—
265	fresh, full bloom	2-00-188	25.0	0.38	0.11	0.07	0.07	0.53	0.04	0.08	—	—	—	107.0	38.7	—	—	—
266			100.0	1.53	0.43	0.27	0.27	2.13	0.15	0.31	—	—	—	430.0	155.2	—	—	—
	Mimosa spp. Mimosa																	
267	browse, fresh, early	2-03-122	26.0	0.62	—	0.08	0.04	0.30	—	—	—	—	—	—	—	—	—	—
268	vegetative		100.0	2.38	—	0.32	0.17	1.14	—	—	—	—	—	—	—	—	—	—
	Morus australis. Mulberry, Japanese																	
269	leaves, fresh	2-30-179	15.0	0.36	—	—	0.04	—	—	—	—	—	—	—	—	—	—	—
270			100.0	2.42	—	—	0.24	—	—	—	—	—	—	—	—	—	—	—
	Musa spp. Banana																	
271	leaves, fresh	2-09-902	19.0	0.23	—	0.06	0.13	—	—	—	—	—	—	—	—	—	—	—
272			100.0	1.20	—	0.32	0.70	—	—	—	—	—	—	—	—	—	—	—
	Nolina texana. Nolina, Texas																	
273	buds, fresh	2-29-855	32.0	—	—	—	0.12	—	—	—	—	—	—	—	—	—	—	—
274			100.0	—	—	—	0.38	—	—	—	—	—	—	—	—	—	—	—
275	leaves, fresh	2-29-852	37.0	—	—	—	0.04	—	—	—	—	—	—	—	—	—	—	—
276			100.0	—	—	—	0.06	—	—	—	—	—	—	—	—	—	—	—

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	Opuntia spp. Pricklypear																	
277	fresh, mature	2-01-059	21.0	—	0.05	—	0.01	—	0.06	0.05	—	—	—	—	—	—	—	1.3
278			100.0	—	0.21	—	0.03	—	0.30	0.23	—	—	—	—	—	—	—	6.0
279	fruit, fresh, immature	4-30-020	26.0	—	—	—	0.03	—	—	—	—	—	—	—	—	—	—	—
280			100.0	—	—	—	0.13	—	—	—	—	—	—	—	—	—	—	—
	Panicum halliti. Panicum, Halls																	
281	fresh, late vegetative	2-29-998	49.0	—	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—
282			100.0	—	—	—	0.10	—	—	—	—	—	—	—	—	—	—	—
	Panicum maximum, Guineagrass																	
283	fresh, 15 to 28 days'	2-09-995	16.0	0.09	—	0.05	0.06	—	—	—	—	—	—	—	—	—	—	—
284	growth		100.0	0.54	—	0.30	0.36	—	—	—	—	—	—	—	—	—	—	—
285	fresh, 29 to 42 days'	2-09-714	18.0	0.10	—	0.05	0.06	—	—	—	—	—	—	—	—	—	—	—
286	growth		100.0	0.53	—	0.30	0.32	—	—	—	—	—	—	—	—	—	—	—
287	fresh, 43 to 56 days'	2-09-910	21.0	0.10	—	0.04	0.07	—	—	—	—	—	—	—	—	—	—	—
288	growth		100.0	0.51	—	0.19	0.33	—	—	—	—	—	—	—	—	—	—	—
	Panicum obtusum. Vine-mesquite																	
289	fresh, late vegetative	2-30-009	47.0	—	—	—	0.07	—	—	—	—	—	—	—	—	—	—	—
290			100.0	—	—	—	0.14	—	—	—	—	—	—	—	—	—	—	—
	Panicum virgatum. Switchgrass																	
291	fresh, early vegetative	2-04-795	35.0	0.16	—	—	0.07	—	—	—	—	—	—	—	—	—	—	—
292			100.0	0.46	—	—	0.20	—	—	—	—	—	—	—	—	—	—	—
	Paspalum dilatatum. Dallisgrass																	
293	fresh, early vegetative	2-01-738	26.0	0.17	—	—	0.11	—	—	—	—	—	—	—	—	—	—	108.8
294			100.0	0.65	—	—	0.42	—	—	—	—	—	—	—	—	—	—	426.6
	Pennisetum incomptum. Pennisetum, incomptum																	
295	fresh	2-30-104	30.0	0.19	—	0.16	0.14	—	—	—	—	—	—	—	—	—	—	—
296			100.0	0.63	—	0.53	0.45	—	—	—	—	—	—	—	—	—	—	—
	Pennisetum purpureum. Napiergrass																	
297	fresh	2-03-166	21.0	0.09	—	0.06	0.07	0.28	0.00	0.02	—	—	—	—	—	—	—	—
298			100.0	0.44	—	0.26	0.35	1.31	0.01	0.10	—	—	—	—	—	—	—	—
299	fresh, 15 to 28 days'	2-09-412	15.0	0.05	—	0.07	0.03	—	—	—	—	—	—	—	—	—	—	—
300	growth		100.0	0.35	—	0.48	0.23	—	—	—	—	—	—	—	—	—	—	—
301	fresh, 29 to 42 days'	2-10-095	21.0	0.08	—	0.08	0.06	—	—	—	—	—	—	—	—	—	—	—
302	growth		100.0	0.39	—	0.37	0.31	—	—	—	—	—	—	—	—	—	—	—
	Phalaris arundinacea. Canarygrass, reed																	
303	fresh	2-01-113	27.0	0.11	—	—	0.09	0.97	—	—	—	—	—	—	—	—	—	—
304			100.0	0.41	—	—	0.35	3.64	—	—	—	—	—	—	—	—	—	—
	Phalaris tuberosa stenoptera. Hardinggrass																	
305	fresh	2-02-354	27.0	0.08	—	—	0.03	—	—	—	—	—	—	—	—	—	—	—
306			100.0	0.29	—	—	0.12	—	—	—	—	—	—	—	—	—	—	—
	Plantago rhodosperma. Plantain, redseed																	
307	leaves, fresh	2-29-870	28.0	—	—	—	0.03	—	—	—	—	—	—	—	—	—	—	—
308			100.0	—	—	—	0.10	—	—	—	—	—	—	—	—	—	—	—

