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INTRODUCTION

THIS bulletin was first published in 1938 and a revised edition was brought out in 1946. The present issue is the third edition in which some important changes have been introduced, both in the text and in the tabular statements.

The original idea in preparing a publication of this nature was to bring together all the information regarding the feeding values of Indian cattle foods, for the use of practical farmers in this country. A large amount of data were available in the literature published by various research workers, but these had to be collected and put in a suitable form which could be utilized by our livestock owners.

In the present edition, the arrangement of the bulletin remains the same as in the previous one. An explanatory note describing the general principles of animal nutrition, as applied to the practical rationing of live-stock is given. This is followed by a statement of requirements for specific purposes, the standards given being those adopted mainly by American workers, as no data of a similar nature are available here. The method of computing rations is illustrated by some examples. A few selected concentrate mixtures are listed with their feeding values. The question of mineral and vitamin A supplements is also discussed. Three appendices are given, namely (1) Composition of Indian Feeding Stuffs, (2) Digestibility Coefficients of Indian Feeding Stuffs, and (3) Digestible Nutrients per 100 lb. of Indian Feeding Stuffs together with their Total Digestible Nutrients, Nutritive Ratios and Starch Equivalents. The last one is sub-divided into two parts, one containing the values expressed on a dry matter basis, which will appeal to scientific workers, and

the second containing data from which it is easy to find out the approximate feeding values per 100 lb. of raw materials. This part will be of more use to practical workers and can be utilized as a ready reckoner.

Some of the important modifications introduced in the present edition are, the revision of the Table III dealing with the requirements of working animals, revision of the Table IV dealing with the requirements for growth depending on the mature live weight of animals and omission of the table dealing with beef cattle which is not very important for practical purposes. Some of the calculations for typical rations have been given on a modified basis which has been explained in the text. A new sub-head 'Cultivated fodders and grazing' has replaced the previous one entitled 'Feeding of green grass and silage'. Some new data have also been incorporated in the various tables.

The compilation of the data given in the first edition was done by my colleagues of the Animal Nutrition Section, Indian Veterinary Research Institute, Izatnagar, Messrs. N. C. Dasgupta, N. K. Ayyar, T. S. Krishnan and P. A. Seshan. Since then, other data have been added to bring the work up to date. The author is greatly indebted to Dr. S. C. Ray, Dairy Technologist of this Institute, for his help in revising the bulletin for this edition. He would also like to thank the various workers in different parts of the country who have expressed their appreciation of the usefulness of this bulletin.

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GENERAL PRINCIPLES

FOOD is essential for the maintenance of life. The nutrients in a feeding stuff enable the animal body to produce the necessary heat to maintain the body temperature, the energy to perform the vital processes of life and the material to replace the essential tissue breakdown which occurs continuously. The food also provides the constituents and the energy required for the production of the body growth in young animals and milk and work by adult ones.

All feeding stuffs are composed of water, organic and mineral matter. Organic matter is again composed of proteins, fats, crude fibre and soluble carbohydrates. The part played by these constituents of food in the nutrition of animals may be considered under the various ingredients which a chemical analysis of the food reveals.

Water. Feeding stuffs always contain a certain amount of water. Even apparently dry fodder, such as straw, contains about 1/10th of its weight as water and the rest as dry matter. All the processes of digestion, absorption of nutrients and elimination of waste from the body require an abundant supply of water either directly or in the shape of succulent feeding stuffs. Water plays an important part in the regulation of the temperature of the body. The water in a feeding stuff is also the carrier of some valuable amides and vitamins in solution.

Proteins. The crude protein in a feeding stuff includes the true protein, containing a number of amino acids, and non-protein nitrogenous compounds such as the amides. The proteins are mainly used for the production of lean meat and for replacing the physiological losses of protein from the body. The raw proteins required to supply the proteins in the milk have also to be provided by the diet of the animal. Any excess of proteins in the food may be used by the animal for the formation of fat and production of energy.

Fats (ether extracts). The fats in feeding stuffs are useful only as energy producing sources. They cannot serve the function of proteins either for building up the muscle or to repair the daily nitrogenous waste. Fat is an energy concentrate, each gram of fat being equal in fuel value to about 2.25 grams of carbohydrates or proteins. The excess energy supplied to the animal over its requirements is generally stored by the system as fat to be drawn upon in times of need. Some of the important vitamin and fatty acids essential for the health of an animal are also supplied through the fats in the diet.

Crude fibre. The cell walls and woody fibre of all plants go under the category of fibre. Natu-

rally this constituent is the least digestible part of the feed. The work and expenditure of energy in chewing and digesting such material make its nutritive value still less. But the digested fraction is used by the animal body exactly like the soluble carbohydrates.

Soluble carbohydrates (nitrogen-free extract). Starch and sugar form the main ingredients of this class of substances. These are used by the animal to produce heat, energy and fat in the body. They are also the source of the fat and sugar in milk. Excess of carbohydrates is reserved by the body in the form of depot fats.

Mineral matter. The minerals available in the feed of an animal are used for the making and repair of bones, digestive juices, blood, etc. and also form the source of the large amounts of minerals secreted through the milk. Not only minerals as a whole but also individual ingredients are found to be important factors in the adequate nutrition of animals. Growing animals and milch cattle have a great need of minerals, such as lime, phosphorus, etc. and have often to be provided with an extra amount of common salt and bone flour added to the ordinary farm ration.

Vitamins. Besides the above, there are certain substances known as vitamins, which are considered to be essential for the proper nutrition of farmstock. Of these, the more important ones from the point of view of cattle nutrition are vitamins A and D, because these have to be supplied to the animals through their feed, but vitamins B and C can be synthesized in the ruminant body. If sufficient green pasture is fed to animals, the need for vitamins A, B, C, D and E is satisfied.

Although the chemical composition of a foodstuff is not a criterion of its feeding value, it forms the basis for judging its nutritive value. Appendix I gives the analysis of a number of foodstuffs for their various ingredients. The absence of representative data for the vitamin contents of the various feeding stuffs is responsible for the deletion of that item from the tables of analysis.

The value of a food stuff depends upon the proportion of it which is digested. The ratio of the digestible portion to the total amount fed multiplied by 100 represents the coefficient of digestibility of a nutrient in the particular feed or in the feed mixture used in a feeding experiment. Digestibility determinations have been carried out for several of the feeding stuffs available in India and the coefficients of digestibility of the various constituents are recorded in Appendix II. For the convenience of users, the coefficients have been rounded to the nearest integer.

From the data given in Appendices I and II, the digestible nutrients per 100 lb. of feeding stuff have been calculated and are tabulated in Appendix III. This table gives, in addition, the total digestible nutrients, nutritive ratios and starch equivalent values of all the common feeding stuffs experimented with in India. These together with the digestible crude protein contents are the figures which enable us to find out whether a diet provides a sufficiency of the major-ingredients involved in nutrition. It would be appropriate, at this stage, to explain what these figures connote.

Digestible crude protein. In the past, opinion differed as to whether the non-protein nitrogenous compounds in a feeding stuff have a nutritive value equal to that of the true protein or only half as much. The researches carried out in recent years, however, show that the non-protein nitrogenous compounds play, in ruminant system, almost an identical role as the true protein. Hence, Digestible Crude Protein (D.C.P.) fraction represents for all practical purposes, the available protein in a feed or feed mixture.

Although protein can replace the carbohydrates in the dietary for purposes of heat production, this is never done in practice because nitrogenous material is always found to be costlier than carbohydrate material.

Starch equivalent. In the United Kingdom and some other European countries, the available energy in a feeding stuff is calculated in terms of Starch Equivalent. The basis of calculation is as follows :

(a) In energy value 1 lb. of carbohydrate in the feed is equivalent to 1.00 lb. of starch, 1 lb. of protein equivalent to 0.94 lb. of starch and 1 lb. of fat (or ether extract) is equivalent to 1.91 lb. or 2.12 lb. or 2.41 lb. of starch, according as the source of the fat is coarse fodder or cereal grains and by-products or seeds and oil cakes respectively.

(b) Each kind of nutrient is multiplied by the above conversion factors and the figures are added.

(c) In the case of concentrates the sum total of the added value obtained in (b) is multiplied by the respective 'Value Number' given by Kellner (*vide, The Scientific feeding of Animals* by Kellner, translated by Goodwin, Duckworth & Co.) to obtain their Starch Equivalent or S. E. Value.

(d) In the consumption of fibrous coarse food a considerable amount of energy is spent in chewing, ruminating and other associated work of digestion. For the roughages, therefore, a correction is made for the fibre content by deducting the following from the added figure in (b) to obtain the S. E. Value :

If the feeding stuff contains 4 per cent and less crude fibre, 0.29 for every per cent of actual crude fibre.

If the material contains 5 per cent and less crude fibre, 0.31 for every per cent of actual crude fibre.

If the material contains 6 per cent and less crude fibre, 0.34 for every per cent of actual crude fibre.

If the material contains 7 per cent and less crude fibre, 0.36 for every per cent of actual crude fibre.

If the material contains 8 per cent and less crude fibre, 0.38 for every per cent of actual crude fibre.

If the material contains 9 per cent and less crude fibre, 0.40 for every per cent of actual crude fibre.

If the material contains 10 per cent and less crude fibre, 0.43 for every per cent of actual crude fibre.

If the material contains 11 per cent and less crude fibre, 0.45 for every per cent of actual crude fibre.

If the material contains 12 per cent and less crude fibre, 0.48 for every per cent of actual crude fibre.

If the material contains 13 per cent and less crude fibre, 0.50 for every per cent of actual crude fibre.

If the material contains 14 per cent and less crude fibre, 0.53 for every per cent of actual crude fibre.

If the material contains 15 per cent and less crude fibre, 0.55 for every per cent of actual crude fibre.

If the material contains 16 per cent or more crude fibre, 0.58 for every per cent of actual crude fibre.

Total digestible nutrients. In the U.S.A., the energy value of a feed is calculated in terms of Total Digestible Nutrients (T.D.N.). The theoretical basis in the calculation of T.D.N. is that in the ruminant system for all practical purposes, the energy efficiency of a unit of digestible carbohydrate is the same as that of a unit of digestible protein, whereas the energy efficiency of a unit of digestible fat is equivalent to 2.25 units of either digestible carbohydrate or digestible protein. Thus, in order to obtain the T.D.N. value of a feed, the digestible ether extract is multiplied by 2.25 which is then added to the sum of digestible crude protein and digestible total carbohydrates.

Nutritive ratio. This is the ratio of digestible protein to the digestible non-nitrogenous nutrients in a feed. The amount of non-nitrogenous nutrients is reckoned as the sum of digestible total

carbohydrates and digestible ether extract multiplied by 2.25. The value of nutritive ratio gives the idea of the proportion of digestible protein in relation to other nutrients. The ratio is narrow in the case of protein-rich feeding stuffs and wide where the feeds are rich in carbohydrate or in fat or in both.

PRINCIPLES OF RATIONING

The ration of an animal may be divided for convenience into two parts, one for maintenance and the other for production purposes. The maintenance ration is that portion of the diet which just enables the animal at rest to carry on the essential processes of life, such as breathing and circulation of blood, without either gain or loss of weight. This to a certain extent is dependent upon the live weight of the animal, although not strictly proportional to it. The maintenance requirement actually varies with basal metabolism and the latter, in turn, with body surface. In order to express it as proportional to body surface, instead of taking live weight as such, one has to consider two-thirds power of live-weight, or $\sqrt[3]{W^2}$, where W stands for live weight. As, however, no animal is kept in a farm in a state of non-production, the requirements for maintenance form only a convenient basis for the calculation of rations for productive purposes. Whatever is supplied to the animal over and above its maintenance requirement is available for production, such as for growth or fattening, for production of calf, for production of milk or for output of work.

Growth. This is a most important form of live-stock production, because it is the foundation on which the other forms of production such as beef, milk or work rest. Within the limits set up by hereditary factors, it is the adequate growth of the young one that determines the possibilities of the animal as a producer. If the growth of a young animal is retarded, it will result in a permanent and substantial loss of production by the animal and its progeny.

The requirements for growth and those for maintenance of the adult animal are very different. For a calf of the same body weight as a mature bullock at rest, the total nutrient requirements are far more than that of the bullock. Since growth consists largely of an increase in the sizes of the muscles, protein tissues and the skeleton, large amounts of proteins, minerals and vitamins must be provided.

Reproduction. For a mother in calf, adequate provision must be made for the growth of the foetus as well as to keep the dam fit to give a liberal supply of good milk on calving. This extra provision need, however, be made only during the last third of the period of pregnancy. If the

mother is under-nourished or is on an unbalanced ration, the calf which is born is weak and under-sized and the milk yield of the cow low and poor in vitamin content. Lack of an adequate supply of vitamin A often results in abortion or birth of weak or blind calves.

Fattening. Growth and fattening are two complementary aspects of meat production. The term fattening implies the deposition of large quantities of tissue fat but this is not the sole object in economic meat production. The aim in meat production is to acquire the maximum amount of lean meat, the quality of which is simultaneously improved by the storage of fat in the muscles and protein tissues, so that the maximum growth synchronizes with the optimum fattening when the animals reach maturity. The requirement of animals for growth is so exacting that unless an abundant supply of net energy is provided in the feed, in excess of the requirement for normal growth, no fattening but only growth will take place.

The rate of conversion of food nutrients into body fat is higher in the case of young ones than with mature animals. Hence if fattening is retarded in the earlier stages, it will make the cost of meat production very high in the later stages. Although fattening as such requires very little protein, it is necessary to increase protein supply also in order to effect rapid gains. Further, the total digestibility of a ration is greatly reduced if the proportion of protein in it is very small. Minerals and vitamins should also be adequately provided, particularly to growing animals, to avoid any unthriftiness in the fattened animals.

Milk production. Milk is the most widely used product of live-stock. The composition of milk differs from that of the carcass or the blood. It is specially rich in protein, lime and phosphorus, and contains large quantities of lactose, fat and vitamins. It is obvious that the animal must be provided with a sufficient quantity of all these ingredients, in addition to its maintenance requirements, in order to be able to cope with the continuous drain from its body in the form of milk.

The cow converts the food proteins into milk protein very efficiently. About 1.25 times the quantity secreted in the milk will satisfy its requirements for milk production, exclusive of the maintenance allowance. Although animals have the capacity to convert the carbohydrates in the feed for the purpose of milk fat production, it is easier for them to convert the fat in their feed. So it is advisable that the concentrate ration of cows should contain at least 4 per cent fat. Minerals and vitamins in the feed of lactating animals are very important.

Work production. Increased muscular effort naturally results in a large amount of nutrients being oxidized in the system. It is known that all the organic constituents of a food are capable of being utilized as sources of energy. However, when the supply of food is adequate, a working animal first draws upon the carbohydrates and fats of the feed. If the supply is insufficient, the body fat is used for the purpose and in the last resort the muscles and other protein tissues are attacked. But so long as there is an abundant supply of carbohydrates in the feed, a mature animal at work needs very little more protein than while at rest. In this respect, work production differs radically from growth or milk production.

The nutrient requirements of working animals depend upon the amount of labour performed. The heavier the work, the greater should be the proportion of easily digestible carbohydrates in the ration. About one-fourth to one-third of the net energy supplied for production purposes is converted into actual useful work. Calculating on the basis of the total gross energy intake per day, an animal working for a full day yields 9 per cent of the intake as actual work. Many factors are known to influence the efficiency of utilization of the feed by a working animal, such as the breed, the speed of working, fatigue and practice.

Practical scales of feeding. Extensive studies have been made in other countries on the requirements of various classes of live stock by means of feeding experiments. Limited investigations carried out in this country suggest that the adoption of foreign standards always leaves a fair margin of safety so far as the feeding of Indian cattle is concerned. There is, therefore, a scope for reduction in these standards for Indian cattle. The figures for maintenance, growth and milk production, given later on, are based on the averages of the maximum and the minimum recommended by Morrison. The figures given for the Net Energy have been converted into corresponding Starch Equivalent Values. The standards recommended for growing and working

animals are partial modifications of those suggested in the earlier edition of the Bulletin. The modifications are as follows :

(a) Tentative supplementary standards for growth have been given to accommodate Indian animals whose mature weights are three-quarter or half of those of foreign breeds. The standard for calves reaching the mature weight of 1,000 lb. has been based on Morrison's data as given in the earlier issue of this Bulletin. For categories of calves reaching the mature weight of 750 and 500 lb., it has been assumed that their growth rate is 75 per cent and 50 per cent respectively of those growing to a mature weight of 1,000 lb., and the requirement of these groups has been calculated in the same proportion as the assumed rate of growth.