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	Prosopis glandulosa. Mesquite, honey																	
309	browse, fresh, late	2-29-999	48.0	—	—	—	0.04	—	—	—	—	—	—	—	—	—	—	—
310	vegetative		100.0	—	—	—	0.08	—	—	—	—	—	—	—	—	—	—	—
	Quercus sinuata brevi-loba. Oak, shin																	
311	browse, fresh, early	2-29-826	32.0	—	—	—	0.10	—	—	—	—	—	—	—	—	—	—	—
312	vegetative		100.0	—	—	—	0.31	—	—	—	—	—	—	—	—	—	—	—
	Quercus virginiana. Oak, live																	
313	browse, fresh, early	2-29-815	36.0	—	—	—	0.14	—	—	—	—	—	—	—	—	—	—	—
314	vegetative		100.0	—	—	—	0.38	—	—	—	—	—	—	—	—	—	—	—
315	leaves, fresh	2-29-859	50.0	—	—	—	0.05	—	—	—	—	—	—	—	—	—	—	—
316			100.0	—	—	—	0.11	—	—	—	—	—	—	—	—	—	—	—
	Ratibida columnifera. Prairieconeflower, upright																	
317	fresh, early vegetative	2-29-846	18.0	—	—	—	0.06	—	—	—	—	—	—	—	—	—	—	—
318			100.0	—	—	—	0.33	—	—	—	—	—	—	—	—	—	—	—
	Rhus aromatica. Sumac, fragrant																	
319	browse, fresh, early	2-29-827	40.0	—	—	—	0.08	—	—	—	—	—	—	—	—	—	—	—
320	vegetative		100.0	—	—	—	0.20	—	—	—	—	—	—	—	—	—	—	—
	Sarcobatus vermiculatus. Greasewood, black																	
321	browse, fresh	2-20-083	35.0	0.39	—	0.17	0.07	0.73	—	0.18	0.098	5.9	—	—	32.7	—	11.6	—
322			100.0	1.10	—	0.48	0.21	2.09	—	0.50	0.280	16.9	—	—	93.4	—	33.1	—
	Schrankia roemeriana. Sensitivebrier, Roemer																	
323	browse, fresh, late	2-29-860	32.0	—	—	—	0.07	—	—	—	—	—	—	—	—	—	—	—
324	vegetative		100.0	—	—	—	0.22	—	—	—	—	—	—	—	—	—	—	—
	Secale cereale. Rye																	
325	fresh	2-04-018	24.0	0.09	—	0.08	0.08	0.82	0.02	—	—	—	—	—	—	—	—	82.3
326			100.0	0.39	—	0.31	0.33	3.40	0.07	—	—	—	—	—	—	—	—	342.6
	Sedum nuttallianum. Stonecrop, Nuttall																	
327	fresh, early vegetative	2-29-836	10.0	—	—	—	0.02	—	—	—	—	—	—	—	—	—	—	—
328			100.0	—	—	—	0.20	—	—	—	—	—	—	—	—	—	—	—
	Setaria macrostachya. Bristlegrass, plains																	
329	fresh, late vegetative	2-29-882	43.0	—	—	—	0.09	—	—	—	—	—	—	—	—	—	—	—
330			100.0	—	—	—	0.20	—	—	—	—	—	—	—	—	—	—	—
	Sorghum bicolor sudanense. Sorghum, Sudangrass																	
331	fresh, early vegetative	2-04-484	18.0	0.08	—	0.06	0.07	0.38	0.00	0.02	—	—	—	36.0	—	—	—	35.2
332			100.0	0.43	—	0.35	0.41	2.14	0.01	0.11	—	—	—	200.0	—	—	—	197.5
333	fresh, midbloom	2-04-485	23.0	0.10	—	0.08	0.08	0.49	0.00	0.03	—	—	—	46.0	—	—	—	41.6
334			100.0	0.43	—	0.35	0.36	2.14	0.01	0.11	—	—	—	200.0	—	—	—	182.5
	Sorghum halepense. Sorghum, Johnsongrass																	
335	fresh	2-04-412	24.0	0.18	—	0.06	0.05	0.74	—	—	—	—	—	—	—	—	—	47.0
336			100.0	0.77	—	0.25	0.23	3.12	—	—	—	—	—	—	—	—	—	198.4

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	Stipa leucotricha. Needlegrass, Texas																	
337	fresh, late vegetative	2-29-822	55.0	—	—	—	0.06	—	—	—	—	—	—	—	—	—	—	—
338			100.0	—	—	—	0.10	—	—	—	—	—	—	—	—	—	—	—
	Tillandsia usneoides. Spanishmoss																	
339	whole, fresh	2-04-648	41.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6.2
340			100.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	15.0
	Tribulus terrestris. Puncturevine																	
341	fresh	2-27-107	22.0	0.77	—	—	0.06	—	—	—	—	—	—	—	—	—	—	—
342			100.0	3.50	—	—	0.26	—	—	—	—	—	—	—	—	—	—	—
	Trifolium alexandrinum. Clover, Egyptian																	
343	fresh	2-01-349	18.0	0.63	—	—	0.06	0.41	—	—	—	—	—	—	—	—	—	—
344			100.0	3.56	—	—	0.32	2.31	—	—	—	—	—	—	—	—	—	—
	Triodia albescens. Triodia, white																	
345	fresh, late vegetative	2-30-011	43.0	—	—	—	0.06	—	—	—	—	—	—	—	—	—	—	—
346			100.0	—	—	—	0.15	—	—	—	—	—	—	—	—	—	—	—
	Vicia sativa. Vetch, common																	
347	fresh	2-05-123	20.0	0.27	—	0.04	0.07	0.51	—	0.02	—	2.0	—	80.0	24.5	—	—	—
348			100.0	1.32	—	0.20	0.34	2.50	—	0.10	—	9.7	—	392.0	120.0	—	—	—
	Vigna sinensis. Cowpea, common																	
349	fresh	2-01-655	15.0	0.29	0.03	0.07	0.04	0.25	0.04	0.05	—	—	—	120.0	—	—	—	—
350			100.0	1.91	0.18	0.43	0.28	1.66	0.25	0.31	—	—	—	798.0	—	—	—	—
	Yucca spp. Yucca																	
351	flowers, fresh	2-05-536	15.0	—	—	—	0.07	—	—	—	—	—	—	—	—	—	—	—
352			100.0	—	—	—	0.48	—	—	—	—	—	—	—	—	—	—	—
353	leaves, fresh, immature	2-30-050	41.0	—	—	—	0.04	—	—	—	—	—	—	—	—	—	—	—
354			100.0	—	—	—	0.10	—	—	—	—	—	—	—	—	—	—	—
	Zexmenia hispida. Zexmenia, orange																	
355	leaves, fresh	2-30-051	39.0	—	—	—	0.04	—	—	—	—	—	—	—	—	—	—	—
356			100.0	—	—	—	0.10	—	—	—	—	—	—	—	—	—	—	—
	SILAGES																	
	Avena sativa. Oats																	
357	silage	3-03-298	31.0	0.10	—	0.09	0.07	0.84	0.07	0.09	0.017	1.7	—	65.0	13.3	0.0	10.7	13.7
358			100.0	0.34	—	0.30	0.24	2.74	0.23	0.29	0.057	5.5	—	211.0	43.3	0.1	35.0	44.6
	Beta vulgaris altissima. Beet, sugar																	
359	aerial part with crowns,	3-00-660	22.0	0.35	—	0.24	0.06	1.28	0.12	0.13	—	—	—	45.0	—	—	—	—
360	silage		100.0	1.56	—	1.07	0.29	5.74	0.54	0.57	—	—	—	200.0	—	—	—	—
	Digitaria decumbens. Pangolagrass																	
361	silage, mature	3-03-494	32.0	0.13	—	0.01	0.03	—	—	—	—	—	—	—	—	—	—	—
362			100.0	0.39	—	0.03	0.08	—	—	—	—	—	—	—	—	—	—	—
	Glycine max. Soybean																	
363	silage wilted	3-04-584	35.0	0.48	—	0.16	0.12	0.32	0.03	0.10	—	3.2	—	62.0	45.4	—	—	—
364			100.0	1.38	—	0.45	0.36	0.93	0.09	0.30	—	9.2	—	179.0	131.1	—	—	—

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Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Calcium (%)	Chlorine (%)	Magnesium (%)	Phosphorus (%)	Potassium (%)	Sodium (%)	Sulfur (%)	Cobalt (mg/kg)	Copper (mg/kg)	Iodine (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Selenium (mg/kg)	Zinc (mg/kg)	Carotene (mg/kg)
	Medicago sativa. Alfalfa																	
365	silage, full bloom	3-00-207	26.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10.8
366			100.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	41.0
	Pennisetum purpureum. Napiergrass																	
367	silage	3-03-170	26.0	0.08	—	—	0.08	—	—	—	—	—	—	—	—	—	—	24.7
368			100.0	0.31	—	—	0.31	—	—	—	—	—	—	—	—	—	—	96.6
	Pisum spp. Pea																	
369	silage	3-03-590	24.0	0.62	—	—	0.12	—	—	—	—	—	—	—	—	—	—	31.0
370			100.0	2.56	—	—	0.48	—	—	—	—	—	—	—	—	—	—	128.7
	Sorghum bicolor saccharatum. Sorghum, sorgo																	
371	silage, dough stage	3-04-466	26.0	0.07	—	—	0.04	—	—	—	—	—	—	—	—	—	—	—
372			100.0	0.27	—	—	0.15	—	—	—	—	—	—	—	—	—	—	—
373	silage, mature	3-04-467	27.0	0.07	—	—	0.04	—	—	—	—	—	—	—	—	—	—	0.8
374			100.0	26.0	—	—	0.14	—	—	—	—	—	—	—	—	—	—	2.9
	Zea mays. Corn																	
375	silage, milk stage	3-02-818	22.0	0.09	—	0.09	0.07	0.35	0.00	—	—	—	—	—	—	—	—	—
376			100.0	0.41	—	0.41	0.29	1.57	0.01	—	—	—	—	—	—	—	—	—
377	silage, dough stage	3-02-819	26.0	0.07	—	0.05	0.05	0.25	0.00	0.04	—	—	—	48.0	—	—	—	17.2
378			100.0	0.27	—	0.18	0.19	0.95	0.01	0.14	—	—	—	180.0	—	—	—	65.1
	ENERGY FEEDS																	
	Avena sativa. Oats																	
379	grain	4-03-309	89.0	0.07	0.09	0.13	0.33	0.39	0.07	0.21	0.055	6.2	0.10	76.0	36.9	0.2	36.9	0.1
380			100.0	0.07	0.11	0.14	0.38	0.44	0.08	0.23	0.062	7.0	0.11	85.0	41.5	0.3	41.5	0.1
	Beta vulgaris altissima. Beet, sugar																	
381	molasses, more than 48%	4-00-668	78.0	0.13	1.28	0.23	0.03	4.72	1.15	0.46	0.361	16.8	—	68.0	4.5	—	14.0	—
382	invert sugar, more than 79.5 degrees brix		100.0	0.17	1.64	0.29	0.03	6.07	1.48	0.60	0.464	21.6	—	87.0	5.8	—	18.0	—
383	pulp, dehydrated	4-00-669	91.0	0.63	0.04	0.24	0.09	0.18	0.19	0.20	0.073	12.5	—	299.0	34.6	—	0.7	0.2
384			100.0	0.69	0.04	0.27	0.10	0.20	0.21	0.22	0.081	13.8	—	329.0	38.2	—	0.8	0.2
385	roots, fresh	4-00-677	20.0	0.05	0.10	0.04	0.05	0.30	0.10	0.01	—	1.6	—	12.0	40.3	—	—	—
386			100.0	0.24	0.49	0.18	0.24	1.52	0.49	0.06	—	8.1	—	61.0	205.7	—	—	—
	Bos taurus. Cattle																	
387	whey, dehydrated	4-01-182	93.0	0.86	0.07	0.13	0.76	1.15	0.65	1.04	0.110	46.6	—	169.0	5.9	—	3.2	—
388			100.0	0.92	0.08	0.14	0.82	1.23	0.70	1.12	0.118	49.9	—	181.0	6.3	—	3.4	—
	Brassica oleracea capitata. Cabbage																	
389	fresh	4-01-046	9.0	0.06	0.05	0.02	0.03	0.26	0.02	0.11	—	1.3	—	7.0	2.8	—	—	0.4
390			100.0	0.64	0.53	0.21	0.35	2.81	0.19	1.17	—	14.1	—	80.0	30.5	—	—	4.7
	Brassica rapa rapa. Turnip																	
391	roots, fresh	4-05-067	9.0	0.05	0.06	0.02	0.02	0.28	0.10	0.04	—	2.0	—	10.0	4.0	—	—	—
392			100.0	0.59	0.65	0.22	0.26	2.99	1.05	0.43	—	21.3	—	112.0	42.7	—	—	—
	Ceratonia siliqua. Carob bean																	
393	pods with seeds	4-08-370	88.0	0.20	—	—	0.30	—	—	—	—	—	—	—	—	—	—	—
394			100.0	0.23	—	—	0.34	—	—	—	—	—	—	—	—	—	—	—
	Citrus spp. Citrus																	
395	pomace, dehydrated or	4-08-652	90.0	1.79	—	—	0.12	0.62	0.05	—	0.220	5.7	—	163.0	6.8	—	14.5	—
396	sun-cured (pulp)		100.0	1.98	—	—	0.13	0.69	0.06	—	0.244	6.4	—	180.0	7.6	—	16.1	—