(b) The requirement for work production has been combined with that of maintenance in order to make the recommendation easy to apply in actual practice to Indian bullocks of varying live-weight. Besides, instead of giving three specifications for work as 'light', 'medium' and 'heavy', as was done in the earlier editions, work has been considered only 'normal' and 'heavy', in this publication. The former is conceived to consist of 6 hours of carting or 4 hours of ploughing, and the latter 8 hours of carting or 6 hours of ploughing. The data for this purpose have been computed by adding together the maintenance requirement for varying live weight as recommended by Morrison with the allowances for work. The work allowance for 'light' and 'medium' work as recommended by Kellner and given in the earlier issue of this Bulletin has been taken as the basis of requirement for 'normal' and 'heavy' work performed by an animal of 1,000 lb. live weight. Since work rate capacity is proportional to live weight raised to the two-thirds power (*vide Animal Nutrition* by L. A. Maynard), the work allowances for animals of live weight below and above 1,000 lb. have been adjusted proportionately.

THE FEEDING STANDARDS

In the computation of a ration, the first consideration will be the capacity for consumption or appetite of the animal. The appetite is measured by the total amount of dry matter in the ration which an animal can consume. Usually the dry matter consumption varies with the live weight of the animal and also with the nature of its production. Cattle will generally eat about 2.0-2.5 lb. of dry matter per 100 lb. of live weight. The milch stock may eat a little more. The buffaloes are slightly heavier eaters than cows. The major portion, about two-third or more, of the total dry matter to be consumed

should come from the roughage quota of the ration, the rest being concentrates. After the quantity of dry matter consumption is known, the next important information required is the quantity of digestible crude protein (D.C.P.) and energy (S.E. or T.D.N.) which the ration must supply.

Maintenance and production requirement for adult animals. In general it can be stated that the maintenance requirement of a 1,000 lb. animal is 0.6 lb. D.C.P. and 6.0 lb. S.E. or 7.5 lb. T.D.N. The feeding standard of animals of different live weights is given in Table I.

TABLE I

Nutrients required for maintenance of adult cattle per head per day

Live weight	Digestible crude protein	Starch equivalent	Total digestible nutrients
lb.	lb.	lb.	lb.
200	0.128	1.31	1.72
300	0.203	1.92	2.55
400	0.273	2.50	3.34
500	0.338	3.05	4.09
600	0.399	3.53	4.80
700	0.458	4.09	5.47
800	0.516	4.59	6.15
900	0.570	5.08	6.80
1000	0.625	5.57	7.47
1100	0.652	6.43	8.11
1200	0.733	6.95	8.75

The dairy cows which have to produce milk will have to be given, over and above the maintenance requirement, additional allowance of the nutrients for milk production. The extra nutrient requirement for milk production varies with the fat content in the milk and is detailed in Table II. The milch animal in advanced stage of pregnancy (from the 5th month of gestation) should receive an extra allowance of 0.3 lb. D.C.P. and 1.0 lb. S.E. or 1.5 lb. T.D.N. over and above what she should get for maintenance+milk production. If, however, there is no milk production, the extra allowance should be superimposed over the maintenance requirement only.

TABLE II

Nutrients required for production per pound of milk, to be added to the maintenance allowance

Fat per cent in milk	Digestible crude protein	Starch equivalent	Total digestible nutrients
	lb.	lb.	lb.
3.0	0.040	0.233	0.269
4.0	0.045	0.275	0.316
5.0	0.051	0.316	0.363
6.0	0.057	0.357	0.411
7.0	0.063	0.398	0.458
8.0	0.069	0.439	0.506
9.0	0.075	0.480	0.553
10.0	0.081	0.521	0.602
11.0	0.086	0.562	0.650

The requirement of nutrients for the performance of work varies, as has already been mentioned, with the kind of work done. The stan-

dard of nutrient requirement of working animals is given in Table III which takes into account the nutritional demand for both maintenance and work production.

TABLE III

Nutrients required for working animals per head per day

Live weight	Normal work		Heavy work	
	Digestible crude protein lb.	Total digestible nutrients lb.	Digestible crude protein lb.	Total digestible nutrients lb.
lb.				
300	0.35	3.3	0.44	4.2
400	0.47	4.3	0.59	5.5
500	0.59	5.3	0.74	6.8
600	0.70	6.2	0.88	8.0
700	0.81	7.1	1.02	9.3
800	0.92	8.0	1.16	10.5
900	1.02	8.9	1.29	11.7
1000	1.13	9.9	1.43	12.9
1100	1.23	10.8	1.56	14.0
1200	1.33	11.8	1.69	15.3

Nutrient requirement for growth. The requirement for growth is of higher order than mere maintenance and during the early stage, relatively more protein is required than energy. The standard of requirement for growth of young stock belonging to different categories of mature weight is given in Table IV.

TABLE IV

Nutrients required by growing cattle per head per day

Live weight	Class I, mature weight: 1000 lb.		Class II, mature weight: 750 lb.		Class III, mature weight: 500 lb.	
	Digestible crude protein lb.	Total digestible nutrients lb.	Digestible crude protein lb.	Total digestible nutrients lb.	Digestible crude protein lb.	Total digestible nutrients lb.
100	0.32	1.6	0.24	1.2	0.16	0.8
150	0.47	2.7	0.35	2.0	0.24	1.4
200	0.57	3.7	0.43	2.8	0.28	1.9
250	0.66	4.5	0.49	3.4	0.33	2.3
300	0.73	5.2	0.55	3.9	0.37	2.6
350	0.79	5.8	0.59	4.3	0.40	2.9
400	0.85	6.4	0.64	4.8	0.43	3.2
450	0.89	6.9	0.67	5.2	0.45	3.5
500	0.93	7.3	0.70	5.5	0.47	3.7
600	1.00	8.2	0.75	6.1		
700	1.07	9.1	0.80	6.8		
800	1.13	9.9	0.85	7.4		
900	1.19	10.8				
1000	1.25	11.5				

SOME TYPICAL EXAMPLES OF COMPUTING RATIONS

In the following paragraphs, the calculation of some typical rations are given in order to illustrate the method of using the various tables. In the actual computation, it is not necessary to use both S.E. and T.D.N. values. Only one of these values needs be used together with the D.M. and D.C.P. values. As mentioned before, the use of T.D.N. values is finding more favour in this country in preference to S.E. values. The proportions of different food stuffs given in the rations are not based on any experimental work.

(1) Calculation of a ration for a cow weighing 600 lb. and at an advanced stage of gestation

The feeds available are rice straw, guinea grass and rape cake. The maintenance requirement for this cow, shown in Table I, is 0.399 lb. D.C.P. and 3.58 lb. S.E. or 4.80 lb. T.D.N. The animal is expected to consume total dry matter to the extent of 12 to 15 lb. With the help of data supplied in the last three columns of Appendix III the maintenance ration of the animal can be formulated as follows :

	D.M.	D.C.P.	S.E.	T.D.N.
Rice straw 7 lb.	6.3	0.00	1.54	2.99
Guinea grass 15 lb.	3.8	0.12	1.31	1.96
Rape cake 1 lb.	0.9	0.28	0.77	0.78
Total	11.0	0.40	3.62	5.73

The animal in addition requires 0.3 lb. D.C.P. and 1.0 lb. S.E. or 1.5 lb. T.D.N. for the purpose of gestation which can be satisfied by incorporating in the ration extra quantities of the following items :

	D.M.	D.C.P.	S.E.	T.D.N.
Guinea grass 5 lb.	1.3	0.04	0.44	0.66
Rape cake 1 lb.	0.9	0.28	0.77	0.78
Total	2.2	0.32	1.21	1.44

(2) Calculation of ration for a cow weighing 800 lb. and yielding 16 lb. of milk with fat content 4.5 per cent

The available food stuffs for the purpose are wheat *bhusa*, jowar silage, gram husk, barley, groundnut cake and wheat bran.

The animal's capacity of total dry matter consumption will be between 20 to 22 lb. which should be conveniently divided into two parts, one for formulating the maintenance and the other for milk production.

According to Table I, the maintenance requirements are met by about 0.5 lb. D.C.P. and 4.5

lb. S. E. or 6.15 lb. T.D.N. The following maintenance quota of the ration can be formulated:

	D.M.	D.C.P.	S.E.	T.D.N.
Wheat <i>bhusa</i> 7 lb.	6.3	0.00	1.55	3.00
Jowar silage 20 lb.	5.0	0.14	2.04	3.06
Groundnut cake 1 lb.	0.9	0.42	0.67	0.72
Total	13.2	0.56	4.26	6.77

For milk production the items of the ration should be concentrates fed in the form of a suitable mixture. According to Table II, the requirements per pound of milk of 4.5 per cent fat are 0.048 lb. D.C.P. and 0.296 lb. S.E. or 0.340 lb. T.D.N. which can be supplied by a concentrate mixture of the following composition :

	Parts	D.C.P.	S.E.	T.D.N.
Barley	50	4.02	36.8	38.8
Groundnut cake	10	4.17	6.7	7.1
Wheat bran	20	2.12	12.4	13.5
Gram husk	20	0.00	6.0	11.0
Total	100	10.31	61.9	70.4

or 1 lb. of the mixture	0.10	0.62	0.70
The requirement for 2 lb. of milk of 4.5 per cent fat	0.10	0.60	0.68

1 lb. of the above mixture is thus sufficient to produce 2 lb. of milk of 4.5 per cent fat. Therefore, for the production of 16 lb. of milk, 8 lb. of the mixture should be fed in addition to the maintenance quota of the ration.

(3) Calculation of the ration for a bullock weighing 800 lb. and doing normal work

The available feeding stuffs are wheat *bhusa*, guinea grass, *til* cake and maize grain.

The requirements for this animal according to the feeding standard given in Table III are, 0.92 lb. D.C.P. and 0.8 lb. T.D.N. The animal can consume 16-20 lb. of dry matter. The ration can be computed as follows :

Item.	Quantity given lb.	D.M. lb.	D.C.P. lb.	T.D.N. lb.
Wheat <i>bhusa</i>	11	9.9	0.00	4.4
Guinea grass	10	3.0	0.13	1.5
Crushed maize	1½	2.7	0.11	1.3
<i>Til</i> cake	1½		0.67	1.3
Total		15.6	0.91	8.5

(4) Calculation of the ration for a growing heifer weighing 250 lb.

The available feeding stuffs are wheat *bhusa*, green berseem, oats, mustard cake and wheat bran.

Assuming that the heifer belongs to Class II group (*vide* Table IV), its capacity for dry matter consumption is 5.0 to 6.3 lb. and its D.C.P. and T.D.N. requirements are 0.49 lb. and 3.4 lb. respectively.

The ration can be computed as follows :

Item	Quantity given lb.	D.M. lb.	D.C.P. lb.	T.D.N. lb.
Wheat <i>blusa</i>	3	2.7	0.00	1.2
Berseem.	6	1.2	0.17	0.7
Concentrate mixture	2½	2.2	0.33	1.7
Total		6.1	0.50	3.6

The concentrate mixture is made up of :

Item	Parts	D.C.P.	T.D.N.
Oats	50	3.53	35.5
Mustard cake	30	3.19	22.1
Wheat bran	20	1.58	12.7
Total	100	13.30	70.3
Per lb. of the mixture		0.13	0.7

In the actual feeding of different classes of stock, it is usual to make the animal eat all the scheduled concentrate and as much as possible of the green fodder. The dry roughage is then given slightly in excess of what is prescribed and the animal adjusts its appetite or its requirement of total dry matter consumption.

In the case of milch stock, as has been already illustrated, the maintenance requirements are usually met by dry and succulent (green or silage) roughage plus a small quantity of a protein concentrate, such as an oil cake. A concentrate mixture is then fed to individual animals in proportion to their milk production. It is highly desirable that this production quota of the ration should be made up by suitably mixing several concentrate feeds in order to confer palatability, laxativeness and above all the complex nutritive quality necessary for milk secretion.

Some common concentrate mixtures. For the sake of convenience, some concentrate mixtures are given below. One pound of each mixture is of equal value and is sufficient for 2.5 lb. of milk production containing 4.5 per cent of fat. Mixture numbers 1, 2 and 4 can be prescribed for milk production in buffaloes, but in this case, one pound of the mixture is sufficient for the production of two pounds of milk only containing about 7.0 to 7.5 per cent fat.

	Per cent	
(1) Cotton seed meal	25	Contains per lb. of mixture 0.12 lb. D.P. and 0.77 lb. S.E.
Wheat bran	20	
Maize	55	
(2) Rape cake	25	Contains per lb. of mixture 0.14 lb. D.P. and 0.74 lb. S.E.
Cotton seed	35	
Wheat bran	10	
Barley	30	
(3) Rape cake	30	Contains per lb. of mixture 0.13 lb. D.P. and 0.74 lb. S.E.
Barley	50	
Oats	20	
(4) Groundnut cake	15	Contains per lb. of mixture 0.14 lb. D.P. and 0.74 lb. S.E.
Gram	40	
Maize	40	
Gram husk	5	
(5) Gingelly cake	15	Contains per lb. of mixture 0.14 lb. D.P. and 0.72 lb. S.E.
Gram	40	
Barley	40	
Rice bran	5	
(6) Groundnut cake	10	Contains per lb. of mixture 0.13 lb. D.P. and 0.73 lb. S.E.
Cotton seed	20	
Rice bran	10	
Maize	30	
Gram	30	

Legume hay as substitute for concentrate. The above mixtures or a suitable variation of any of them can be used with ordinary roughages, such as *anjana* hay, *dhub* grass, green maize, etc. but where leguminous hay such as berseem or lucerne is available, it is possible to cut down a considerable part of the concentrate from the feed, specially with poor or medium producers. A suitable ration with some leguminous hay as the main source of protein can be prepared by using the tables and appendices given in this publication. It is however not desirable to withhold completely cake or grain from a ration as this is likely to have adverse effect in the long run.

Mineral supplement. It has been stated previously that growing animals and milch cattle need a large amount of minerals, but no addition of minerals has been made in the rations for which calculations have been given above. The usual practice in large farms is to provide blocks of rock salt which can be licked by animals. Otherwise, an approximate amount of 1 oz. common salt is given to adult animals in their feed. Besides this, both for the growing and milch animals it is often necessary to provide some phosphorus and lime-rich mineral mixture. This is specially true where leguminous crops, which are usually rich in lime, are not fed regularly. Most of the concentrates are rich in phosphorus but poor in lime and as such, unless leguminous fodder or good quality hay are available, the dairy ration is likely to be badly balanced in regard to lime and phosphorus. A cow of average weight requires for maintenance 1 1/2 oz. lime (CaO) and 4/5 oz. phosphoric acid (P₂O₅) daily and for a production of 10 lb. of milk, another 1/2 to 3/4 oz. lime and 2/3 to 1 oz. phosphoric acid. These are rough estimates. In Appendix I, the mineral analysis is given of the common Indian feeding stuffs, from which it is easy to

calculate whether a ration contains a sufficient amount of the materials or not. In general, it is found advisable to give one oz. of a good mineral mixture to growing animals, and about 2 oz. of the mixture to lactating animals per day depending on the milk yield. The mineral mixture may be prepared as follows : Common salt 50 per cent, finely ground chalk 25 per cent, and sterilized feeding bone flour 25 per cent. This mixture can be fed at a level of about 3 per cent of the concentrate feed, no extra common salt being necessary. In some farms, a more complicated mixture is used and has given good results with heavy milking animals. The mixture has the following approximate composition :

	Per cent	
Sterilized bone flour	50	
Finely ground chalk	25	
Common salt	20	
Sulphur	5	
Oxide of iron	2	
	100	
Add potassium iodide		4 oz.
Total		100 lb. 4 oz.

This mixture is fed at the rate of about 2 per cent of the concentrate feed. Blocks of rock salt are kept in the farm which supply additional common salt to the animals if required.

Vitamin supplement. The straw and hay, as commonly available in India, are practically devoid of vitamin A potency. This is also the case with most of the concentrates. For this reason, avitaminosis-A in a mild form is widely prevalent and occasional instances of this trouble, such as intrauterine blindness, ophthalmia in growing animals, abortion and sterility are found in many places. The only practical method of remedying this defect in the ration is to provide for green grazing, failing which, a suitable supplement of green feed, 8-10 lb. daily, should be given to growing, in-calf and lactating animals.

Cultivated fodders and grazing. By-products like straw, *bhusa*, pulse husks, bran, broken grains, oilcakes, etc. and limited quantities of cottonseed, gram, maize and barley constitute important items of feed for Indian cattle. It has been estimated that if our cattle have to maintain even the present output of work and milk without any detriment to their health and constitution, they would require very much more of the various items of by-products, seeds and grains than what is available today. Since the supply of these depends upon the production of food and cash crops and, as the prospect of accelerating the latter to the tune of animal requirement does not appear feasible in any near future, a plan is urgently needed for a system of animal feeding which could be to a large extent independent of oilcakes, bran, and other concentrate feeds. In

the typical examples of computing rations given earlier, the practice now in vogue has been followed. It may be seen from these instances that the feeding schedule has been so formulated that the requirement for production is met exclusively by concentrate feeds, and for maintenance, largely by a dry roughage with a small supplementation of concentrate *plus* green fodder or silage. Based on this system of feeding, when an attempt is made to estimate the overall quantitative requirement of various feeding stuffs, one finds that almost an unbridgeable gap exists between the demand and the supply.