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Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Calcium (%)	Chlorine (%)	Magnesium (%)	Phosphorus (%)	Potassium (%)	Sodium (%)	Sulfur (%)	Cobalt (mg/kg)	Copper (mg/kg)	Iodine (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Selenium (mg/kg)	Zinc (mg/kg)	Carotene (mg/kg)
	Daucus spp. Carrot																	
397	roots, fresh	4-01-145	12.0	0.05	0.06	0.02	0.04	0.33	0.12	0.02	—	1.2	—	14.0	3.7	—	—	80.1
398			100.0	0.40	0.50	0.20	0.35	2.80	1.04	0.17	—	10.4	—	120.0	31.5	—	—	677.5
	Hordeum vulgare. Barley																	
399	grain	4-00-549	88.0	0.04	0.16	0.14	0.34	0.41	0.03	0.15	0.087	7.9	0.04	75.0	16.1	0.2	16.9	2.0
400			100.0	0.05	0.18	0.15	0.38	0.47	0.03	0.17	0.099	9.0	0.05	85.0	18.3	0.2	19.1	2.3
	Ipomoea batatas. Sweet-potato																	
401	tubers, fresh	4-04-788	33.0	0.03	0.02	0.05	0.05	0.34	0.02	0.04	—	1.4	—	16.0	3.7	—	—	143.8
402			100.0	0.10	0.06	0.16	0.15	1.01	0.05	0.13	—	4.2	—	48.0	11.1	—	—	431.2
	Laminariales (order)-fucales (order). Seaweed, kelp																	
403	whole, sun-cured	4-04-190	89.0	1.32	—	5.68	0.16	—	—	—	—	—	—	250.0	—	—	—	—
404			100.0	1.48	—	6.37	0.18	—	—	—	—	—	—	281.0	—	—	—	—
	Malus spp. Apple																	
405	pomace, wet	4-00-424	20.0	0.02	—	—	0.02	0.10	—	—	—	—	—	—	—	—	—	—
406			100.0	0.10	—	—	0.10	0.47	—	—	—	—	—	—	—	—	—	—
	Oryza sativa. Rice																	
407	bran with germs	4-03-928	91.0	0.07	0.07	0.94	1.54	1.74	0.03	0.18	—	13.2	—	190.0	376.0	0.4	29.4	—
408			100.0	0.08	0.08	1.04	1.70	1.92	0.04	0.20	—	14.5	—	210.0	414.8	0.4	32.4	—
409	grain	4-03-939	89.0	0.06	0.08	0.13	0.27	0.32	0.04	0.04	0.044	3.1	0.04	51.0	17.6	—	14.7	—
410			100.0	0.07	0.09	0.15	0.30	0.36	0.04	0.05	0.050	3.5	0.05	57.0	19.8	—	16.6	—
	Pennisetum glaucum. Pearl-millet																	
411	grain	4-03-118	90.0	0.05	0.14	0.16	0.31	0.43	0.04	0.13	0.044	21.9	—	24.0	30.7	—	13.2	—
412			100.0	0.06	0.16	0.18	0.35	0.48	0.04	0.14	0.049	24.5	—	27.0	34.3	—	14.7	—
	Saccharum officinarum. Sugarcane																	
413	molasses, more than 46%	4-04-696	75.0	0.75	2.31	0.32	0.08	2.86	0.16	0.35	0.902	59.2	1.57	186.0	42.0	—	22.4	—
414	invert sugars, more than 79.5 degrees brix		100.0	1.00	3.10	0.43	0.11	3.84	0.22	0.47	1.210	79.4	2.10	250.0	56.3	—	30.0	—
	Secale cereale. Rye																	
415	grain	4-04-047	88.0	0.06	0.03	0.12	0.32	0.46	0.02	0.15	—	6.8	—	60.0	57.6	0.4	31.3	0.1
416			100.0	0.07	0.03	0.14	0.37	0.52	0.03	0.17	—	7.8	—	69.0	65.8	0.4	35.7	0.1
	Solanum tuberosum. Potato																	
417	tubers, fresh	4-03-787	23.0	0.01	0.07	0.03	0.06	0.51	0.02	0.02	—	6.6	—	18.0	9.8	—	—	—
418			100.0	0.04	0.28	0.14	0.24	2.17	0.09	0.09	—	28.4	—	78.0	41.7	—	—	—
419	tubers, silage	4-03-768	25.0	0.01	—	0.04	0.06	0.53	0.02	0.06	—	—	—	22.0	—	—	—	—
420			100.0	0.04	—	0.14	0.23	2.13	0.09	0.23	—	—	—	90.0	—	—	—	—
	Sorghum bicolor subglabrescens. Sorghum, milo																	
421	grain	4-04-444	89.0	0.03	0.08	0.16	0.28	0.34	0.02	0.11	0.474	11.0	0.06	50.0	17.3	0.1	21.9	0.2
422			100.0	0.04	0.09	0.18	0.32	0.38	0.02	0.13	0.531	12.4	0.07	56.0	19.4	0.1	24.5	0.3
	Triticum aestivum. Wheat																	
423	bran	4-05-190	89.0	0.11	0.05	0.53	1.22	1.38	0.04	0.22	0.100	12.7	0.07	114.0	110.5	0.4	113.7	2.6
424			100.0	0.13	0.05	0.60	1.38	1.56	0.04	0.25	0.113	14.3	0.07	128.0	124.5	0.4	128.0	2.9
425	grain	4-05-211	89.0	0.04	0.07	0.15	0.37	0.38	0.04	0.16	0.120	6.3	0.09	54.0	37.0	0.3	44.2	0.1
426			100.0	0.04	0.08	0.16	0.42	0.42	0.05	0.18	0.135	7.1	0.10	61.0	41.6	0.3	49.7	0.1
	Zea mays. Corn																	
427	ears, ground	4-02-849	87.0	0.06	0.04	0.12	0.24	0.46	0.02	0.14	0.272	6.8	0.02	79.0	12.3	0.1	12.1	3.2
428			100.0	0.07	0.05	0.14	0.27	0.53	0.02	0.16	0.314	7.9	0.03	91.0	14.2	0.1	14.0	3.7

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429	grain	4-02-879	87.0	0.04	—	0.10	0.24	0.96	0.01	0.12	0.019	2.1	—	43.0	4.9	0.3	19.8	—
430			100.0	0.05	—	0.11	0.28	1.10	0.02	0.14	0.022	2.4	—	50.0	5.6	0.3	22.7	—
	Zea mays indentata. Corn, dent yellow																	
431	grain	4-02-935	89.0	0.03	0.04	0.12	0.26	0.33	0.03	0.11	0.046	3.5	—	27.0	4.8	0.1	12.8	2.2
432			100.0	0.03	0.05	0.14	0.29	0.37	0.03	0.12	0.052	4.0	—	30.0	5.4	0.1	14.4	2.5
	PROTEIN SUPPLEMENTS																	
	Arachis hypogaea. Peanut																	
433	kernels	5-03-657	95.0	0.06	0.02	0.18	0.43	0.61	0.29	0.25	—	—	—	20.0	—	—	—	0.2
434			100.0	0.06	0.02	0.19	0.45	0.64	0.30	0.26	—	—	—	21.0	—	—	—	0.2
435	kernels, meal solvent	5-03-650	92.0	0.26	0.03	0.15	0.62	1.13	0.07	0.30	0.109	15.3	0.07	142.0	26.8	—	19.9	—
436	extracted		100.0	0.29	0.03	0.17	0.68	1.23	0.08	0.33	0.119	16.6	0.07	154.0	29.2	—	21.7	—
	Blood, meal spray dehy																	
437	(blood flour)	5-00-381	93.0	0.48	0.25	0.22	0.24	0.09	0.39	0.34	—	8.2	—	2784.0	6.4	—	—	—
438			100.0	0.52	0.27	0.24	0.26	0.10	0.42	0.37	—	8.8	—	2993.0	6.9	—	—	—
	Bos taurus. Cattle																	
439	milk, fresh	5-01-168	12.0	0.12	0.11	0.01	0.09	0.14	0.05	0.04	0.001	0.1	—	1.0	—	—	2.8	—
440			100.0	0.95	0.92	0.10	0.76	1.12	0.38	0.32	0.005	0.8	—	10.0	—	—	23.0	—
	Brassica spp. Rape																	
441	seeds, meal solvent	5-03-871	91.0	0.61	0.10	0.55	0.95	1.24	0.09	1.14	—	—	—	—	—	1.0	—	—
442	extracted		100.0	0.67	0.11	0.60	1.04	1.36	0.10	1.25	—	—	—	—	—	1.1	—	—
	Brevoortia tyrannus. Fish, menhaden																	
443	meal mechanical	5-02-009	92.0	5.18	0.55	0.14	2.89	0.70	0.39	0.45	0.153	10.7	1.09	480.0	33.7	2.2	148.3	—
444	extracted		100.0	5.65	0.60	0.16	3.16	0.76	0.43	0.49	0.167	11.7	1.19	524.0	36.8	2.4	161.9	—
	Carthamus tinctorius. Safflower																	
445	seeds without hulls,	5-07-959	92.0	0.35	0.16	1.02	1.29	1.10	0.04	0.20	1.969	8.5	—	484.0	39.3	—	33.3	—
446	meal solvent extracted		100.0	0.38	0.18	1.11	1.40	1.19	0.05	0.22	2.147	9.3	—	528.0	42.8	—	36.3	—
	Cereals																	
447	brewers grains, dehy-	5-02-141	92.0	0.30	0.15	0.15	0.51	0.08	0.21	0.30	0.076	21.2	0.07	245.0	37.2	0.7	27.3	0.5
448	drated		100.0	0.33	0.17	0.16	0.55	0.09	0.23	0.32	0.082	23.0	0.07	266.0	40.4	0.8	29.6	0.5
	Cicer arietinum. Chickpea																	
449	seeds	5-01-218	91.0	0.15	—	—	0.34	0.81	0.03	—	—	—	—	70.0	—	—	—	—
450			100.0	0.17	—	—	0.37	0.89	0.03	—	—	—	—	77.0	—	—	—	—
	Cocos nucifera. Coconut																	
451	meats oil residue,	5-01-573	91.0	0.17	0.03	0.33	0.60	1.49	0.04	0.34	0.126	9.4	—	683.0	65.4	—	—	—
452	meal solvent extracted		100.0	0.19	0.03	0.36	0.66	1.63	0.04	0.37	0.139	10.4	—	750.0	71.8	—	—	—
	Cyamopsis tetragonoloba. guar																	
453	seeds without endo-	5-05-687	88.0	0.19	—	—	0.49	1.46	—	0.39	—	—	—	—	—	—	—	—
454	sperm, ground		100.0	0.22	—	—	0.56	1.67	—	0.44	—	—	—	—	—	—	—	—
	Glycine max. Soybean																	
455	seeds, meal solvent	5-04-604	90.0	0.30	0.04	0.27	0.63	1.97	0.34	0.43	0.090	22.8	0.13	119.0	29.0	0.3	42.9	0.2
456	extracted		100.0	0.34	0.04	0.30	0.70	2.20	0.38	0.47	0.101	25.4	0.15	133.0	32.4	0.3	47.9	0.2
	Gossypium spp. Cotton																	
457	seeds, meal solvent	5-01-621	91.0	0.17	0.05	0.54	1.10	1.39	0.04	0.26	0.150	19.9	—	208.0	20.8	—	62.2	—
458	extracted, 41% protein		100.0	0.18	0.05	0.59	1.21	1.52	0.05	0.28	0.165	21.8	—	228.0	22.8	—	68.2	—