In countries where animal husbandry has made the greatest progress, a sound diet for cattle is built around a good quality green forage. A properly selected green fodder is well known to be the most natural food for the herbivores, not only for the balanced distribution of its nutrient constituents but also for its bulk which is necessary to fill up the capacious stomach of a ruminant. Moreover, such combination in a single item of feed has been found to reduce greatly the cost of feeding, specially for milk production. In India, owing to climatic conditions and other limitations, the possibility of developing organized pasturage will be difficult to realize, but by some reorientation of cropping programme, if about 10 per cent of the total arable acreage of the country could gradually be appropriated for organized production of fodder crops, the problem of feeding the milk producing animals can easily be solved. The following example illustrates this point of view :

A milch cow of average body weight of 500 lb. and yielding 4 lb. of milk (of 4.5 per cent fat) a day requires according to the Morrison standard as given in Tables I and II :

(a) For maintenance	0.34 lb., D.C.P. and 4.1 lb., T.D.N.
(b) For milk production	0.19 lb., D.C.P. and 1.4 lb., T.D.N.
Total	0.53 lb., D.C.P. and 5.5 lb., T.D.N.

There is some evidence to show that Morrison's standard is rather liberal for Indian cattle; a cut of 20 per cent can be introduced and the total requirement can be brought down to 0.42 lb., D.C.P. and 4.4 lb., T.D.N., and this can be met from the following ration schedule :

		Available	
		D.C.P.(lb.)	T.D.N.(lb.)
(a) Mixed green fodder of say, Guinea grass + Lucerne in the pro- portion of 3 : 1.	} 28 lb.	0.43	3.6
(b) Straw	2 lb.	0.00	0.8
Total		0.43	4.4

It is well known that the majority of our cows yield on an average much less than 3 to 4 lb. of milk a day. If that is so, it is evident that in a ration schedule as formulated above, the use of concentrate feeds can easily be done away with. Even in the case of heavy yielding dairy cows and buffaloes producing on an average 15 lb. of milk a day, a basic ration drawn on the same principle would be able to maintain the animal and at the same time support the first 4 to 6 lb. of milk production. Concentrates need, therefore, be given only for the additional amount of milk yield. The new system of feeding suggested should not only reduce the use of concentrate feeds but also the cost of milk production.

Although organized pasturage is almost non-existent in this country, a fairly large amount of grass grows in so-called waste lands and in the forest area. Much of this grass, however, is not available to the consuming live-stock owing to the remoteness of its situation.

There is an important point about green grass to which attention may be drawn. It may be observed from Appendix III that some of the hays which are nothing but field dried grass supply hardly any digestible proteins to the animals. The same materials in the green state, however, have a fairly high nutritive value including a good amount of digestible protein, and this is the reason why during the monsoon period when grass grows abundantly, emaciated indigenous cattle pick up condition quickly on grass alone. Thus, it has been found possible to maintain non-producing animals in prime condition for a large part of the year in areas where good quality *anján* or *dhub* grass grows. When the grass is allowed to become over-ripe, much of its nutritive value is lost, but converting the green fodder into mixed silage preserves the food value considerably. When green feed is scarce, a good silage is of great value to milch cattle.

When good grazing is available, the concentrate portion of the ration can be cut down in the

case of most of the animals. In this country, good grazing is available only during the monsoon months, after which the quality of the grazing becomes gradually poor and the farmer must judge for himself if his animals are getting much food from grazing. As a rough guide, one can describe the quality of grazing as good, medium and poor and depending on this, the concentrate requirement should be varied so as to economize the cost of feeding. Thus when the grazing is good, the amount of concentrate may be cut down to one-third, in the case of medium grazing to 1/2, and in the case of poor grazing to 3/4th of the protein requirement under stall feeding conditions. The dry roughage should be given *ad lib* after the day's grazing so as to satisfy the dry matter and energy requirement. Some caution is, however, necessary in the case of heavy milking animals, where a sudden reduction in the quantity of concentrate mixture may reduce the milk yield.

The following publications may be consulted for further information :

1. *Feeds and Feeding* by F. B. Morrison ; The Morrison Publishing Company, Ithaca, New York, 20th Ed., 1944.
2. *Rations for Live stock* by T. B. Wood ; Ministry of Agriculture and Fisheries, London, Bulletin No. 48, 1936.
3. *The Feeding of Dairy Cows* by J. Mackintosh ; Ministry of Agriculture and Fisheries, London, Bulletin No. 42, 1932.
4. *The Principle and Practice of Feeding Farm Animals* by E. T. Halnan and F. H. Garner ; Longmans Green & Co., London (1940).
5. *The Scientific Feeding of Animals* by O. Kellner, translated by William Goodwin ; Duck-worth & Co. (1926).
6. *Animal Nutrition* by L. A. Maynard ; Mc-Graw-Hill Book Company, Inc., New York & London (1947).

APPENDICES

Average percentage composition of Indian

Serial No.	Name	Place of origin	Total ash	Ash sol. in HCl	Crude protein	Organic constituents			
						Carbohydrates		Ether extract	
						Fibre	Nitrogen-free extract		
GREEN FEEDS									
1	<i>Bajra (Pennisetum sylvhidrum)</i>	jus. before flowering	Punjab	14.70	10.90	16.25	28.23	38.79	2.03
2	Ditto	maximum flowering	"	11.30	8.61	12.56	28.45	45.72	1.97
3	Ditto	milk stage	"	9.21	6.28	10.56	27.96	50.15	2.12
4	Ditto	dough stage	"	8.21	5.40	8.81	24.90	56.22	1.86
5	Ditto	ripe stage	"	7.68	5.09	8.88	23.96	57.74	1.74
6	Ditto	milk dough stage	I. Vallpur.	..	..	6.90	31.80	48.90	1.82
7	Barley (<i>Hordeum vulgare</i>)	..	Punjab	11.37	9.19	11.47	31.85	43.45	1.86
8	Ber (<i>Zizyphus jujuba</i>)	..	Izat Nagar	10.72	..	8.59	30.13	48.83	1.74
9	Berseem (<i>Trifolium alexandrinum</i>)	..	Bihar	20.25	12.99	15.45	26.06	35.88	2.36
10	Ditto	maximum	Punjab	18.96	14.43	23.10	30.87	46.94	2.78
11	Ditto	minimum	"	8.49	7.07	13.99	19.47	33.24	1.39
12	Ditto	average	"	14.16	12.00	17.35	25.91	49.69	1.89
13	Cowpea (<i>Vigna catjang</i>)	..	Bihar	10.86	6.20	17.38	33.10	36.16	2.50
14	Grass— <i>Anjan (Pennisetum cenchroides)</i>	young	Bangalore	13.82	9.23	12.41	..	..	..
15	Ditto	prime	"	11.57	6.61	9.97	..	..	..
16	Ditto	ripe	"	10.26	4.93	7.25	..	..	..
17	Ditto	young	Bihar	17.05	9.42	7.40	..	..	..
18	Ditto	prime	"	13.45	7.06	5.18	..	..	..
19	Ditto	ripe	"	13.71	6.00	5.54	..	..	..
20	Ditto	maximum	Punjab	20.85	10.96	12.92	43.62	56.34	2.30
21	Ditto	minimum	"	9.14	3.63	3.00	25.30	39.06	0.97
22	Ditto	average	"	16.08	8.14	8.36	30.54	43.30	1.72
23	Ditto	young	"	13.10	9.60	11.42	27.20	41.41	1.87
24	Ditto	prime	"	13.31	6.45	6.24	34.43	44.55	1.47
25	Ditto	ripe	"	15.85	8.73	9.10	29.16	44.29	1.60
26	Grass— <i>Barajargi (Dichanthum annuatum)</i>	1st cut	Bareilly	11.85	..	5.19	31.37	49.66	1.63
27	Ditto	2nd cut	"	9.91	..	3.79	35.03	50.99	1.18
28	Ditto	3rd cut	"	10.13	..	2.73	33.30	52.84	1.00
29	Grass— <i>Bhanjara (Apludanatica)</i>	1st cut	"	18.53	..	10.23	32.29	36.96	1.99
30	Ditto	2nd cut	"	10.91	..	4.56	33.63	49.72	1.18
31	Ditto	3rd cut	"	12.13	..	4.06	40.15	41.97	1.69
32	Grass— <i>Bur (Andropogon taniger)</i>	ripe stage	Punjab	12.34	3.90	6.13	30.46	49.23	1.84
33	Grass— <i>Chhimbar (Eleusine flagellifera)</i>	..	"	12.55	6.87	11.42	33.88	49.57	1.58
34	Grass— <i>Chotijargi (Bothriochloa pertusa)</i>	1st cut	Bareilly	12.31	..	5.44	36.49	44.63	1.23
35	Ditto	2nd cut	"	11.32	..	3.86	35.69	48.01	1.13
36	Ditto	3rd cut	"	11.28	..	3.19	36.50	47.76	1.27
37	Grass— <i>Lal (Hymenacche amplexicaulis)</i>	flowering stage	Assam	12.20	..	9.38	22.10	54.02	2.50
38	Grass— <i>Dedi (Gramineae Ischaemum Rugosum, Salisb)</i>	..	Bihar (Chaibasa forest)	9.00	3.02	4.31	27.30	56.37	1.02
39	Grass— <i>Dhiv (Cynodon dactylon)</i>	..	Bangalore	11.74	6.82	12.72	31.00	42.42	2.12
40	Grass— <i>Dub (young)</i>	..	"	13.54	7.84	14.75	..	..	..
41	Ditto	(prime)	"	11.91	6.08	11.07	..	..	..
42	Ditto	(ripe)	"	9.31	4.85	8.44	..	..	..
43	Ditto	(young)	Bihar	15.07	9.94	7.91	..	..	..
44	Ditto	(prime)	"	13.10	6.71	7.74	..	..	..
45	Ditto	(ripe)	"	10.72	5.26	5.91	..	..	..
46	Ditto	(maximum)	Punjab	13.97	7.38	21.94	30.74	55.40	2.71
47	Ditto	(minimum)	"	7.79	2.27	4.96	18.63	41.97	1.21
48	Ditto	(average)	"	11.75	3.60	10.47	28.17	47.81	1.80
49	Ditto	(young)	"	12.58	6.20	21.94	18.61	44.14	2.71
50	Ditto	(prime)	"	12.65	5.69	10.04	31.89	44.00	1.42
51	Ditto	(ripe)	"	7.79	2.27	4.90	39.74	49.07	1.50
52	Grass— <i>Dila or motha (Cyperus tria)</i>	ripe stage	"	8.64	3.63	6.04	32.77	51.69	0.89
53	Grass— <i>Elephant (Pennisetum purpureum)</i>	..	"	16.04	10.16	6.16	28.07	47.47	2.26
54	Grass— <i>Forest (Anaphalis glabrastaff)</i>	..	Bihar (Ranchi)	8.48	2.51	5.66	23.80	60.26	2.20
55	Grass— <i>Forest (Gramineae Ischaemum contortus Roem.)</i>	..	Bihar (Prohat Range)	7.98	2.78	3.94	31.30	55.65	1.13
56	Grass— <i>Forest (Gramineae imperant arundanica Cyrill)</i>	..	"	4.88	3.52	3.56	33.99	56.26	1.40
57	Grass— <i>Ghumur (Panicum antidotale)</i>	ripe stage	Punjab	7.97	3.84	7.26	45.47	43.11	1.19
58	Grass— <i>Giant Star (Cynodon plectostachyum)</i>	1st cut	Almora	11.86	..	12.19	26.60	47.70	1.65
59	Ditto	2nd cut	"	11.21	..	9.44	30.36	48.09	0.90
60	Ditto	3rd cut	"	8.22	..	7.19	32.72	51.01	0.86
61	Ditto	4th cut	"	10.82	..	5.44	37.60	45.24	0.90
62	Grass— <i>Guinea (Panicum maximum)</i>	maximum	Bangalore	11.07	10.09	13.96	41.76	49.96	2.66
63	Ditto	minimum	"	11.39	5.89	4.73	31.59	35.57	0.66
64	Ditto	average	"	13.87	7.25	7.69	37.33	39.44	1.67
65	Grass— <i>Guinea (Panicum maximum)</i>	young	"	15.54	3.55	7.08	38.38	37.01	1.19
66	Ditto	prime	"	12.32	6.31	4.82	42.14	49.06	0.66
67	Ditto	..	Bengal	13.94	5.88	7.97	32.36	43.99	1.73
68	Ditto	..	Punjab	12.15	..	5.22	36.38	44.70	1.55
69	Ditto	..	Madhya Pradesh	..	..	..	..	..	..
70	Grass— <i>Gulba (Chrysopogon montanus)</i>	1st cut	Saharanpur	9.73	..	6.13	36.84	46.05	1.25
71	Ditto	2nd cut	"	8.73	..	4.64	36.67	48.78	1.18
72	Ditto	3rd cut	"	10.78	..	4.45	31.60	51.59	1.58
73	(Isi Grass <i>lima weightii</i>)	early	Bombay	10.22	4.54	6.02	36.62	45.76	1.38
74	Ditto	before flower	"	10.31	3.61	4.21	38.87	45.59	1.02
75	Ditto	in flower	"	9.41	3.61	4.08	41.09	44.32	1.10
76	Ditto	in seed	"	10.55	2.87	3.21	37.39	47.73	1.12

DIX I

feeding stuffs on dry matter basis

No. of analyses	Mineral constituents						No. of analyses	Serial No.
	Ash sol. in HCl	CaO	P ₂ O ₅	MgO	Na ₂ O	K ₂ O		
1	10.90	1.06	0.42	0.63	0.46	6.24	1	1
1	3.61	0.84	0.48	0.48	0.06	4.80	1	2
1	6.28	0.73	0.50	0.41	0.19	3.38	1	3
1	5.40	0.60	0.39	0.34	0.24	2.96	1	4
1	5.09	0.55	0.44	0.33	0.13	2.96	1	5
..	..	..	..	..	..	..	..	6
..	9.19	0.72	0.59	0.29	0.94	3.98	..	7
1	..	0.09	0.76	..	..	..	1	8
2	12.09	2.33	0.75	0.77	..	4.78	1	9
..	14.43	4.05	0.92	0.72	2.58	5.09	..	10
..	7.07	2.20	0.32	0.38	0.36	1.44	..	11
14	12.00	2.69	0.64	0.61	1.67	3.40	..	12
1	6.80	1.96	0.78	1.44	..	1.85	13	13
2	9.23	0.41	0.65	0.35	1.33	4.14	2	14
2	6.61	0.49	0.47	0.39	1.20	2.40	2	15
2	4.93	0.43	0.39	0.40	0.89	1.67	2	16
4	9.42	0.75	0.64	0.38	1.14	4.32	2	17
4	7.06	0.72	0.50	0.38	0.95	3.13	4	18
3	6.09	0.63	0.69	0.33	1.10	1.68	3	19
..	10.96	1.90	1.05	0.51	1.91	4.53	..	20
..	3.63	0.43	0.41	0.19	0.10	1.26	..	21
22	8.14	0.77	0.72	0.36	1.14	3.33	..	22
4	9.60	0.70	0.85	0.36	1.48	4.11	22	23
7	6.45	0.67	0.61	0.35	0.83	3.04	4	24
5	8.73	0.60	0.65	0.36	1.18	2.73	5	25
1	..	0.52	0.55	0.51	0.31	0.86	1	26
1	..	0.40	0.49	0.38	0.28	0.69	1	27
1	..	0.50	0.35	0.45	0.44	0.52	1	28
1	..	0.52	0.93	0.89	0.67	2.56	1	29
1	..	0.44	0.66	0.94	0.98	1.08	1	30
1	..	0.49	0.57	0.89	0.39	1.13	1	31
1	3.90	1.04	0.34	0.38	0.07	1.65	1	32
6	6.87	0.95	0.59	0.37	0.92	1.40	6	33
1	..	0.55	0.52	0.50	0.43	0.85	1	34
1	..	0.47	0.41	0.55	0.73	1.01	1	35
1	..	0.60	0.69	0.64	0.35	0.90	1	36
1	..	0.18	0.47	..	..	..	1	37
1	3.02	0.32	0.32	0.22	..	0.80	1	38
1	..	..	..	..	..	..	..	39
2	7.84	0.81	0.58	0.39	0.47	3.17	..	40
2	6.08	0.70	0.51	0.32	0.43	2.33	2	41
2	4.85	0.41	0.28	0.34	0.83	2.00	2	42
2	9.94	1.07	0.41	0.44	0.52	5.16	2	43
2	6.71	0.90	0.44	0.36	0.79	2.76	2	44
2	5.26	0.72	0.45	0.31	0.86	1.95	2	45
..	7.38	0.98	0.82	0.60	0.57	3.85	..	46
..	2.27	0.50	0.23	0.19	0.06	0.84	..	47
..	5.60	0.77	0.59	0.34	0.23	2.08	..	48
1	6.20	0.81	0.82	0.44	0.15	2.36	15	49
5	5.69	0.81	0.63	0.42	0.28	0.25	1	50
1	2.27	0.50	0.23	0.19	0.18	0.84	5	51
1	3.63	1.15	0.27	0.35	0.41	0.95	1	52
4	10.16	0.70	0.61	0.30	0.68	2.99	4	53
1	2.51	0.31	0.29	0.22	..	0.56	1	54
1	2.78	0.85	0.16	0.26	..	0.93	1	55
1	3.52	1.25	0.13	0.21	..	1.48	1	56
1	3.31	0.54	0.21	0.35	0.34	1.95	1	57
1	..	1.36	0.82	..	..	..	1	58
1	..	1.05	0.76	..	..	..	1	59
1	..	0.73	0.69	..	..	..	1	60
1	..	0.32	0.24	..	..	..	1	61
..	8.55	0.85	0.90	..	..	..	1	62
..	6.31	0.54	0.37	0.57	0.74	3.78	..	63
28	7.08	0.71	0.56	0.38	0.23	2.23	..	64
1	8.55	0.71	0.90	0.45	0.41	2.92	13	65
1	6.31	0.54	0.72	0.50	0.64	3.78	1	66
1	5.88	1.23	0.54	0.44	0.45	2.56	1	67
1	..	..	..	0.73	0.57	1.45	1	68
..	..	1.81	0.59	..	..	1.81	..	69
1	..	0.45	0.39	..	..	1.56	1	70
1	..	0.51	0.41	0.58	0.52	1.14	1	71
1	..	0.65	0.20	0.60	0.76	0.91	1	72
2	4.54	0.39	0.33	0.31	0.31	1.92	2	73
2	3.61	0.37	0.15	0.30	0.31	1.23	2	74
2	3.61	0.36	0.20	0.30	0.21	1.21	3	75
2	2.87	0.46	0.16	0.40	0.23	0.64	3	76

Serial No.	Name	Place of origin	Total ash	Ash sol. in HCl	Organic constituents				
					Crude protein	Carbohydrates		Ether extract	
						Fibre	Nitrogen-free extract		
77	Grass— <i>Lamba</i> (<i>Aristida depressa</i>)	Punjab Simla Hills	4.95	1.45	2.31	42.25	41.99	1.50	
78	Grass— <i>Makra</i> or <i>Madhana</i> (<i>Elusine aegyptiaca</i>) milk stage.	Punjab	12.46	8.65	7.25	33.74	45.32	1.23	
79	Grass—Mixture (<i>Pennisetum cenchroides</i> and <i>Andropogon contortus</i>)	"	12.80	4.45	3.06	35.01	49.14	0.99	
80	Grass—Mixture (<i>Pennisetum cenchroides</i> and <i>Andropogon pertusus</i>) milk stage.	"	9.66	4.31	5.33	34.30	49.08	1.63	
81	Grass— <i>Mushyal</i> (<i>Isclima laxum</i>) before flower	Bombay	11.64	4.03	5.06	34.24	47.70	1.36	
82	Ditto in flower	"	9.85	2.97	3.69	38.79	46.68	0.99	
83	Ditto in seed	"	11.80	2.51	2.79	34.52	49.79	1.10	
84	Ditto	Madhya Pradesh	..	..	..	..	..	..
85	Grass—Napier (<i>Pennisetum purpureum</i>)	Bengal	16.70	10.07	5.35	31.90	44.16	1.89	
86	Grass— <i>Palwan</i> (<i>Andropogon pertusus</i>)	Punjab	10.42	5.87	8.78	33.00	46.13	1.67	
87	Ditto flowering stage	"	9.10	2.86	4.74	41.09	43.76	1.31	
88	Ditto pre-milk stage	"	10.01	3.31	3.14	45.20	50.54	1.11	
89	Ditto milk stage	"	10.94	4.06	4.72	40.71	42.30	1.33	
90	Ditto ripe stage	"	9.82	3.05	4.81	36.27	48.31	0.79	
91	Grass— <i>Panni</i> ripe stage (<i>Andropogon muricatus</i>)	"	12.60	6.09	4.84	36.60	44.70	1.18	
92	Grass— <i>Sandhaur</i> (<i>Bolhrichloa intermedia</i>) 1st cut	Bareilly	9.53	..	3.88	38.88	40.40	1.31	
93	Ditto 2nd cut	"	9.24	..	3.74	37.65	48.24	1.13	
94	Ditto 3rd cut	"	8.52	..	2.09	37.79	50.27	1.33	
95	Grass— <i>Sudan</i> (<i>Andropogon sorghum</i> var. <i>sudanensis</i>)	Punjab	14.39	7.49	5.68	27.03	51.01	1.89	
	Grass Miscellaneous—Full maturity	Madhya Pradesh Nagpur Farm.	..	..	..	..	..	..
96	Grass— <i>Usar</i> (<i>Sporobolus arabicus</i>) 1st cut	Makhdumpur	9.39	..	9.11	31.52	48.56	1.42	
97	Ditto 2nd cut	"	9.57	..	7.96	33.85	46.71	1.01	
98	Ditto 3rd cut	"	7.81	..	4.64	34.64	51.88	1.03	
99	<i>Andropogon annulatus</i>	Madhya Pradesh Nagpur Farm.	..	..	..	..	..	..
100	" <i>caricosus</i>	"	..	..	..	..	..	..
101	" <i>contortus</i>	"	..	..	..	..	..	..
102	" <i>monti kola</i>	"	..	..	..	..	..	..
103	" <i>pertusus</i>	"	..	..	..	..	..	..
104	" <i>pumilus</i>	"	..	..	..	..	..	..
105	" <i>purpureo-stericus</i>	"	..	..	..	..	..	..
106	<i>Apludavaria</i>	"	..	..	..	..	..	..
107	<i>Ischaemum laxum</i>	"	..	..	..	..	..	..
108	<i>Ischaemum sulcatum</i>	"	..	..	..	..	..	..
109	Grass from Adhartal Farm	"	..	..	..	..	..	..
110	Ditto Betul Farm	"	..	..	..	..	..	..
111	Ditto Bareilly Farm	"	..	..	..	..	..	..
112	Ditto Buldana Farm	"	..	..	..	..	..	..
113	Ditto Khandwa Farm	"	..	..	..	..	..	..
114	Ditto Powarkheda Farm	"	..	..	..	..	..	..
115	Ditto Raipur Farm	"	..	..	..	..	..	..
116	Ditto Seoni Farm	"	..	..	..	..	..	..
117	Ditto Sindewahi Farm	"	..	..	..	..	..	..
118	Ditto Tellar kheri Farm	"	..	..	..	..	..	..
119	Ditto Tharsa Farm	"	..	..	..	..	..	..
120	Ditto Degnullah area	Punjab	9.12	4.97	7.21	32.29	50.01	1.37	
121	Ditto the adjoining Degnullah area	"	9.76	7.25	3.35	34.83	51.15	0.91	
122	Gram-green fodder (<i>Cicer arietinum</i>)	"	9.07	7.48	10.88	33.05	44.91	2.09	
123	Ditto whole plant	"	11.38	8.06	11.28	27.16	47.96	2.22	
124	<i>Guar</i> (<i>Cyamopsis psoraleoides</i>)	Madhya Pradesh Nagpur.	12.72	10.74	8.56	29.99	47.00	1.73	
125	Ditto	"	..	..	..	..	..	..
126	<i>Jowar</i> (<i>Andropogon sorghum</i>) young	Bangalore	9.40	6.48	8.91	35.13	44.42	2.14	
127	Ditto prime maximum	"	12.08	6.78	10.05	41.14	53.13	2.38	
128	Ditto prime minimum	"	5.91	3.53	3.42	27.23	43.10	1.06	
129	Ditto prime average	"	8.55	4.96	7.75	32.36	49.61	1.73	
130	Ditto prime ripe.	"	8.06	4.85	4.63	38.66	47.49	1.16	
131	Ditto age:—9-10 1/2 weeks	Bihar	7.58	4.96	2.85	30.91	57.48	1.18	
132	Ditto (18 weeks)	"	5.68	2.41	3.49	30.89	58.49	1.45	
133	Ditto young	Punjab	8.96	4.78	5.21	38.87	45.50	1.37	
134	Ditto prime	"	6.37	3.40	3.76	35.13	53.34	1.40	
135	Ditto ripe	"	7.11	3.50	3.87	33.63	53.78	1.56	
136	<i>Lobia</i> (<i>Dolichos lablab</i>)	"	14.80	..	..	28.08	..	3.50
137	<i>Lucerne</i> (<i>Medicago sativa</i>) maximum	Bangalore	11.76	10.95	25.81	35.21	39.94	3.08	
138	Ditto minimum	"	9.42	0.03	16.85	26.97	30.24	1.34	
139	Ditto average	"	10.69	10.07	20.24	30.13	36.62	2.32	
140	Ditto maximum	Punjab	17.66	15.44	26.60	43.66	46.23	2.63	
141	Ditto minimum	"	9.27	8.19	13.31	21.02	21.16	1.08	
142	Ditto average	"	14.10	11.73	19.90	29.51	34.68	1.91	
143	Ditto	Bihar	14.49	12.32	22.71	21.54	38.39	2.87	
144	Maize (<i>Zea mays</i>)	"	8.15	4.99	6.74	35.95	47.07	2.09	
145	Ditto	Lyalpur	8.98	..	7.62	25.73	56.20	1.47	
146	<i>Moth</i> (<i>Phaseolus acuminifolius</i>)	Punjab	15.53	12.42	12.12	30.70	39.95	1.79	
147	<i>Methi</i> (<i>Trigonella foenum-graecum</i>)	"	8.80	8.27	15.69	31.05	42.39	2.07	

DIX I—contd.

No. of analyses	Mineral constituents						No. of analyses	Serial No.
	Ash, sol. in HCl	CaO	P ₂ O ₅	MgO	Na ₂ O	K ₂ O		
1	1.45	0.49	0.12	0.23	0.17	0.38	1	77
1	8.65	0.91	0.49	0.70	0.74	3.75	1	78
1	4.45	0.70	0.29	0.34	0.15	1.12	1	79
1	4.31	0.53	0.63	0.33	0.37	2.07	1	80
3	4.03	0.49	0.17	0.32	0.36	1.08	3	81
3	2.97	0.50	0.16	0.29	0.22	0.87	3	82
3	2.51	0.59	0.29	0.35	0.25	0.46	3	83
1	10.07	0.79	0.22	..	..	0.88	1	84
7	5.87	0.46	0.80	0.37	0.30	4.80	1	85
2	2.86	0.78	0.56	0.33	0.12	2.29	7	86
2	3.31	0.47	0.29	0.21	0.14	2.09	2	87
2	4.96	0.61	0.32	0.27	0.15	1.20	2	88
1	3.66	0.69	0.47	0.40	..	2.53	2	89
1	6.09	0.54	0.37	0.23	0.49	1.60	1	90
1	..	0.57	0.27	0.29	0.28	1.31	1	91
1	..	0.57	0.47	0.53	0.50	1.18	1	92
1	..	0.49	0.41	0.51	0.53	1.08	1	93
1	..	0.50	0.43	0.47	0.31	0.92	1	94
5	7.49	1.19	1.33	0.50	0.08	1.99	5	95
1*	..	0.41	0.53	1.00	2.15	0.86	1	96
1	..	0.35	0.76	0.77	1.84	0.86	1	97
1	..	0.39	0.51	0.65	1.55	0.69	1	98
..	..	0.53	0.24	..	..	1.40	1	99
..	..	..	..	..	..	..	..	100
..	..	1.14	0.14	..	..	2.36	1	101
..	..	0.45	0.33	..	..	0.41	1	102
..	..	0.87	0.48	..	..	0.63	1	103
..	..	0.76	0.32	..	..	0.94	1	104
..	..	0.86	0.37	..	..	1.39	1	105
..	..	0.75	0.32	..	..	2.13	1	106
..	..	0.59	0.55	..	..	1.16	1	107
..	..	0.59	0.22	..	..	0.51	1	108
..	..	0.52	0.33	..	..	0.50	1	109
..	..	0.49	0.12	..	..	0.93	1	110
..	..	0.58	0.28	..	..	0.17	1	111
..	..	0.57	0.06	..	..	0.44	1	112
..	..	0.39	0.05	..	..	0.54	1	113
..	..	0.51	0.04	..	..	0.35	1	114
..	..	0.73	0.18	..	..	0.87	1	115
..	..	0.67	0.21	..	..	0.34	1	116
..	..	0.69	0.24	..	..	0.97	1	117
..	..	0.47	0.07	..	..	0.35	1	118
..	..	0.54	0.36	..	..	2.00	1	119
..	..	0.45	0.18	..	..	0.55	1	120
1	4.97	0.43	0.47	0.61	1.04	1.12	1	121
1	7.25	0.53	0.32	0.62	1.44	1.50	1	122
2	7.48	1.79	0.52	0.44	0.86	2.77	2	123
4	8.06	1.63	0.57	0.47	0.35	2.60	4	124
2	10.74	3.20	0.38	1.05	0.34	2.55	2	125
..	..	5.42	0.42	..	..	3.94	1	126
..	..	0.51	0.57	0.45	0.45	2.68	1	127
..	..	..	..	..	..	..	..	128
..	..	..	..	..	..	..	..	129
28	..	..	..	..	..	..	..	130
6	..	0.35	0.48	0.29	..	1.57	1	131
3	4.96	0.59	0.42	0.76	..	2.04	3	132
2	2.41	0.62	0.33	0.25	..	0.58	2	133
5	4.78	0.69	0.41	0.35	0.27	2.45	5	134
6	3.40	0.59	0.32	0.35	0.17	1.67	6	135
6	3.50	0.63	0.25	0.37	0.11	1.76	6	136
2	..	2.77	0.60	0.97	0.55	3.52	2	137
..	..	..	..	..	..	..	..	138
..	..	..	..	..	..	..	..	139
6	..	1.73	0.79	0.41	0.72	4.38	1	140
..	15.44	3.64	1.12	0.79	0.53	4.93	..	141
..	8.19	1.94	0.38	0.26	0.06	2.21	..	142
14	11.73	2.80	0.74	0.44	0.35	4.11	14	143
1	..	..	..	..	..	..	..	144
3	4.99	0.73	0.63	0.74	..	1.61	3	145
..	..	..	..	..	..	..	..	146
1	12.42	3.60	0.62	0.79	0.07	3.80	1	147
1	8.27	2.06	0.51	3.42	0.30	2.77	1	147