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Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Calcium (%)	Chlorine (%)	Magnesium (%)	Phosphorus (%)	Potassium (%)	Sodium (%)	Sulfur (%)	Cobalt (mg/kg)	Copper (mg/kg)	Iodine (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Selenium (mg/kg)	Zinc (mg/kg)	Carotene (mg/kg)
	Helianthus annuus. Sunflower, common																	
459	seeds without hulls,	5-04-739	93.0	0.41	0.10	0.71	0.91	1.06	0.22	—	—	3.5	—	31.0	19.0	—	—	—
460	meal solvent extracted		100.0	0.44	0.11	0.77	0.98	1.14	0.24	—	—	3.8	—	33.0	20.4	—	—	—
	Linum usitatissimum. Flax, common																	
461	seeds, meal solvent	5-02-048	90.0	0.39	0.04	0.60	0.80	1.38	0.14	0.39	0.188	25.7	—	319.0	37.6	0.8	—	—
462	extracted		100.0	0.43	0.04	0.66	0.89	1.53	0.15	0.43	0.208	28.5	—	354.0	41.7	0.9	—	—
	Lycopersicon esculentum. Tomato																	
463	pomace, dehydrated	5-05-041	92.0	0.39	—	0.18	0.55	3.33	—	—	—	29.9	—	4223.0	47.0	—	—	—
464			100.0	0.43	—	0.20	0.60	3.63	—	—	—	32.6	—	4600.0	51.2	—	—	—
	Meat, with bone, meal																	
465	rendered	5-00-388	93.0	10.30	0.74	1.02	5.10	1.33	0.72	0.25	0.180	1.5	1.31	684.0	13.3	0.3	89.1	—
466			100.0	11.06	0.80	1.09	5.48	1.43	0.77	0.27	0.193	1.6	1.41	735.0	14.3	0.3	95.6	—
	Phaseolus vulgaris. Bean, navy																	
467	seeds	5-00-623	89.0	0.16	0.06	0.13	0.52	1.31	0.04	0.23	—	9.9	—	99.0	21.1	—	—	—
468			100.0	0.18	0.06	0.15	0.59	1.47	0.05	0.26	—	11.0	—	110.0	23.6	—	—	—

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Entry Number	SCIENTIFIC NAME Feed Name	International Feed Number	Dry Matter (%)	Calcium (%)	Chlorine (%)	Magnesium (%)	Phosphorus (%)	Potassium (%)	Sodium (%)	Sulfur (%)	Cobalt (mg/kg)	Copper (mg/kg)	Iodine (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Selenium (mg/kg)	Zinc (mg/kg)	Carotene (mg/kg)
	Poultry																	
469	feathers, meal	5-03-795	91.0	0.25	0.28	0.20	0.66	0.28	0.69	1.47	0.043	6.4	0.04	74.0	12.5	0.8	67.8	—
470	hydrolyzed		100.0	0.28	0.30	0.22	0.72	0.31	0.76	1.61	0.047	7.0	0.05	81.0	13.6	0.9	74.3	—
	Secale cereale. Rye																	
471	distillers grains,	5-04-023	92.0	0.15	0.05	0.17	0.48	0.07	0.17	0.44	—	—	—	—	18.4	—	—	—
472	dehydrated		100.0	0.16	0.05	0.18	0.52	0.08	0.18	0.48	—	—	—	—	20.0	—	—	—
	Sesamum indicum. Sesame																	
473	seeds, meal mechanical	5-04-220	93.0	2.01	0.07	0.46	1.36	1.25	0.04	0.33	—	—	—	93.0	47.8	—	99.7	0.4
474	extracted		100.0	2.17	0.07	0.50	1.46	1.35	0.04	0.35	—	—	—	100.0	51.5	—	107.5	0.5
	Sorghum bicolor. Sorghum																	
475	distillers grains,	5-04-374	94.0	0.15	—	0.18	0.69	0.36	0.05	0.17	—	—	—	47.0	—	—	—	—
476	dehydrated		100.0	0.16	—	0.19	0.74	0.38	0.05	0.18	—	—	—	50.0	—	—	—	—
	Triticum aestivum. Wheat																	
477	germs, ground	5-05-218	88.0	0.05	0.07	0.25	0.92	0.97	0.03	0.25	0.118	9.7	—	51.0	133.7	0.4	119.0	—
478			100.0	0.06	0.08	0.28	1.05	1.09	0.03	0.28	0.134	10.9	—	58.0	151.4	0.4	134.8	—

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TABLE 4 Composition Values of Minerals for Goats; Data Expressed As-Fed and Dry (100% Dry Matter)a

Entry Number	Feed Name Description	International Feed Number	Dry Matter (%)	Protein Equivalent N x 6.25 (%)	Calcium (Ca) (%)	Chlorine (Cl) (%)	Magnesium (Mg) (%)	Phosphorus (P) (%)	Potassium (K) (%)
	AMMONIUM								
001	phosphate, monobasic,	6-09-338	97	68.8	0.27	—	0.45	24.00	0.01
002	$(NH_4)H_2PO_4$		100	70.9	0.28	—	0.46	24.74	0.01
003	phosphate, dibasic,	6-00-370	97	112.4	0.50	—	0.45	20.00	0.01
004	$(NH_4)_2HPO_4$		100	115.9	0.52	—	0.46	20.60	0.01
	BONE								
005	charcoal (Bone black)	6-00-402	90	8.5	27.10	—	0.53	12.73	0.14
006	(Bone char)		100	9.4	30.11	—	0.59	14.14	0.16
007	meal, steamed	6-00-400	97	12.8	29.82	—	0.32	12.49	0.18
008			100	13.2	30.71	—	0.33	12.86	0.19
	CALCIUM								
009	carbonate, $CaCO_3$	6-01-069	100	—	39.39	—	0.05	0.04	0.06
010			100	—	39.39	—	0.05	0.04	0.06
011	phosphate, monobasic, from	6-01-082	97	—	15.91	—	0.59	20.95	0.08
012	defluorinated phosphoric acid		100	—	16.40	—	0.61	21.60	0.08
013	phosphate, dibasic, from	6-01-080	97	—	21.30	—	0.57	18.70	0.07
014	defluorinated phosphoric acid		100	—	22.00	—	0.59	19.30	0.07
015	sulfate, anhydrous (Gypsum),	6-01-087	85	—	22.02	—	2.21	0.01	—
016	$CaSO_4$		100	—	25.90	—	2.61	0.01	—
	COBALT								
017	carbonate, $CoCO_3$	6-01-566	99[b]	—	—	—	—	—	—
018			100	—	—	—	—	—	—
019	COLLOIDAY CLAY (Soft	6-03-947	99[b]	—	17.00	—	0.38	9.00	—
020	rock phosphate)		100	—	17.17	—	0.38	9.09	—
	COPPER (CUPRIC)								
021	sulfate, pentahydrate	6-01-720	100	—	—	—	—	—	—
022	$CuSO_4 \cdot 5H_2O$, cp		100	—	—	—	—	—	—
023	CURACAO PHOSPHATE	6-05-586	99[b]	—	34.00	—	0.80	14.00	—
024			100	—	34.34	—	0.81	14.14	—
	IRON (FERROUS)								
025	sulfate, heptahydrate,	6-20-734	98[b]	—	—	—	—	—	—
026	$FeSO_4 \cdot 7H_2O$		100	—	—	—	—	—	—
	LIMESTONE								
027	limestone	6-02-632	100	—	34.00	0.03	2.06	0.02	0.12
028			100	—	34.00	0.03	2.06	0.02	0.12
029	magnesium (dolomitic)	6-02-633	99[b]	—	22.08	0.12	9.89	0.04	0.36
030			100	—	22.30	0.12	9.99	0.04	0.36
	MAGNESIUM								
031	carbonate, $MgCO_3Mg(OH)_2$	6-02-754	98[b]	—	0.02	0.00	30.20	—	—
032			100	—	0.02	0.00	30.81	—	—
033	oxide, MgO	6-02-756	98	—	3.00	—	54.90	—	—
034			100	—	3.07	—	56.20	—	—

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Entry Number	Sodium (Na) (%)	Sulfur (S) (%)	Cobalt (Co) (%)	Copper (Cu) (%)	Fluorine (F) (%)	Iodine (I) (%)	Iron (Fe) (%)	Manganese (Mn) (%)	Selenium (Se) (%)	Zinc (Zn) (%)
001	0.06	1.42	0.001	0.001	0.24	—	1.69	0.04	—	0.01
002	0.06	1.46	0.001	0.001	0.25	—	1.74	0.04	—	0.01
003	0.05	2.10	—	0.001	0.20	—	1.20	0.04	—	0.01
004	0.05	2.16	—	0.001	0.21	—	1.24	0.04	—	0.01
005	—	—	—	—	—	—	—	—	—	—
006	—	—	—	—	—	—	—	—	—	—
007	5.53	2.44	—	—	—	—	2.600	—	—	0.01
008	5.69	2.51	—	—	—	—	2.670	—	—	0.01
009	0.06	—	—	—	—	—	0.030	0.03	—	—
010	0.06	—	—	—	—	—	0.030	0.03	—	—
011	0.06	1.19	0.001	0.001	0.20	—	1.53	0.035	—	0.009
012	0.06	1.22	0.001	0.001	0.21	—	1.58	0.036	—	0.009
013	0.05	1.11	0.001	0.001	0.18	—	1.40	0.03	—	0.01
014	0.05	1.14	0.001	0.001	0.18	—	1.44	0.03	—	0.01
015	—	20.01	—	—	—	—	0.171	—	—	—
016	—	23.54	—	—	—	—	0.201	—	—	—
017	—	0.20	45.54	—	—	—	0.049	—	—	—
018	—	0.20	46.00	—	—	—	0.050	—	—	—
019	0.10	—	—	—	1.49	—	1.90	—	—	—
020	0.10	—	—	—	1.50	—	1.92	—	—	—
021	—	12.84	—	25.45	—	—	—	—	—	—
022	—	12.84	—	25.45	—	—	—	—	—	—
023	0.20	—	—	—	0.54	—	0.35	—	—	—
024	0.20	—	—	—	0.55	—	0.35	—	—	—
025	—	12.10	—	—	—	—	21.400	—	—	—
026	—	12.35	—	—	—	—	21.840	—	—	—
027	0.06	0.04	—	—	—	—	0.350	—	—	—
028	0.06	0.04	—	—	—	—	0.350	—	—	—
029	—	—	—	—	—	—	0.076	—	—	—
030	—	—	—	—	—	—	0.077	—	—	—
031	—	—	—	—	—	—	0.021	—	—	—
032	—	—	—	—	—	—	0.022	—	—	—
033	—	—	—	—	0.02	—	—	0.01	—	—
034	—	—	—	—	0.02	—	—	0.01	—	—