Serial No	Name	Place of origin	Total ash	Ash sol. in HCl	Organic constituents				
					Crude protein	Carbohydrates		Ether extract	
						Fibre	Nitrogen-free extract		
148	Oats (<i>Avena sativa</i>)	Punjab	13.91	10.81	14.63	32.88	36.44	2.14	
149	French milk stage	"	9.33	6.26	6.44	28.72	53.90	2.31	
150	ripe	"	9.35	7.30	9.24	34.82	44.78	1.80	
151	Poker (<i>Ficus infectoria</i>)	Izatnagar	8.78	"	9.60	28.33	49.91	3.38	
152	Peas (<i>Pisum sativa</i>) 11 1/2 weeks	Punjab	3.89	3.05	16.69	22.66	54.42	2.49	
152	Pipal (<i>Ficus religiosa</i>)	Izatnagar	14.00	"	11.87	27.42	43.39	3.32	
154	Senji (<i>Melilotus pavia</i> flora)	Punjab	9.50	6.10	15.46	31.62	41.05	1.47	
155	Shaflav (<i>Trifolium resupinatum</i>)	"	17.66	13.95	21.51	16.90	42.02	1.91	
156	Shisham leaves (<i>Dalbergia sissoo</i>)	"	13.42	"	2.71	26.71	54.58	2.42	
157	Soya beans (<i>Glycin hispida</i>)	Bihar	9.43	8.73	12.56	23.69	52.13	2.22	
158	Sun flower (<i>Helianthus annuus</i>)	Punjab	15.34	"	11.94	23.98	45.25	3.44	
159	Teosinte (<i>Euchlaena mexicana</i>)	Bihar	10.60	6.09	4.47	32.20	51.33	1.20	
160	Velvet bean (<i>Stizolobium decumbens</i>)	Punjab	14.93	"	15.14	19.27	48.53	2.13	
161	Water hyacinth (<i>Eichharnia speciosa</i>)	Pengal	16.47	16.06	6.54	24.70	50.59	1.70	
162	Wheat (<i>Triticum vulgare</i>)	Punjab	8.65	5.61	7.31	34.73	47.97	1.31	
Silage									
163	Grass	"	14.44	4.79	7.77	33.75	42.55	1.49	
164	Guinea grass (<i>Panicum maximum</i>)	Bangalore	9.90	4.59	5.23	38.73	44.61	1.53	
165	Jowar (<i>Andropogon sorghum</i>) young	"	14.58	8.04	7.17	39.24	37.22	1.79	
166	Ditto prime maximum	"	14.93	7.50	7.12	41.68	50.28	2.61	
167	Ditto prime minimum	"	6.80	3.85	4.94	29.36	10.87	1.95	
168	Ditto prime average	"	10.63	5.51	5.89	37.33	44.38	1.77	
169	Ditto prime ripe	"	6.49	2.80	4.48	41.56	45.91	1.57	
170	Maize (<i>Zea mays</i>)	Punjab	11.33	"	7.92	24.57	55.08	1.10	
171	Oat (<i>Avena sativa</i>)	"	9.54	"	7.73	40.29	40.15	2.29	
172	Ragi straw (<i>Elycus coracana</i>)	Bangalore	9.62	6.46	3.64	38.78	46.49	1.47	
173	Rice straw (<i>Oryzativa</i>)	"	11.40	6.17	5.92	30.01	47.47	1.66	
174	Shisham leaves (<i>Dalbergia sisoo</i>)	Punjab	14.41	"	3.18	27.53	51.60	3.22	
175	Spear grass (<i>Andropogon contortus</i>) young	Hosur, Madras.	12.22	5.30	6.62	36.85	43.95	1.26	
176	Ditto prime	"	15.53	5.39	6.59	32.60	43.43	1.65	
177	Wheat straw (<i>Triticum vulgare</i>)	Punjab	14.62	3.76	3.47	39.32	42.06	0.47	
DRIED ROUGHAGES									
Hays									
178	Aijampur hay (young)	Mysore	12.47	6.36	7.77	36.85	41.00	1.06	
179	Ditto (prime)	"	11.60	5.63	5.44	30.22	42.80	0.95	
180	Ditto (ripe)	"	8.42	4.21	3.21	37.18	50.40	0.74	
181	Ahmadnagar	Ahmadnagar	16.31	2.30	3.85	36.01	41.95	0.93	
182	Ambala hay	Punjab	10.72	6.26	5.55	35.31	46.47	1.42	
183	<i>Andropogon nanulatus</i> (early)	Bombay	13.58	5.55	9.70	33.03	42.51	1.18	
184	Ditto (just before flower)	"	10.21	3.40	5.20	38.50	44.47	1.02	
185	Ditto (in flower)	"	10.64	3.20	4.08	39.89	44.36	1.03	
186	Ditto (in seed)	"	11.46	2.33	2.68	39.07	45.63	1.15	
187	Ditto (early)	Pusa (Bihar)	"	"	"	"	"	"	
188	Ditto (in flower)	"	"	"	"	"	"	"	
189	Ditto (ripe)	"	"	"	"	"	"	"	
190	Anjan hay (<i>Pennisetum cenchroides</i>) early	Bihar	"	"	"	"	"	"	
191	Ditto just before flower	"	"	"	"	"	"	"	
192	Ditto in flower	"	"	"	"	"	"	"	
193	Ditto dead ripe	"	"	"	"	"	"	"	
194	Ditto early	Bombay	"	"	"	"	"	"	
195	Ditto in flower	"	"	"	"	"	"	"	
196	Ditto in flower	Bangalore	"	"	"	"	"	"	
197	Ditto dead ripe	"	"	"	"	"	"	"	
198	Ditto	Meerut	10.18	4.60	4.87	32.91	51.21	0.83	
199	Anjan hay (<i>Pennisetum cenchroides</i>)	Punjab	11.91	7.57	5.73	36.69	44.25	1.42	
200	Aurangabad hay	Aurangabad	16.13	2.61	2.45	36.26	43.60	1.56	
201	Ditto (young)	"	14.48	2.23	4.16	40.65	39.56	1.15	
202	Ditto (prime)	"	15.40	2.47	2.58	37.78	42.81	1.43	
203	Ditto (ripe)	"	15.58	1.96	1.66	38.73	42.72	1.31	
204	Babar hay	Murree Hills	6.40	2.04	2.33	32.10	56.86	2.31	
205	Bangalore hay	Military, Grass Farm.	10.02	2.45	2.47	35.41	50.84	1.26	
206	Belgaum hay	Belgaum	14.77	1.91	2.26	31.25	50.33	1.39	
207	Bellary hay	Bellary Madras	14.04	2.66	2.44	36.90	45.36	1.28	
208	Bir hay	Hissar Farm, Punjab.	11.24	6.47	5.51	29.67	52.56	1.02	
209	Boda hay	Cuddapah Madras	6.99	2.45	3.74	40.55	47.38	1.34	
210	Bolarum hay	Bolarum, Decan.	13.30	2.96	2.81	37.00	45.45	1.44	
211	Ditto (young)	"	12.98	4.34	5.06	36.04	44.76	1.16	
212	Ditto (prime)	"	12.49	3.49	3.81	36.91	45.64	1.15	
213	Ditto (ripe)	"	9.44	1.75	1.98	38.28	49.44	0.86	
214	Dal hay	Assam	12.90	"	7.50	29.20	48.97	1.43	
215	Dalhousie hay	Dalhousie	9.33	2.51	3.41	38.63	47.75	0.88	

DIX I—contd.

No. of analyses	Mineral constituents						No. of analyses	Serial No.
	Ash sol. in HC	CaO	P ₂ O ₅	MgO	Na ₂ O	K ₂ O		
7	10.81	0.67	0.76	0.37	1.09	5.28	7	143
3	6.26	0.66	0.50	0.37	0.70	3.43	3	149
1	7.90	0.49	0.35	0.21	0.87	2.93	1	150
1	..	3.22	0.68	..	..	..	1	151
1	..	1.63	0.60	0.31	..	0.91	1	152
1	3.05	3.68	0.55	..	..	..	1	153
4	6.10	1.89	0.42	0.44	0.34	2.21	4	154
4	13.95	2.79	0.76	0.56	0.67	4.87	4	155
3	..	..	..	..	..	..	..	156
1	8.73	1.87	0.57	1.39	..	2.35	1	157
1	..	..	..	..	..	..	..	158
1	6.09	1.07	0.37	0.49	..	2.24	1	159
1	..	..	..	..	..	..	..	160
1	..	..	..	..	..	..	..	161
2	5.61	0.41	0.35	0.31	0.11	3.29	2	162
2	..	..	..	..	..	..	..	163
2	..	..	..	..	..	..	..	164
3	..	..	..	..	..	..	..	165
..	..	..	..	..	..	..	..	166
..	..	..	..	..	..	..	..	167
2f	..	0.64	0.42	0.42	..	2.48	1	168
1	..	..	..	..	..	..	..	169
1	..	..	..	..	..	..	..	170
2	..	..	..	..	..	..	..	171
1	..	..	..	..	..	..	..	172
3	..	..	..	..	..	..	..	173
2	..	..	..	..	..	..	..	174
1	..	..	..	..	..	..	..	175
4	..	..	..	..	..	..	..	176
2	..	..	..	..	..	..	..	177
1	6.36	0.84	0.44	0.41	0.07	2.90	1	178
1	5.63	0.56	0.44	0.39	0.18	2.18	1	179
1	4.21	0.51	0.15	0.49	0.13	0.82	1	180
1	..	..	..	..	..	..	..	181
1	6.26	0.57	0.67	0.24	0.87	2.53	1	182
4	5.55	0.64	0.56	0.35	0.44	2.15	4	183
7	..	0.66	0.33	0.34	0.43	1.26	4	184
8	..	0.58	0.24	0.29	0.27	1.08	4	185
..	..	0.56	0.11	0.30	0.35	0.50	4	186
..	..	1.00	0.52	0.26	0.62	2.50	2	187
..	..	0.63	0.44	0.21	0.15	0.81	1	188
..	..	1.15	0.46	0.21	0.13	0.44	1	189
..	..	0.75	0.64	0.38	1.14	4.07	4	190
..	..	0.70	0.57	0.38	1.27	4.13	3	191
..	..	0.63	0.42	0.38	1.17	3.99	1	192
..	..	0.63	0.69	0.33	1.10	2.02	3	193
..	..	0.50	0.23	0.61	1.13	0.66	1	194
..	..	0.60	0.21	0.72	1.02	0.61	1	195
..	..	0.45	0.56	0.37	1.27	3.30	4	196
..	..	0.42	0.39	0.39	0.89	1.67	2	197
2	4.26	0.36	0.72	0.31	1.36	1.61	1	198
1	..	0.43	0.42	0.28	0.10	2.09	1	199
3	2.47	0.73	0.11	0.31	0.20	0.69	2	200
1	2.23	0.57	0.19	0.34	0.23	0.67	1	201
1	2.47	0.51	0.13	0.28	0.29	0.59	1	202
1	1.96	0.55	0.05	0.26	0.39	0.23	1	203
1	2.04	0.65	0.05	0.24	0.31	0.26	1	204
8	..	..	..	..	..	..	..	205
2	1.91	0.55	0.08	0.36	0.18	0.30	2	206
5	2.66	0.79	0.07	0.42	0.31	0.57	5	207
2	6.47	0.48	0.42	0.36	0.79	2.50	2	208
1	2.45	0.40	0.14	0.29	0.21	0.82	1	209
19	..	0.72	0.08	0.44	0.28	0.53	12	210
1	4.34	0.73	0.24	0.37	0.44	1.43	1	211
1	3.49	0.75	0.22	0.32	0.35	0.90	1	212
1	1.75	0.50	0.09	0.27	0.34	0.17	1	213
1	..	0.20	0.46	..	..	..	1	214
1	2.51	0.76	0.15	0.19	0.15	0.44	1	215

Serial No.	Name	Place of origin	Total ash	Ash sol. in HCl	Organic constituents			
					Crude protein	Carbohydrates		Ether extract
						Fibre	Nitrogen-free extract	
216	Dub hay	Bangalore	14.97	6.04	11.06	25.86	46.19	1.90
217	Ditto	Bareilly	11.08	4.85	9.09	24.40	54.48	0.96
218	Ditto	Fyzabad	12.10	5.98	7.68	23.23	53.66	3.33
219	Ditto	Lucknow	10.07	4.56	7.51	20.77	61.14	0.51
220	Ditto	Karnal	12.48	4.62	6.76	24.15	55.99	0.62
221	Ditto	Lyallpur	12.54	..	11.10	18.38	56.60	1.38
222	Ferozepur hay	Ferozepur	11.57	7.27	8.99	32.93	45.51	1.04
223	Guinea grass hay (before flowering)	Bangalore	16.00	9.83	7.56	38.14	37.08	1.22
224	Ditto (in flower)	"	12.30	6.10	4.76	42.10	39.69	1.15
225	Jarwah hay	Lucknow	11.56	3.65	3.50	35.21	47.57	2.16
226	Jhelum hay	Jhelum	9.63	5.25	5.15	29.93	54.08	1.21
227	Jowar hay (<i>Andropogon sorghum</i>) young	Bangalore	9.77	6.63	6.88	40.70	41.30	1.35
228	Ditto prime	"	8.51	4.57	4.30	38.93	47.10	1.16
229	Ditto ripe	"	7.62	4.57	4.41	42.07	44.82	1.08
230	Jowar hay	Punjab	10.23	4.75	5.42	37.76	44.96	1.63
231	Jubbulpore hay (young)	Jubbulpore	10.77	4.26	4.15	38.72	44.92	1.44
232	Ditto (prime)	"	8.63	3.07	3.24	39.28	47.73	1.12
233	Ditto (ripe)	"	11.96	2.45	2.58	39.55	44.88	1.03
234	Jullundur hay	Jullundur	8.15	2.64	3.51	40.11	47.24	0.99
235	Jutogh hay	Jutogh	7.33	3.11	3.74	39.37	43.16	1.40
236	Kasauli hay	Kasauli	8.76	3.84	4.19	36.90	48.41	1.74
237	Kollukattai grass hay (young)	Hosur, Madras	12.70	8.88	16.89	28.49	40.78	1.14
238	Ditto (prime)	"	10.90	7.01	10.01	35.33	42.60	1.16
239	Ditto (ripe)	"	9.93	5.28	6.38	33.30	49.71	0.68
240	Lahore hay	Lahore	9.76	4.61	4.38	38.76	45.70	1.40
241	Lunder hay (<i>Anthistiria anathera</i>)	Murree Hills	7.20	1.76	1.56	39.79	49.64	1.81
242	Meerut Farm hay	Meerut	10.98	2.87	2.92	38.63	46.56	0.91
243	Ditto (young)	"	14.64	4.09	3.54	32.61	47.60	1.51
244	Ditto (prime)	"	14.03	3.65	2.92	31.97	49.52	1.56
245	Ditto (ripe)	"	12.71	3.15	2.87	37.20	46.17	1.05
246	Multan hay (Geneva)	Multan	10.68	4.44	2.98	39.20	45.91	1.23
247	Ditto (Musel)	"	11.22	4.46	3.15	36.37	48.29	0.97
248	Murree hay	Murree	7.35	2.74	3.68	43.89	43.17	1.91
249	Natal grass hay (<i>Tricholaena rosea</i>)	Mysore	7.09	4.47	5.61	41.61	43.39	1.40
250	Oar hay (<i>Avena sativa</i>)	Lahore	8.40	4.91	5.23	28.90	56.44	1.03
251	Ditto	Punjab	8.34	5.19	5.60	35.02	48.45	1.69
252	Rawalpindi hay	Rawalpindi	8.21	2.62	4.08	38.37	47.73	1.61
253	Rhodes grass hay (<i>Chloris gayana</i>)	Bangalore	12.14	7.92	12.33	27.28	45.84	2.41
254	Ditto (young)	Hosur, Madras	10.40	4.48	7.51	36.57	44.31	1.21
255	Ditto (prime)	"	11.08	5.43	6.56	36.16	42.14	1.26
256	Ditto (ripe)	"	9.08	3.88	6.36	39.31	44.09	1.16
257	Rosa hay	Murree Hills	8.35	2.44	2.63	33.54	53.18	2.30
258	Ruth hay	Bolarum	8.04	2.30	2.34	41.18	47.18	1.26
259	Ditto (ripe)	"	13.10	2.80	2.74	31.40	51.80	0.66
260	Ruth hay	Jubbulpore	9.94	1.78	2.33	28.67	57.95	0.91
261	Ditto	Kirkee, Poona	17.17	2.12	2.53	31.12	45.30	0.88
262	Scented grass hay	Cuddapah, Madras	7.21	3.92	6.49	35.77	47.26	3.27
263	Seguri hay	Seguri	9.92	1.90	5.84	38.44	44.80	1.00
264	Sialkot hay	Sialkot	10.09	3.57	4.83	38.65	45.46	0.97
265	Spear grass hay (<i>Andropogon contortus</i>) early	Bangalore	..	..	..	..	..	..
266	Ditto just before flower	"	8.76	3.46	5.61	38.21	46.00	1.42
267	Ditto in flower	"	9.74	2.07	3.18	37.39	48.22	1.47
268	Ditto in seed	"	9.22	4.27	6.97	34.52	47.04	1.35
269	Ditto young	Hosur, Madras	9.73	3.50	5.30	36.89	46.89	1.19
270	Ditto prime	"	9.03	3.30	2.97	38.32	48.75	0.98
271	Ditto ripe	"	13.31	3.36	5.88	33.58	46.11	1.12
272	Ditto early	Bombay	11.06	3.17	4.42	38.64	44.87	1.01
273	Ditto before flower	"	8.85	2.78	3.71	40.27	46.23	0.94
274	Ditto in flower	"	10.86	2.19	1.72	28.23	48.29	0.99
275	Ditto in seed	"	..	..	..	..	..	..
276	Ditto early	Bihar	..	..	..	..	..	..
277	Ditto in flower	"	..	..	..	..	..	..
278	Ditto ripe	"	..	..	..	..	..	..
279	Spear grass hay	Uttar Pradesh	10.11	1.92	2.28	33.74	53.07	0.8
280	Ditto	Murree Hills	6.58	3.38	5.35	36.04	40.6	1.60
281	Star grass hay (<i>Cynodon plecto-tachyum</i>)	Almora	10.82	..	5.44	37.60	45.24	0.90
282	Sugar cane leaves	Bangalore	6.09	3.13	2.64	37.13	52.73	1.36
283	Suank hay	Sargodha	7.97	3.84	7.26	40.47	43.11	1.19
284	Tatsira hay	Murree Hills	6.69	2.35	2.47	31.64	57.19	2.01
285	Telegaon hay	Telegaon	15.72	2.34	2.72	37.47	43.12	0.97
286	Tornagallu hay	Tornagallu	11.60	2.47	2.22	37.52	47.45	1.21
287	Uridul hay (<i>Oryza sativa</i> var. <i>salua</i>)	Assam	..	..	8.19	32.00	42.31	1.76
288	Ular grass hay	Etawah	8.84	..	6.12	34.59	49.63	1.02
289	Wheat hay	Punjab	7.23	3.51	5.06	35.12	51.32	1.27
Legume hays								
290	Berseem hay	"	12.13	10.89	14.70	30.56	40.99	1.62
291	Cluster bean hay	Mysore	16.51	13.47	25.21	13.82	43.59	0.87

DIX I—contd.

No. of analyses	Mineral constituents						No. of analyses	Serial No
	Ash sol. in HCl	CaO	P ₂ O ₅	MgO	Na ₂ O	K ₂ O		
4	..	..	..	..	..	..	..	213
I	4.85	0.70	0.44	0.31	0.40	1.53	1	217
I	5.98	0.72	0.52	0.46	0.26	1.51	1	218
I	4.56	0.55	0.59	0.24	0.44	2.52	1	219
I	4.62	0.49	0.60	0.23	0.99	2.03	1	220
I	..	..	..	..	..	..	..	221
I	7.27	0.71	0.57	0.32	0.82	2.28	1	222
I	..	..	..	..	..	..	..	223
I	..	..	..	..	..	..	..	224
I	3.65	0.41	0.36	0.20	0.28	1.48	1	225
I	5.25	0.38	0.35	0.38	0.46	1.63	1	226
6	..	0.38	0.54	0.15	0.26	3.39	1	227
I	..	0.38	0.33	0.33	0.26	1.67	13	228
15	..	0.32	0.56	0.31	0.32	1.90	2	229
6	..	0.68	0.62	0.45	0.17	2.49	8	230
8	..	0.68	0.32	0.34	0.23	1.55	1	231
I	4.26	0.48	0.15	0.33	0.36	1.12	1	232
I	3.07	0.50	0.18	0.26	0.03	0.90	1	233
I	2.45	0.57	0.1	0.22	0.30	1.55	1	234
I	3.64	0.80	0.42	0.35	0.22	1.30	1	235
I	3.11	1.01	0.21	0.29	0.26	0.69	1	236
I	3.84	..	..	..	..	..	..	237
I	..	..	..	..	..	..	..	238
I	..	..	..	..	..	..	..	239
I	4.61	0.67	0.35	0.20	0.48	1.81	1	240
I	1.76	0.60	0.03	0.10	0.10	0.37	1	241
I	2.71	0.59	0.33	0.28	0.41	0.82	2	242
4	4.26	0.38	0.53	0.22	0.18	2.00	1	243
2	3.92	0.39	0.42	0.26	0.27	1.74	1	244
3	..	..	..	..	..	..	..	245
I	4.44	0.60	0.20	0.17	0.27	1.07	1	246
I	4.46	0.83	0.22	0.18	0.18	1.09	1	247
I	2.74	0.91	0.11	0.26	0.49	0.81	1	248
I	4.47	0.48	0.25	0.49	0.25	1.96	1	249
I	..	..	..	..	..	..	..	250
14	5.19	0.46	0.38	0.22	0.70	2.44	14	251
2	2.36	0.82	0.13	0.19	0.34	0.77	2	252
2	..	..	..	..	..	..	..	253
I	4.48	0.59	0.45	0.31	1.08	3.03	1	254
I	5.43	0.42	0.23	0.17	0.97	1.30	1	255
I	..	..	..	..	..	..	..	256
I	2.44	0.79	0.07	0.28	0.27	0.32	1	257
I	1.98	0.42	0.17	0.31	0.45	0.60	2	258
I	..	..	..	..	..	..	..	259
I	1.78	0.51	0.14	0.27	0.24	0.42	2	260
2	2.12	0.50	0.06	0.31	0.45	0.38	2	261
I	3.92	0.52	0.19	0.35	0.39	1.70	1	262
I	..	..	..	..	..	..	..	263
I	3.57	..	0.43	0.19	0.33	1.84	1	264
..	..	0.55	0.42	0.34	0.23	2.33	3	265
..	..	0.56	0.43	0.42	0.27	3.21	1	265
I	..	0.43	0.21	0.26	0.24	1.22	3	266
I	..	0.39	0.18	0.26	0.22	1.04	1	267
I	..	..	..	..	..	..	..	268
I	..	..	..	..	..	..	..	269
5	..	..	..	..	..	..	..	270
6	..	..	..	..	..	..	..	271
4	..	0.47	0.30	0.39	0.25	1.41	5	272
6	..	0.47	0.29	0.30	0.39	1.23	6	273
6	..	0.42	0.23	0.25	0.30	0.96	7	274
6	..	0.48	0.17	0.21	0.33	0.50	8	275
5	..	0.59	0.36	0.27	0.24	1.74	3	276
..	..	0.47	0.25	0.24	0.31	1.21	3	277
..	..	0.84	0.23	0.25	0.38	0.74	1	278
3	1.82	0.41	0.19	0.20	0.41	0.38	3	279
I	3.38	0.63	0.20	0.28	0.15	1.10	1	280
I	..	0.52	0.24	..	..	..	1	281
I	3.18	0.55	0.14	0.37	0.46	1.00	1	282
I	3.24	0.54	0.21	0.35	0.34	1.95	1	283
I	2.35	0.89	0.07	0.17	0.11	0.33	1	284
I	..	..	..	..	..	..	..	285
3	2.47	0.63	0.06	0.37	0.45	0.53	3	286
I	..	..	..	..	..	..	..	287
I	..	0.30	0.33	..	..	..	1	288
I	3.51	0.30	0.50	0.39	0.05	1.79	1	289
I	..	..	..	..	..	..	..	290
I	10.89	2.07	0.65	0.61	0.58	3.89	1	290
I	13.47	3.39	0.61	1.51	0.20	3.29	1	291

Serial No.	Name	Place of origin	Total ash	Ash sol. in HCl	Organic constituents				
					Crude protein	Carbohydrates		Ether extract	
						Fibre	Nitrogen-free extract		
292	Cowpea hay	Mysore	13.32	10.19	15.31	34.34	35.44	1.09	
293	Gram hay	Punjab	11.17	8.26	12.94	35.33	38.14	1.46	
294	Groundnut hay	Mysore	14.81	11.73	21.51	24.54	38.10	0.95	
295	Katai (<i>Dolichos biflorus</i>)	Sabour	13.09	7.99	10.56	16.20	58.34	1.81	
297	Lobia hay (<i>Dolichos lablab</i>)	Sargodha	12.51	..	..	36.12	..	2.25
297	Lucerne hay	Bangalore	12.74	7.64	21.26	29.41	35.18	1.41	
298	Moth hay (<i>Phaseolus aconitifolius</i>)	Punjab	13.75	10.07	10.59	26.75	47.06	1.85	
299	Pea hay (<i>Pisum sativum</i>)	Sargodha	7.60	6.13	10.94	29.17	50.32	1.91	
300	Soya bean hay	Mysore	12.04	10.02	14.90	29.13	42.59	1.29	
DRIED ROUGHAGES									
Straws									
301	<i>Apluda aristata</i> Linn	Palamau Forest, Bihar.	8.13	6.83	6.90	23.27	..	..
302	Barley stalks	Sargodha, Punjab.	6.08	4.74	2.97	38.59	51.32	1.04	
303	Barley straw	Mona, Punjab	8.05	5.40	2.21	47.39	41.43	0.92	
304	<i>Batasad</i>	Goikera Forest, Bihar.	9.19	7.47	6.48	39.86	..	..
305	<i>Chrysopogon monticola</i> Trin	Palamau Forest, Bihar.	9.60	..	4.48	26.48	57.58	1.86	
306	Gramineae <i>Alpuda varia Amutica</i> , L. Inc. <i>A. aristata</i> Willd.	Probat Range Forest, Bihar.	10.23	8.77	5.88	26.42	..	..
307	Gram stalks	Punjab	6.17	3.96	4.51	53.81	34.84	0.67	
308	Gram straw	..	13.31	..	6.01	44.45	35.70	0.53	
309	<i>Jankai (Phragmites karka)</i>	Goikera Forest, Bihar.	15.81	13.65	3.77	29.79	..	..
310	Jowar straw	Bangalore	9.82	5.45	4.91	34.17	49.55	1.44	
311	<i>Khoro bumbee (Chrysopogon lancearinus)</i>	Goikera Forest, Bihar.	16.31	14.50	4.71	27.64	..	..
312	<i>Luped dumba (Eulalia cunningii)</i>	..	8.49	7.44	6.90	38.67	..	..
313	Millet straw	Bangalore	17.51	5.95	5.39	32.32	43.51	1.27	
314	<i>Oplismenus burmannii</i> Beauv	Palamau Forest, Bihar.	14.91	13.56	1.31	20.70	..	..
315	Ragi straw (<i>Eulasia coracana</i>)	Bangalore	8.10	5.35	3.67	35.93	51.38	0.92	
316	Rice straw (<i>Oryza sativa</i>)	..	17.28	4.41	2.92	33.36	45.58	0.86	
317	Ditto (<i>Aman</i>)	Bengal	14.18	3.87	3.25	33.63	47.91	1.03	
318	Ditto (<i>Aus</i>)	..	12.84	4.08	5.04	34.92	45.83	1.57	
319	Ditto (<i>Bora</i>)	..	21.94	3.81	5.69	29.07	41.71	0.94	
320	Ditto	Kanke Farm, Bihar.	15.20	2.50	3.75	30.70	49.40	0.95	
321	Ditto	Pusa, Bihar	17.28	4.41	2.92	33.36	45.58	0.86	
322	Ditto	Kangrah, Punjab.	16.49	7.46	2.40	36.49	43.75	0.87	
323	Ditto	Karnal, Punjab	20.39	6.05	3.75	30.61	43.67	1.55	
324	<i>Rolega (Schima nervosum)</i>	Goikera Forest, Bihar.	8.88	7.22	4.46	24.53	..	..
325	<i>Rottboelia exaltata</i>	Palamau Forest, Bihar.	10.80	..	5.25	31.13	52.02	0.80	
326	<i>Schizachyrium brevifolium</i> Nees	..	12.10	10.70	4.66	26.11	..	..
327	Tonto Jono	Goikera Forest, Bihar.	9.21	7.66	5.45	25.04	..	..
328	Wheat <i>bhoosa</i>	Karnal, Punjab	14.07	3.13	2.39	39.55	42.97	1.02	
329	Wheat straw	Pusa, Bihar	11.30	6.39	3.28	42.14	41.66	1.62	
330	Ditto	Karnal, Punjab.	11.83	3.91	3.26	38.51	45.24	1.16	
CONCENTRATES									
Grains and seeds									
331	<i>Babul</i> pods (<i>Acacia beans</i>)	Pusa, Bihar	5.47	5.30	15.77	12.44	65.52	0.80	
332	Ditto ripe	..	6.24	6.09	14.91	16.50	59.56	2.79	
333	<i>Babul</i> seed (crushed)	Karnal	7.43	5.73	14.64	14.80	59.87	3.26	
334	Barley	Bangalore	4.53	2.68	9.48	5.23	79.09	1.67	
335	Ditto	Mona, Punjab	3.21	2.38	11.50	5.39	78.84	1.06	
336	Ditto	Lyallpur	2.69	..	10.12	6.85	77.43	2.91	
337	Barley heads	Punjab	4.79	2.56	9.39	20.21	64.00	1.11	
338	Cotton seed	..	4.66	..	18.02	25.74	30.98	20.60	
339	Gram	Bangalore	3.48	3.10	21.63	9.72	62.09	3.08	
340	Ditto	Pusa	3.59	3.43	20.19	9.81	62.19	4.22	
341	Ditto	Lyallpur	2.63	..	19.63	7.50	65.40	4.84	
342	Ditto (grain)	Punjab	3.05	3.42	18.06	9.83	63.67	4.94	
343	Ditto (grain with pods)	..	9.08	8.38	16.18	23.79	48.18	2.77	
344	Groundnut (kernel)	..	2.15	2.10	31.28	1.39	13.61	51.57	
345	Horse gram	..	5.10	3.95	24.74	4.82	64.38	0.96	
346	Linseed	Lyallpur	5.25	..	19.22	6.78	32.64	36.11	
347	<i>Kulthi (Dolichos biflorus)</i>	Bangalore	7.77	..	22.46	6.10	58.48	1.26	
348	Maize	Punjab	1.94	..	11.11	1.90	80.66	4.39	
349	Ditto	Lyallpur	1.85	..	10.55	2.20	82.10	3.30	

DIX I—contd.

No. of analyses	Mineral constituents						No. of analyses	Serial No.
	Ash sol. in HCl	CaO	P ₂ O ₅	MgO	Na ₂ O	K ₂ O		
2	10.19	2.27	0.40	0.70	0.25	2.89	2	292
2	8.26	2.14	0.46	0.48	0.33	2.99	2	293
1	..	2.65	0.58	1.25	0.18	3.26	1	294
1	7.99	2.54	0.42	1.00	..	1.20	1	295
1	..	3.78	0.36	1.03	0.75	2.14	1	296
1	10.07	3.27	0.42	0.96	0.88	2.16	1	297
1	6.13	1.58	0.48	0.33	0.19	2.02	1	298
1	10.02	2.86	0.60	1.20	0.30	2.02	1	299
1	..	..	..	..	..	..	..	300
1	6.83	0.48	0.23	0.29	..	1.23	1	301
2	4.74	0.46	0.19	0.34	0.27	1.58	2	302
2	5.40	0.44	0.16	0.15	0.29	2.71	2	303
1	7.47	0.83	0.39	0.67	..	0.31	1	304
1	..	0.64	0.19	0.15	..	1.28	1	305
1	8.77	0.70	0.29	0.25	..	2.03	1	306
5	3.96	0.47	0.27	0.36	0.08	2.91	5	307
1	..	..	..	..	..	..	..	308
1	13.65	1.03	0.23	0.51	..	1.32	1	309
..	..	..	..	..	..	..	..	310
..	14.50	1.86	0.62	1.22	..	2.23	1	311
..	7.44	0.89	0.21	0.49	..	1.72	1	312
..	..	0.93	0.39	0.36	..	2.08	1	313
..	13.50	..	..	..	..	..	..	314
..	..	1.11	0.16	0.45	0.26	1.50	12	315
..	..	0.50	0.15	0.23	0.50	1.63	14	316
..	3.81	0.71	0.12	0.30	0.27	1.78	4	317
..	3.83	0.64	0.18	0.40	0.21	2.03	1	318
..	..	..	..	..	..	..	..	319
..	2.50	0.19	0.25	0.10	..	1.43	1	320
..	..	..	..	..	..	..	..	321
..	..	0.40	0.25	0.24	0.44	2.31	1	322
..	..	..	..	..	..	..	..	323
..	..	0.71	0.27	0.60	..	2.35	1	324
..	..	..	0.30	0.26	..	2.07	1	325
..	..	0.43	0.16	0.28	..	0.98	1	326
..	..	0.76	0.36	0.51	..	1.67	1	327
..	..	..	0.15	0.11	0.28	1.25	1	328
..	..	..	..	..	..	..	..	329
..	..	..	..	..	..	..	..	330
..	..	..	..	..	..	..	..	331
..	..	..	..	..	..	..	..	332
..	..	..	..	..	..	..	..	333
..	..	..	..	..	..	..	..	334
..	..	..	..	..	0.05	0.56	1	335
..	..	..	..	0.21	..	..	1	336
..	..	..	..	0.26	0.14	1.07	5	337
..	..	..	..	..	..	..	..	338
..	..	..	..	..	..	..	..	339
..	..	..	..	..	..	..	..	340
..	..	..	..	..	..	..	..	341
..	..	..	..	..	..	..	..	342
..	..	..	..	..	0.22	6.72	1	343
..	..	..	..	0.27	0.16	2.15	5	344
..	..	..	..	0.98	..	..	..	345
..	..	..	..	0.23	..	..	..	346
..	..	..	..	0.56	..	..	..	347
..	..	..	..	..	..	..	..	348
..	..	..	..	1.42	..	..	..	349

Serial No.	Name	Place of origin	Total ash	Ash sol. in HCl	Organic constituents				
					Crude protein	Carbohydrates		Ether extract	
						Fibre	Nitrogen-free extract		
350	Oats	Punjab	4.79	1.83	10.07	12.71	65.88	6.55	
351	Rice	Bangalore	1.28	0.96	8.33	0.38	89.13	0.88	
352	Sarson (<i>Brassica campestris</i>)	Lyallpur	6.02	..	21.58	6.25	22.50	43.65	
353	Senji pods	Punjab	8.54	8.09	25.30	14.85	49.37	1.94	
354	Sova been seed	Lyallpur	6.11	..	41.62	6.04	28.82	17.41	
355	Wheat	Karnal	1.97	1.89	9.65	2.41	24.70	1.27	
356	Ditto	Lyallpur	1.90	..	10.50	1.89	83.86	1.85	
<i>Oilcakes and meals</i>									
357	Cocoanut cakes (country mill pressed)	Cochin	8.37	6.14	23.44	12.91	42.28	13.00	
358	Ditto (expeller)	"	8.34	6.48	25.34	13.20	44.92	8.20	
359	Cotton seed cake	Punjab	6.56	..	22.84	24.11	37.40	9.15	
360	Ditto meal	Bangalore	7.96	6.94	37.22	7.63	34.31	12.88	
361	Groundnut cake	"	5.70	4.76	51.75	7.39	26.94	8.22	
362	Linseed cake	Bengal	10.20	6.96	30.51	9.48	43.24	6.57	
363	Ditto meal	Karnal	6.78	5.57	29.90	9.77	49.43	4.12	
364	Maize cake	Rampur	3.45	..	23.67	9.88	48.03	14.97	
365	Mohua cake	Karnal	9.93	5.11	17.90	5.62	59.22	17.23	
366	Rape cake	Pusa	9.33	7.43	36.37	7.70	33.19	13.41	
367	Safflower cake	Bombay	6.80	5.19	42.80	13.25	26.62	8.53	
368	Sarson cake	Punjab	9.99	..	36.00	10.05	32.76	11.11	
369	Til cake	Bangalore	11.02	6.85	46.30	4.92	27.85	9.91	
370	Toria cake	Lyallpur	7.54	..	33.79	11.20	34.08	12.49	
<i>By-products</i>									
371	Arhar husk	Pusa	5.67	4.76	7.04	44.10	42.79	..	
372	Brewery grain	Bangalore	4.15	2.19	19.18	13.53	59.32	..	
373	Gram dust	Pusa	5.55	4.61	17.48	27.01	47.45	..	
374	Ditto husk	Bangalore	5.99	4.05	5.73	48.40	38.95	..	
375	Groundnut shell	"	14.25	10.20	8.16	59.74	14	..	
376	Maize husk	Rampur	2.19	..	8.12	15.67	..	..
377	Molasses (<i>khandsari</i>)	Bangalore	6.08	..	0.92	..	..	..
378	Rice bran	Hosur, Madras	22.08	6.92	10.40	14.6	..	..
379	Ditto	Bengal	13.85	11.29	13.99	14	..	..
380	Wheat bran	Bangalore	5.59	4.64	15.41	..	..	..
381	Ditto	Pusa	9.90	7.32	11.36	..	..	..