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Entry Number	Feed Name Description	International Feed Number	Dry Matter (%)	Protein Equivalent N x 6.25 (%)	Calcium (Ca) (%)	Chlorine (Cl) (%)	Magnesium (Mg) (%)	Phosphorus (P) (%)	Potassium (K) (%)
	MANGANESE (MANGANOUS)								
035	oxide, MnO, cp	6-03-056	99[b]	—	—	—	—	—	—
036			100	—	—	—	—	—	—
037	OYSTERSHELL, GROUND	6-03-481	99	—	37.62	0.01	0.30	0.07	0.10
038	(flour)		100	—	38.00	0.01	0.30	0.07	0.10
	PHOSPHATE								
039	rock, defluorinated	6-01-780	100	—	32.00	—	0.42	18.00	0.09
040			100	—	32.00	—	0.42	18.00	0.09
	POTASSIUM								
041	bicarbonate, $KHCO_3$, cp	6-29-493	99[b]	—	—	—	—	—	38.65
042			100	—	—	—	—	—	39.05
043	iodide, KI	6-03-759	100[b]	—	—	—	—	—	21.00
044			100	—	—	—	—	—	21.00
	SODIUM								
045	bicarbonate, $NaHCO_3$	6-04-272	100	—	—	—	—	—	—
046			100	—	—	—	—	—	—
047	chloride, NaCl	6-04-152	100	—	—	60.66	—	—	—
048			100	—	—	60.66	—	—	—
049	phosphate, monobasic,	6-04-288	97	—	—	—	—	21.80	—
050	monohydrate, $NaH_2PO_4 \cdot H_2O$		100	—	—	—	—	22.50	—
051	selenite, Na_2SeO_3	6-26-013	98[b]	—	—	—	—	—	—
052			100	—	—	—	—	—	—
053	sulfate, decahydrate,	6-04-292	97[b]	—	—	—	—	—	—
054	$Na_2SO_4 \cdot 10H_2O$, cp		100	—	—	—	—	—	—
055	tripolyphosphate, $Na_5P_3O_{10}$	6-08-076	96	—	—	—	—	24.00	—
056			100	—	—	—	—	25.00	—
	ZINC								
057	oxide, ZnO	6-05-553	100	—	—	—	—	—	—
058			100	—	—	—	—	—	—
059	sulfate, monohydrate,	6-05-555	99[b]	—	0.02	0.015	—	—	—
060	$ZnSO_4 \cdot H_2O$		100	—	0.02	0.015	—	—	—

[a] The composition of mineral ingredients that are hydrated (e.g. $CaSO_4 \cdot 2H_2O$) is shown including the waters of hydration, both on an as-fed and dry matter basis. Mineral composition of feed grade mineral supplements varies by source, mining site, and manufacturer. Use manufacturer's analysis when available.

[b] Dry matter values have been estimated for these minerals.

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Entry Number	Sodium (Na) (%)	Sulfur (S) (%)	Cobalt (Co) (%)	Copper (Cu) (%)	Fluorine (F) (%)	Iodine (I) (%)	Iron (Fe) (%)	Manganese (Mn) (%)	Selenium (Se) (%)	Zinc (Zn) (%)
035	—	—	—	—	—	—	—	76.67	—	—
036	—	—	—	—	—	—	—	77.45	—	—
037	0.21	—	—	—	—	—	0.284	0.01	—	—
038	0.21	—	—	—	—	—	0.287	0.01	—	—
039	0.04	—	0.001	0.002	0.18	—	0.670	0.02	—	0.006
040	0.04	—	0.001	0.002	0.18	—	0.670	0.02	—	0.006
041	—	—	—	—	—	—	—	—	—	—
042	—	—	—	—	—	—	—	—	—	—
043	—	—	—	—	—	68.17	—	—	—	—
044	—	—	—	—	—	68.17	—	—	—	—
045	27.00	—	—	—	—	—	—	—	—	—
046	27.00	—	—	—	—	—	—	—	—	—
047	39.34	—	—	—	—	—	—	—	—	—
048	39.34	—	—	—	—	—	—	—	—	—
049	16.18	—	—	—	—	—	—	—	—	—
050	16.18	—	—	—	—	—	—	—	—	—
051	26.07	—	—	—	—	—	—	—	44.7	—
052	26.60	—	—	—	—	—	—	—	45.6	—
053	13.84	9.65	—	—	—	—	—	—	—	—
054	14.27	9.95	—	—	—	—	—	—	—	—
055	29.80	—	—	—	—	—	0.004	—	—	—
056	31.00	—	—	—	—	—	—	—	—	—
057	—	—	—	—	—	—	—	—	—	78.00
058	—	—	—	—	—	—	—	—	—	78.00
059	—	17.50	—	—	—	—	0.001	0.001	—	36.00
060	—	17.68	—	—	—	—	0.001	0.001	—	36.36

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Dry Forages and Roughages

Agropyron desertorum	Wheatgrass, crested
Agrostis alba	Redtop
Andropogon spp	Bluestem
Arachis hypogaea	Peanut, groundnut
Avena sativa	Oats
Brachiaria mutica	Paragrass
Bromus inermis	Brome, smooth
Cajanus cajan	Pigeonpea
Carthamus tinctorius	Safflower
Cicer arietinum	Chickpea, gram
Chloris gayana	Rhodesgrass
Cynodon dactylon	Bermudagrass
Cynodon dactylon	Bermudagrass, coastal
Dactylis glomerata	Orchardgrass, cocksfoot
Digitaria decumbens	Pangolagrass
Echinochloa crusgalli	Barnyardgrass
Eragrostis spp	Lovegrass
Festuca arundinacea	Fescue, Kentucky 31
Glycine max	Soybean
Gossypium spp	Cotton
Hordeum vulgare	Barley
Kochia spp	Summercypress
Lespedeza striata	Lespedeza, common
Lolium multiflorum	Ryegrass, Italian
Medicago sativa	Alfalfa, Lucerne
Oryza sativa	Rice
Panicum maximum	Guineagrass
Paspalum dilatatum	Dallisgrass
Paspalum notatum	Bahiagrass
Pennisetum purpureum	Napiergrass
Phalaris arundinacea	Canarygrass, reed
Phleum pratense	Timothy
Pisum sativum sativum	Pea, garden
Poa pratensis	Bluegrass, Kentucky
Prosopis spicigera	Mesquite, spicigera
Pueraria spp	Kudzu
Saccharum officinarum	Sugarcane
Secale cereale	Rye
Sorghum bicolor	Sorghum
Sorghum bicolor sudanense	Sorghum, Sudangrass
Sorghum halepense	Sorghum, Johnsongrass
Trifolium alexandrinum	Clover, Egyptian
Trifolium pratense	Clover, red
Triticum aestivum	Wheat
Vicia spp	Vetch
Vigna sinensis	Cowpea, common
Wood	
Zea mays	Corn, maize
Ziziphus nummularia	Jujube, Wild

Pasture, Range Plants, and Forages Fed Green

Acacia catechu	Acacia, catechu
Agave spp	Agave
Agropyron desertorum	Wheatgrass, crested
Agropyron smithii	Wheatgrass, western
Agrostis alba	Redtop
Ailanthus excelsa	Ailanthus, excelsa
Albizia lebbeck	Lebbeck tree
Ambrosia spp	Ragweed
Andropogon barbinodis	Bluestem, cane
Andropogon scoparius	Bluestem, little
Anemone heterophylla	Anemone, heterophylla
Aristida oligantha	Threeawn, prairie
Aristida wrightii	Threeawn, Wright
Artemisia filifolia	Sagebrush, sand
Artemisia ludoviciana albula	Sagebrush, Mexican
Aster spp	Aster
Astragalus nuttallii	Milkvetch, Nuttall
Atriplex confertifolia	Saltbush, Shadscale
Avena sativa	Oats
Azadirachta indica	Margosa
Bouteloua curtipendula	Grama, sideoats
Bouteloua hirsuta	Grama, hairy
Brachiaria mutica	Paragrass
Brassica campestris	Rape, turnip
Brassica oleracea medullosa	Kale, marrow
Bromus catharticus	Brome, rescue
Buchloe dactyloides	Buffalograss
Carex planostachys	Sedge, thicket
Carthamus tinctorius	Safflower
Celtis reticulata	Hackberry, netleaf
Celtis tetendra	Hackberry, tetendra
Cenchrus ciliaris	Buffelgrass
Cenchrus spp	Sandbur
Chloris spp	Windmillgrass
Cichorium intybus	Chicory, bluedaisy
Commelina spp	Dayflower
Crotalaria juncea	Crotalaria, sunn
Corton spp	Croton
Cucurbita foetidissima	Buffalogourd
Cyamopsis tetragonoloba	Guar
Cynodon dactylon	Bermudagrass
Dactylis glomerata	Orchardgrass, cocksfoot
Dactyloctenium aegyptium	Crowfootgrass, Durban
Dalbergia sissoo	Dalbergia, sissoo
Dalea formosa	Dalea, feather
Dasylirion texanum	Sotol, Texas
Digera aneensis	Digera, aneensis
Diospyros texana	Persimmon, Texas
Echinochloa crusgalli	Barnyardgrass
Elymus canadensis	Wildrye, Canada
Elymus junceus	Wildrye, Russian
Engelmannia pinnatifida	Engelmanndaisy
Eriochloa sericea	Cupgrass, Texas
Eurotia lanata	Winterfat, common