APPENDICES

DIX I—concl'd.

No. of analyses	Mineral constituents						No. of analyses	Serial No.
	Ash sol. in HCl	CaO	P ₂ O ₅	MgO	Na ₂ O	K ₂ O		
5	..	(0.16) *	(0.93) *	..	..	..	..	350
4	..	0.22	0.48	0.18	..	0.32	1	351
1	..	0.69	1.62	..	..	..	1	352
1	8.09	1.87	0.80	0.41	..	2.78	1	353
1	..	0.57	1.77	..	..	..	1	354
1	1.89	0.32	0.94	0.11	0.03	0.47	1	355
1	..	0.20	0.77	..	..	..	1	356
1	357
1	..	(0.56) *	(1.69) *	..	..	..	..	358
1	359
8	..	(0.39) *	(2.96) *	..	..	..	..	360
8t	..	0.28	1.28	0.54	0.32	1.43	46	361
2	6.96	0.52	2.20	0.98	0.47	0.92	2	362
4	363
1	..	0.32	1.19	..	..	..	1	364
2	365
16	366
11	367
1	368
3	369
1	370
1	371
11	372
1	373
8	374
..	375
1	..	0.43	0.21	..	..	..	1	376
6	377
2	11.29	0.22	6.23	2.6	0.38	0.19	2	378
26	..	0.25	1.98	0.75	0.35	1.46	6	379
1	380
..	381

*(Foreign data)

APPENDIX II

Average digestibility coefficients of Indian feeding stuffs

serial No.	Name of feed	Place of origin	Organic matter	Crude protein	Ether extract	Fibre	Nitrogen-free extract	Total carbohydrates	Number of tests
<i>Green feeds</i>									
1	Bajra	Lyallpur	..	62	67	60	69	..	3
2	Ber leaves	Izatnagar	..	36	62	27	34	..	1
3	Berseem	Lyallpur	..	81	50	60	80	..	3
4	Dal grass	Assam	..	62	38	61	67	65	1
5	Dal grass hay	..	..	42	39	71	61	64	1
6	Elephant grass	Lyallpur	..	62	59	63	65	..	3
7	Gar	..	..	77	39	26	70	..	..
8	Guinea grass (young)	Bangalore	77	74	47	78	75	77	3
9	Guinea grass	..	59	58	43	61	52	..	3
10	Ditto	Lyallpur	..	59	42	58	60	..	3
11	Jowar (young)	Bangalore	62	47	42	66	60	63	3
12	Ditto (prime)	..	58	44	44	59	60	60	3
13	Ditto (ripe)	..	58	25	38	62	58	59	9
14	Ditto	Punjab	..	34	37	58	62	..	6
15	Lucerne	Bangalore	67	80	46	50	72	62	11
16	Maize	Lyallpur	..	61	65	70	76	..	3
17	Oats	..	..	72	50	76	79	..	4
18	Paker leaves	Izatnagar	..	56	62	32	58	..	1
19	Pipal leaves	..	..	59	36	22	52	..	1
20	Seni	Lyallpur	..	82	43	58	76	..	3
21	Sudan grass	..	..	28	32	58	51	..	3
22	Sunflower	..	..	72	44	20	79	..	2
23	Velvet beans	..	..	70	64	59	79	..	4
<i>Silage</i>									
24	Jowar	Bangalore	56	40	47	63	53	57	4
25	Maize	Lyallpur	..	43	53	69	72	..	4
26	Oats	..	..	52	48	77	61	..	8
27	Ragi straw	Bangalore	57	8	44	69	52	60	2
28	Speargrass	Hosur, Madras.	59	26	40	69	..	62	12
29	Wheat straw	Bangalore	57	25	24	65	52	58	2
<i>Hays</i>									
30	Ahmadnagar hay	Ahmadnagar	51	31	46	..	..	51	2
31	Ajjampur hay (young)	Mysore	67	49	29	79	61	70	2
32	Ditto (prime)	..	64	36	45	75	58	66	2
33	Ditto (ripe)	..	64	4	40	72	61	66	2
34	Ambala hay	Ambala	..	44	38	57	50	..	2
35	Anjan hay	Meerut	57	35	30	..	..	59	2
36	Aurangabad hay	Aurangabad	52	13	45	57	50	53	6
37	Ditto (young)	..	51	34	45	60	45	52	2
38	Ditto (prime)	..	50	12	42	57	46	51	2
39	Ditto (ripe)	..	47	..	57	53	43	48	2
40	Bangalore hay	Military Grass Farm, Bangalore.	54	2	39	63	50	55	9
41	Bellary hay	Bellary	54	11	43	60	52	56	6
42	Boda hay	Cuddapah	44	14	34	51	41	45	2
43	Bolarum hay	Bolarum	52	..	47	59	48	53	34
44	Ditto (young)	..	59	45	..	..	..	61	3
45	Ditto (prime)	..	59	32	..	..	..	61	3
46	Ditto (ripe)	..	52	..	3	..	..	54	3
47	Dalhousie hay	Dalhousie	..	11	30	64	49	..	3
48	Dub hay	Bangalore	63	73	51	63	54	61	3
49	Ditto	Lyallpur	..	54	27	54	46	..	3
50	Ferozepur hay	Ferozepur	..	58	37	58	50	..	3
51	Guinea grass hay (before flower)	Bangalore	56	54	33	64	49	56	3
52	Ditto (in flower)	..	53	44	28	60	47	54	3
53	Jhelum hay	Jhelum	..	34	35	64	61	..	3
54	Jowar hay (young)	Bangalore	57	41	31	67	50	58	6
55	Ditto (prime)	..	56	41	28	60	44	57	12
56	Ditto (ripe)	..	56	14	40	58	57	58	14
57	Jubbulpore hay (young)	Jubbulpore	58	23	29	64	57	60	3
58	Ditto (prime)	..	57	12	39	63	56	59	3
59	Ditto (ripe)	..	52	..	31	59	51	54	3
60	Jullundur hay	Jullundur	..	25	34	65	44	..	2
61	Jutogh hay	Jutogh	..	17	27	58	49	..	4
62	Kasauli hay	Kasauli	..	19	40	60	46	..	3
63	Kollukattai grass hay (young)	Hosur, Madras.	68	66	28	..	..	69	3
64	Ditto (prime)	..	63	55	41	..	..	64	3
65	Ditto (ripe)	..	59	47	23	..	..	60	3
66	Lahore hay	Lahore	..	36	26	64	52	..	2
67	Meerut Farm hay	Meerut	48	8	34	..	..	49	18
68	Ditto (young)	..	55	28	25	54	57	56	3
69	Ditto (prime)	..	52	14	31	54	55	54	3
70	Ditto (ripe)	..	51	10	30	51	54	52	3
71	Multan hay (Geneva)	Multan	..	..	21	60	48	..	3
72	Multan hay (Musel)	..	..	12	17	62	50	..	3

APPENDIX II—contd.

Serial No.	Name of feed	Place of origin	Organic matter	Crude protein	Ether extract	Fibre	Nitrogen-free extract	Total carbohydrates	Number of tests
<i>Hays—contd.</i>									
73	Murree hay	Murree	..	16	37	61	45	..	2
74	Natal grass hay	Mysore	57	43	29	63	54	59	2
75	Oat hay	Lahore	69	46	72	..	..	70	2
76	Ditto	Lyallpur	..	47	74	65	64	..	01
77	Rawalpindi hay	Rawalpindi	..	21	48	65	40	..	2
78	Rhodes grass hay	Bangalore	63	60	33	69	54	63	3
79	Ditto (young)	Hosur, Madras.	64	50	33	..	..	66	2
80	Ditto (prime)	"	65	55	39	..	..	67	2
81	Ditto (prime)	"	59	49	38	..	..	59	2
82	Ruhk hay (ripe)	Bolarum	53	14	48	..	..	55	4
83	Scented grass hay	Cuddappah	56	47	33	64	53	58	3
84	Seguri hay	Seguri	48	52	49	..	..	48	3
85	Sialkot hay	Sialkot	..	40	29	55	50	..	2
86	Spear grass hay (young)	Hosur, Madras.	58	42	42	63	50	59	18
87	Ditto (prime)	"	50	16	43	57	47	51	18
88	Ditto (ripe)	"	55	..	36	..	..	57	18
89	Star grass hay	Almora	..	44	57	..	..	52	2
90	Sugarcane leaves	Bangalore	49	..	26	56	47	51	3
91	Telegaon hay	Telegaon	39	2	40	..	..	40	4
92	Tornagallu hay	Tornagallu	52	2	43	57	50	53	6
93	Uridal grass hay	Assam	..	50	22	74	55	63	1
94	Usar grass hay	Etawah	..	42	41	..	..	43	1
<i>Legume hays</i>									
95	Berseem hay	Lyallpur	..	70	29	49	77	..	4
96	Cowpea hay	Mysore	62	68	..	51	62	57	4
97	Groundnut hay	"	61	69	..	39	64	54	5
98	Lucerne hay	Bangalore	63	77	30	51	68	60	6
<i>Straws</i>									
99	Gram bhoosa or straw	Lyallpur	..	40	..	40	47	..	3
100	Ragi straw	Bangalore	60	6	41	69	58	62	40
101	Rice straw	"	60	..	35	72	53	62	24
102	Ditto (Bengal)	Dacca	51	9	43	62	46	..	(graphic method)
103	Ditto	Kangra, Punjab.	49	..	47	61	42	51	3
104	Ditto	Pusa	58	..	56	72	43	61	18
105	Wheat straw	Lyallpur	..	..	36	61	53	..	3
<i>Concentrates: Grain and seed</i>									
106	Arhar (<i>Cajanus indicus</i>)	"	..	70	50	..	..	82	1
107	Bajra	"	..	47	55	..	..	61	1
108	Barley	"	..	72	91	..	..	76	1
109	Cotton seed	"	..	69	90	63	59	..	18
110	Gram	"	..	69	84	..	..	89	1
111	Guara	"	..	82	65	..	..	81	1
112	Jowar	"	..	48	65	..	..	89	1
113	Linseed	"	..	81	93	..	..	67	1
114	Maize	"	..	55	82	..	..	76	1
115	Matri (<i>Lens esculenta</i>)	"	..	79	79	..	..	85	1
116	Moth (<i>Phaseolus aconitifolius</i>)	"	..	78	75	..	..	87	1
117	Rawan (<i>Dolichos lablab</i>)	"	..	77	60	..	..	72	1
118	Sarson	"	..	95	69	..	..	81	1
119	Soya bean	"	..	90	77	..	..	58	1
120	Wheat	"	..	60	67	..	..	97	1
<i>Concentrates: Cakes and meals</i>									
121	Cotton seed cake	"	..	85	98	74	59	..	..
122	Groundnut cake	Bangalore	75	90	97	10	51	..	24
123	Linseed cake	Bengal	72	85	96	27	67	..	18
124	Maize cake	Rampur	..	84	70	..	..	60	1
125	Sarson cake	Lyallpur	..	85	93	44	74	..	..
126	Toria cake	"	..	84	91	38	61	..	..
<i>By-products</i>									
127	Gram husk	Bangalore	..	..	85	66	71	70	7
128	Maize husk	Rampur	..	55	53	76	79	79	1
129	Wheat bran	Bangalore	76	77	66	80	84	77	10

APPENDIX III

Nutritive value of Indian feeding stuffs

Serial No.	Name	Place of origin	Digestible nutrients per 100 lb. dry material				Nutritive ratio	Digestible nutrients per 100 lb. raw material**		
			Crude protein	Carbo-hydrates	Ether extract	Total		Digestible crude protein	Starch equivalent	Total digestible nutrients
			lb.	lb.	lb.	lb.	lb.	lb.	lb.	
<i>Green feeds</i>										
1	Bajra	Lyallpur	4.31	52.63	1.02	59.24	12.9	1.08	11.6	14.8
2	Berseem	Bihar	12.56	44.47	1.18	59.68	3.8	2.51	10.0	11.9
3	Ditto	Punjab	14.10	48.23	0.94	64.46	3.6	2.82	11.0	12.9
4	Dal grass	Assam	5.81	49.48	0.87	57.24		1.46	12.5	14.3
5	Elephant grass	Punjab	3.85	48.54	1.33	55.39	13.4	0.96	11.1	13.8
6	Guar	"	6.63	40.73	0.67	48.88	6.4	1.33	7.6	9.8
7	Guinea grass (young)	Bangalore	5.83	58.00	0.56	65.09	10.2	1.46	12.3	16.3
8	Ditto	"	4.44	45.23	0.72	51.28	10.6	1.11	8.6	12.8
9	Ditto	Bengal	4.60	44.93	0.74	51.20	10.1	1.15	9.5	12.8
10	Ditto	Lyallpur	3.10	47.72	0.65	52.28	15.9	0.78	9.0	13.1
11	Jowar (young)	Bangalore	4.20	50.07	0.91	56.27	12.4	0.84	8.6	11.3
12	Ditto (prime)	"	3.44	48.86	0.77	54.03	14.7	1.03	12.0	16.2
13	Ditto (ripe)	"	1.16	51.24	0.45	53.40	45.0	0.46	13.3	21.4
14	Ditto (9 to 10 1/2 weeks)	Bihar	1.26	52.68	0.52	55.12	42.6	0.25	8.7	11.0
15	Ditto (18 weeks)	"	0.88	53.16	0.56	55.29	62.1	0.26	12.4	16.6
16	Ditto (young)	Punjab	2.46	53.16	0.58	56.93	22.2	0.49	8.3	11.3
17	Ditto (prime)	"	1.67	52.73	0.62	55.80	32.5	0.50	12.0	16.7
18	Ditto (ripe)	"	0.97	52.02	0.60	54.34	54.9	0.39	14.5	21.7
19	Lucerne	Bangalore	16.19	41.59	1.06	60.17	2.7	3.24	9.7	12.0
20	Ditto	Bihar	18.17	37.34	1.31	58.47	2.2	3.63	10.1	11.7
21	Ditto	Punjab	15.92	40.00	0.83	57.79	2.6	3.18	9.3	11.6
22	Maize	Lyallpur	4.68	60.94	0.96	67.77	13.5	1.17	14.5	16.9
23	Ditto	Bihar	4.14	61.08	1.36	68.28	15.5	1.04	13.4	17.1
24	Oats	Punjab	10.50	53.79	1.07	66.70	5.4	2.63	13.1	16.7
25	Senji	"	12.61	50.01	0.63	64.04	4.1	2.52	10.3	12.8
26	Sudan grass	"	1.57	41.47	0.61	44.41	27.2	0.39	8.7	11.1
27	Sunflower	"	8.55	40.56	1.51	52.50	5.1	2.14	10.8	13.1
28	Velvet beans	"	10.66	49.64	1.37	63.38	4.9	2.13	11.3	12.7
<i>Tree Leaves</i>										
29	Ber	Izatnagar	3.09	25.13	1.08	30.65	9.0	1.24	6.3	12.3
30	Paker	"	5.38	37.01	2.10	47.12	7.7	2.15	13.0	18.8
31	Pipal	"	7.00	28.59	1.19	38.26	4.5	2.10	7.9	11.5
<i>Silage</i>										
32	Jowar	Bangalore	2.35	46.93	0.82	51.13	20.8	0.71	9.9	15.3
33	Maize	Punjab	3.41	56.70	0.59	61.43	17.0	1.02	15.5	18.4
34	Oats	"	4.06	55.67	1.09	62.18	14.3	1.22	11.9	18.7