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Evax prolifera	Evax, prolifera
Ficus benghalensis	Banyantree
Ficus glomerata	Fig, cluster
Ficus religiosa	Peepultree
Ficus roxburghii	Fig, roxburgh
Ficus virens	Fig, spotted
Forestiera pubescens	Forestiera, downy
Grewia oppositifolia roxburghii	Grewia, oppositifolia, roxburghii
Gutierrezia texana	Snakeweed, Texas
Gymnosperia spinosa	Gymnosperia, spinosa
Helianthus spp	Sunflower
Hilaria belangeri	Curlymesquite
Hordeum vulgare	Barley
Juniperus ashei	Juniper, ashe
Juniperus pinchotii	Juniper, redberry
Kochia vestita	Summercypress, gray
Lactuca sativa	Lettuce
Lasiurus sindicus	Lasiurus, sindicus
Lepidium spp	Pepperweed
Leptochloa dubia	Sprangletop, green
Leptoloma cognatum	Witchgrass, fall
Lespedeza striata	Lespedeza, common
Lesquerella gordonii	Bladderpod, Gordon
Leucaena retusa	Leadtree, littleleaf
Lolium spp	Ryegrass
Lonicera albiflora	Honeysuckle, bush
Lotus spp	Trefoil
Lupinus texensis	Bluebonnet, Texas
Medicago sativa	Alfalfa, Lucerne
Melia azedarach	Chinaberry
Mimosa spp	Mimosa
Moringa oleifera	Horseradishtree
Morus australis	Mulberry, Japanese
Morus spp	Mulberry
Musa spp	Banana
Nolina texana	Nolina, Texas
Onobrychis viciifolia	Sainfoin, common
Opuntia spp	Pricklypear
Panicum antidotale	Panicum, blue
Panicum hallii	Panicum, Halls
Panicum maximum	Guineagrass
Panicum obtusum	Vine-mesquite
Panicum virgatum	Switchgrass
Paspalum dilatatum	Dallisgrass
Pennisetum incomptum	Pennisetum, incomptum
Pennisetum purpureum	Napiergrass
Phalaris tuberosa stenoptera	Hardinggrass
Phaseolus atropurpureus	Bean, purple
Pisum sativum sativum	Pea, garden
Pisum spp	Pea
Plantago rhodosperma	Plantain, redseed
Prosopis glandulosa	Mesquite, honey
Quercus sinuata breviloba	Oak, shin
Quercus virginiana	Oak, live
Ratibida columnifera	Prairieconeflower, upright
Rhus aromatica	Sumac, fragrant
Sarcobatus vermiculatus	Greasewood, black
Schrankia roemeriana	Sensitivebrier, Roemer
Secale cereale	Rye
Sedum nuttallianum	Stonecrop, Nuttall
Sesbania cannabina	Sesbania, pea
Setaria macrostachya	Bristlegrass, plains
Setaria spp	Millet
Sorghum bicolor	Sorghum
Sorghum bicolor sudanense	Sorghum, Sudangrass
Sorghum halepense	Sorghum, Johnsongrass
Stipa leucotricha	Needlegrass, Texas
Syzygium cumini	Javaplum
Tillandsia usneoides	Spanishmoss
Tribulus terrestris	Puncturevine
Trifolium alexandrinum	Clover, Egyptian, Alexandrian, Berseem
Triodia albescens	Triodia, white
Vicia sativa	Vetch, common
Vigna sinensis	Cowpea, common
Yucca spp	Yucca
Zexmenia hispida	Zexmenia, orange
Ziziphus jujuba	Jujube, common

Silages

Avena sativa	Oats
Beta vulgaris altissima	Beet, sugar
Digitaria decumbens	Pangolagrass
Glycine max	Soybean
Medicago sativa	Alfalfa
Pennisetum purpureum	Napiergrass
Pisum spp	Pea
Sorghum bicolor saccharatum	Sorghum, sorgo
Zea mays	Corn, maize

Energy Feeds

Animal

Avena sativa	Oats
Beta vulgaris altissima	Beet, sugar
Bos taurus	Cattle
Brassica oleracea capitata	Cabbage
Brassica rapa rapa	Turnip
Ceratonia siliqua	Carob bean
Citrus spp	Citrus
Daucus spp	Carrot
Hordeum vulgare	Barley
Ipomoea batatas	Sweetpotato
Laminariales (order)—Fucales (order)	Seaweed, kelp
Malus spp	Apple
Manihot esculenta	Cassava, common
Oryza sativa	Rice
Pennisetum glaucum	Pearlmillet
Quercus spp	Oak
Saccharum officinarum	Sugarcane
Secale cereale	Rye
Solanum tuberosum	Potato

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Sorghum bicolor subglabrescens	Sorghum, milo	*Cyamopsis tetragonoloba*	Guar
Triticum aestivum	Wheat		
Zea mays	Corn, maize	*Glycine max*	Soybean
Zea mays indentata	Corn, dent yellow	*Gossypium* spp	Cotton
		Helianthus annuus	Sunflower, common
Protein Supplements		*Linum usitatissimum*	Flax, common
		Lycopersicon esculentum	Tomato
Arachis hypogaea	Peanut, groundnut	Meat, With Bone, Meal Rendered	
Blood, Meal Spray Dehy (Blood Flour)		*Phaseolus vulgaris*	Bean, Navy
Bos taurus	Cattle	Poultry	
Brassica spp	Rape	*Secale cereale*	Rye
Brevoortia tyrannus	Fish, menhaden	*Sesamum indicum*	Sesame
Carthamus tinctorius	Safflower	*Sorghum bicolor*	Sorghum
Cereals		*Triticum aestivum*	Wheat
Cicer arietinum	Chickpea, gram	Urea	
Cocos nucifera	Coconut		

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Einfluss des Manganmangels auf den Gehalt neugeborener Laemmer an Fett, Protein, Mangan, Asche, Kalzium, Phosphor, Zink und Kupfer. (Manganese deficiency in ruminants. 4. Effect of manganese deficiency on fat, protein, manganese, ash, calcium, phosphorus, zinc and copper contents of newborn kids.) Arch. Tierernaehr. 23:213.

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