35	Bagi straw	Bangalore	0.30	51.04	0.64	52.78	175.0	0.09	10.2	15.8	
36	Spear grass	Hosur, Madras	1.74	47.00	0.66	50.22	27.8	0.52	12.0	15.1	
37	Wheat straw	Bangalore	0.86	47.37	0.11	48.48	55.5	0.26	8.7	14.5	
	<i>Hays</i>										
38	Ahmadnagar hay	Ahmadnagar	1.20	39.83	0.45	42.05	34.1	1.08	18.4	37.8	
39	Ajjampur hay (young)	Mysore	3.85	54.88	0.30	59.41	14.5	3.47	33.9	53.5	
40	Ditto (prime)	"	1.96	54.11	0.43	57.03	28.0	1.76	30.6	51.3	
41	Ditto (ripe)	"	0.13	57.72	0.29	58.51	466.3	0.12	33.1	52.7	
42	Ambala hay	Ambala	2.45	43.55	0.54	47.22	18.3	2.21	23.5	42.5	
43	Anjan hay	Meerut	1.71	49.41	0.25	51.68	29.3	1.54	29.2	46.5	
44	Ditto	Punjab	2.01	47.54	0.43	50.51	24.2	1.81	26.1	45.5	
45	Aurangabad hay	Aurangabad	0.31	42.57	0.70	44.45	141.0	0.28	20.9	40.0	
46	Ditto (young)	"	1.43	41.80	0.52	44.40	30.0	1.29	20.9	40.0	
47	Ditto (prime)	"	0.30	42.22	0.61	43.89	146.5	0.27	19.6	39.2	
48	Ditto (ripe)	"	0.00	39.02	0.75	40.70	..	0.00	16.2	36.6	
49	Bangalore hay	Military Grass Farm, Bangalore.	0.05	47.55	0.49	48.71	1048.0	0.05	25.2	43.8	
50	Bellary hay	Bellary, Madras	0.27	43.49	0.56	45.01	162.8	0.24	21.1	30.5	
51	Bota hay	Cuddappah	0.52	39.89	0.46	41.44	79.1	0.47	15.9	37.3	
52	Bolarum hay	Bolarum	0.00	43.72	0.68	45.25	..	0.00	21.2	40.7	
53	Ditto (young)	"	2.27	49.05	0.32	52.04	22.0	2.04	27.8	46.8	
54	Ditto (prime)	"	1.21	50.03	0.43	52.21	42.2	1.09	27.5	47.0	
55	Ditto (ripe)	"	0.00	49.96	0.28	47.59	..	0.00	22.8	42.8	
56	Dal grass hay	Assam	3.15	50.03	0.56	54.44	..	2.65	31.2	46.7	
57	Dalhousie hay	Dalhousie	0.38	47.90	0.27	48.88	126.8	0.34	23.8	45.0	
58	Dub hay	Bangalore	8.09	44.21	0.98	54.52	5.7	7.28	34.8	49.1	
59	Ditto	Bareilly	4.94	38.41	0.26	43.94	7.9	4.45	26.5	39.5	
60	Ditto	Fyzabad	4.18	37.40	0.91	43.62	9.4	3.76	26.6	39.3	
61	Ditto	Lucknow	4.09	39.56	1.39	46.78	10.5	3.68	30.6	42.1	
62	Ditto	Karnal	3.68	38.98	0.17	43.04	10.7	3.31	25.9	38.7	
63	Ditto	Lyallpur	6.04	36.16	0.38	43.05	6.1	5.44	28.7	38.7	
64	Ferozepur hay	Ferozepur	5.23	41.95	0.38	48.04	8.2	4.71	25.7	43.2	
65	Guinea grass hay (before flower)	Bangalore	4.09	42.33	0.40	47.33	10.6	3.68	22.3	42.6	
66	Ditto (in flower)	"	2.09	43.89	0.32	46.69	21.3	1.88	19.9	42.0	
67	Jhelum hay	Jhelum	1.76	52.14	0.42	54.85	30.1	1.58	33.5	49.4	
68	Jwar hay (young)	Bangalore	2.81	47.65	0.42	51.39	17.3	2.53	24.8	46.3	
69	Ditto (prime)	"	1.78	48.66	0.32	51.17	27.7	1.60	25.6	46.1	
70	Ditto (ripe)	"	0.64	49.99	0.43	51.59	79.8	0.58	24.3	46.4	
71	Ditto	Punjab	2.25	46.79	0.46	50.07	21.3	2.03	25.1	45.1	
72	Jubbulpore hay (young)	Jubbulpore	0.94	50.26	0.42	52.13	54.2	0.85	26.6	46.9	
73	Ditto (prime)	"	0.40	51.41	0.44	52.79	130.6	0.36	26.8	47.5	
74	Ditto (ripe)	"	0.00	45.94	0.31	46.65	..	0.00	21.2	42.0	
75	Jullundur hay	Jullundur	0.88	46.54	0.33	48.17	53.9	0.79	22.2	43.4	
76	Jutogh hay	Jutogh	0.64	46.31	0.38	47.81	71.5	0.58	22.3	43.0	
77	Kasauli hay	Kasauli	0.81	44.06	0.70	46.44	56.5	0.73	22.3	41.8	
78	Kolukkattai grass hay (young)	Hosur, Madras	11.17	47.56	0.32	59.44	4.3	10.05	37.9	53.5	
79	Ditto (prime)	"	5.49	49.56	0.48	56.13	9.2	4.94	31.7	50.5	
80	Ditto (ripe)	"	2.97	49.46	0.16	52.78	16.8	2.67	29.9	47.5	
81	Lahore hay	Lahore	1.60	48.36	0.37	50.78	30.8	1.44	25.3	45.7	
82	Meerut Farm hay	Meerut	0.25	41.94	0.31	42.80	172.4	0.23	18.4	38.6	
83	Ditto (young)	"	0.99	44.99	0.40	46.88	46.3	0.89	25.0	42.2	
84	Ditto (prime)	"	0.39	44.12	0.48	45.59	114.7	0.35	24.2	41.0	
85	Ditto (ripe)	"	0.27	43.76	0.31	44.73	163.1	0.24	20.7	50.3	
86	Multan hay (Geneva)	Multan	0.00	45.28	0.26	45.87	..	0.00	20.7	41.3	

Serial No.	Name	Place of origin	Digestible nutrients per 100 lb. dry material				Nutritive ratio	Digestible nutrients per 100 lb. raw material**		
			Crude protein	Carbo-hydrates	Ether extract	Total		Digestible crude protein	Starch equivalent	Total digestible nutrients
			lb.	lb.	lb.	lb.		lb.	lb.	lb.
87	Multan hay (Musel)	Multan	0.38	46.53	0.16	47.27	123.9	0.34	23.5	42.5
88	Murree hay	Murree	0.57	46.13	0.70	48.28	81.9	0.51	20.3	43.5
89	Natal grass hay	Mysore	2.42	49.79	0.41	53.12	21.0	2.18	25.8	47.8
90	Oat hay	Lahore	2.40	60.02	0.74	64.09	25.7	2.16	42.2	57.7
91	Ditto	Lyallpur	2.62	54.61	1.26	60.06	22.0	2.36	34.7	54.1
92	Rawalpindi hay	Rawalpindi	0.86	44.07	0.77	46.66	53.4	0.77	21.7	42.0
93	Rhodes grass hay	Bangalore	7.38	49.95	0.80	55.13	6.5	6.64	34.7	49.6
94	Ditto (young)	Hosur, Madras	3.72	53.17	0.39	57.78	14.5	3.35	32.6	52.0
95	Ditto (prime)	"	5.13	52.20	0.49	58.43	10.4	4.62	33.3	52.6
96	Ditto (ripe)	"	3.11	48.91	0.45	53.02	16.1	2.80	26.9	47.7
97	Rukh hay	Bolarum	0.34	48.23	0.60	49.92	147.9	0.31	23.2	44.9
98	Ditto (ripe)	"	0.39	45.41	0.46	46.83	118.3	0.35	25.7	42.2
99	Ditto	Jubbulpore	0.33	47.39	0.43	48.70	144.9	0.30	28.6	43.8
100	Ditto	Kirkee, Poona	0.36	43.35	0.42	44.65	122.2	0.32	22.2	40.2
101	Scented grass hay	Cuddappah	3.03	47.99	1.07	53.43	16.6	2.73	28.9	48.1
102	Seguri hay	Seguri	3.02	39.62	0.49	43.74	13.5	2.72	19.0	39.4
103	Siakot hay	Siakot	1.94	43.94	0.28	46.52	23.0	1.75	21.5	41.9
104	Spear grass hay (in flower)	Bangalore	0.89	43.00	0.61	45.27	50.0	0.80	20.5	40.7
105	Ditto (in seed)	"	0.00	49.09	0.53	50.29	..	0.00	25.6	45.3
106	Ditto (young)	Hosur, Madras	2.93	48.76	0.57	52.97	17.1	2.64	29.3	47.7
107	Ditto (prime)	"	0.84	42.78	0.51	44.77	52.4	0.76	20.9	40.3
108	Ditto (ripe)	"	0.00	49.93	0.35	50.71	..	0.00	25.6	45.6
109	Ditto (early)	Bombay	2.47	47.12	0.47	50.65	19.5	2.22	27.8	45.6
110	Ditto (before flower)	"	1.86	49.38	0.42	52.19	27.1	1.67	26.6	47.0
111	Ditto (in flower)	"	0.59	44.17	0.41	45.67	76.9	0.53	20.0	41.1
112	Ditto (in seed)	"	0.00	49.61	0.33	50.34	..	0.00	25.3	45.3
113	Ditto	United Provinces	0.00	49.78	0.29	50.43	..	0.00	27.7	45.4
114	Ditto	Murree Hills	2.25	51.13	0.67	54.89	23.4	2.03	29.9	49.4
115	Sugarcane leaves	Bangalore	0.00	45.50	0.36	46.30	..	0.00	22.1	41.7
116	Telegaon hay	Telegaon	0.05	32.60	0.39	33.53	647.8	0.05	10.5	30.2
117	Tornagallu hay	Tornagallu	0.05	45.38	0.52	46.60	1028.0	0.05	22.2	41.9
118	Star grass hay	Almora	2.39	43.08	0.51	46.62	18.0	1.95	21.9	42.0
119	Uridal grass hay	Assam	4.09	46.81	0.39	51.78	..	3.49	28.1	44.0
120	Usar grass hay	Etawah	2.57	36.13	0.42	39.65	14.4	2.31	17.5	35.7
	<i>Legume hays</i>									
121	Berseem hay	Lyallpur	10.29	54.44	0.47	65.79	5.4	9.26	42.6	59.2
122	Cowpea hay	Mysore	10.33	40.13	0.00	50.46	3.9	9.30	26.6	45.4
123	Groundnut hay	"	14.93	34.00	0.00	48.93	2.3	13.44	30.4	44.0
124	Lucerne hay	Bangalore	16.37	38.59	0.42	55.90	2.4	14.73	33.9	50.3

125	Gram <i>bhoosa</i> or straw	Lyallpur	2.41	34.67	0.00	37.08	14.4	2.17	10.1	33.4
126	Ragi straw	Bangalore	0.23	54.55	0.38	55.63	243.5	0.21	31.2	50.1
127	Rice straw	"	0.00	48.86	0.30	49.54	..	0.00	27.1	44.6
128	Ditto (<i>Anan</i>)	Bengal	0.28	42.85	0.44	44.13	154.4	0.25	22.1	39.7
129	Ditto (<i>Aus</i>)	"	0.44	42.60	0.68	44.57	100.2	0.40	21.7	40.1
130	Ditto (<i>Boro</i>)	"	0.50	37.18	0.41	38.59	76.6	0.45	19.4	34.7
131	Ditto	Kanke Farm, Bihar	0.00	49.04	0.53	50.23	..	0.00	29.0	45.2
132	Ditto	Pusa, Bihar	0.00	48.33	0.48	49.41	..	0.00	26.9	44.5
133	Ditto	Kangra, Punjab	0.00	40.71	0.41	41.62	..	0.00	18.3	37.5
134	Ditto	Karnal, Punjab	0.00	37.11	0.72	38.74	..	0.00	18.6	34.9
135	Wheat straw	Pusa, Bihar	0.00	47.65	0.58	48.95	..	0.00	21.9	44.1
136	Ditto	Karnal, Punjab	0.00	47.31	0.41	48.24	..	0.00	23.2	43.4
137	Wheat <i>bhoosa</i>	"	0.00	46.75	0.36	47.56	..	0.00	22.41	42.8

Concentrates : Grains and seeds

138	Arhar	Lyallpur	14.35	57.56	0.95	74.05	4.2	12.92	64.4	75.6
139	Bayra	"	5.08	49.17	2.81	60.57	11.1	4.57	51.3	54.5
140	Barley*	Bangalore	7.39	75.69	1.30	86.01	10.6	6.65	75.5	77.4
141	Ditto	Mona, Punjab	8.97	77.55	0.83	86.38	8.6	8.07	73.6	77.7
142	Ditto	Lyallpur	7.29	63.90	2.65	77.15	9.6	6.56	68.0	69.4
143	Cotton seed	"	12.49	34.65	18.50	88.77	6.1	11.24	68.4	80.0
144	Gram*	Bangalore	14.33	63.27	1.96	82.01	4.7	12.90	69.2	73.8
145	Ditto	Lyallpur	13.54	64.88	4.07	87.17	5.5	12.19	76.1	78.5
146	Ditto*	Pusa	13.37	63.42	2.69	82.83	5.2	12.03	70.0	74.6
147	Ditto*	Punjab	11.96	64.80	3.14	83.83	6.0	10.76	70.8	74.5
148	Guar	Lyallpur	32.23	39.93	2.96	78.82	1.4	29.01	67.5	70.9
149	Jowar	"	7.30	70.76	1.63	81.73	10.2	6.57	69.3	73.6
150	Linseed	"	15.57	26.42	33.58	117.55	6.6	14.01	108.7	105.8
151	Maize*	Punjab	8.22	76.90	4.08	94.31	10.5	7.40	83.5	84.9
152	Ditto	Lyallpur	5.80	64.07	2.71	79.56	12.1	5.22	67.8	68.4
153	Matri	"	19.59	59.33	0.63	80.34	3.1	17.63	69.8	72.3
154	Moth	"	20.75	56.72	1.20	80.77	2.9	18.67	69.5	72.2
155	Oats	Punjab	7.85	57.81	5.70	78.48	9.0	7.07	64.0	70.6
156	Rawan	Lyallpur	20.33	46.66	0.54	68.24	2.3	18.30	59.0	61.4
157	Sarson seed	"	20.50	23.29	30.12	111.56	4.5	18.45	102.8	100.4
158	Soya bean seed	"	37.46	20.22	13.41	87.84	1.3	33.71	78.1	79.1
159	Wheat	"	6.30	83.18	1.24	92.27	13.6	5.67	78.5	83.0

Concentrates : Cakes and meals

160	Cocoanut cake* (country mill pressed)	Cochin	21.10	39.75	13.00	90.10	3.3	18.99	76.3	81.1
161	Ditto* (expeller)	"	22.81	42.12	8.20	83.81	2.7	20.53	69.1	75.4
162	Cotton seed cake	Lyallpur	19.42	39.96	8.97	79.56	3.1	17.48	59.3	71.6
163	Cotton seed meal	Bangalore	31.65	25.99	12.62	86.04	1.7	28.49	74.2	77.4
164	Groundnut cake	"	46.39	14.59	7.97	78.92	0.7	41.75	67.4	71.0
165	Linseed cake	Bengal	25.86	31.69	6.33	71.79	1.8	23.27	60.6	64.6
166	Maize cake	Rampur	19.88	34.90	11.83	81.39	3.1	18.10	67.4	74.1
167	Rape cake	Pusa	30.92	27.76	12.48	86.77	1.8	27.83	75.7	78.1
168	Sarson cake	Lyallpur	30.68	28.46	10.34	82.41	1.7	27.61	70.4	74.2
169	Til cake*	Bangalore	42.60	23.36	9.32	86.92	1.0	38.34	75.9	78.2
170	Toria cake	Lyallpur	28.51	24.97	11.35	79.01	1.8	25.66	66.7	71.1

Serial No.	Name	Place of origin	Digestible nutrients per 100 lb. dry material				Nutritive ratio	Digestible nutrients per 100 lb. raw material**		
			Crude protein	Carbo-hydrates	Ether extract	Total		Digestible crude protein	Starch equivalent	Total digestible nutrients
			lb.	lb.	lb.	lb.		lb.	lb.	lb.
<i>By-products</i>										
171	Gram husk	Bangalore	0.00	59.59	0.77	61.33	..	0.00	29.8	55.2
172	Maize husk	Rampur	4.54	68.94	0.81	75.30	15.6	4.09	59.1	67.9
173	Rice bran*	Hosur, Madras	6.76	35.15	10.00	64.40	8.5	6.08	52.0	58.0
174	Ditto*	Bengal	9.09	31.69	15.70	76.11	7.4	8.18	63.8	68.5
175	Wheat bran	Bangalore	11.80	58.00	2.28	74.93	5.4	10.62	62.3	67.4
176	Ditto	Pusa, Bihar	8.72	59.10	1.14	70.39	7.1	7.85	54.5	63.4

* In these cases foreign digestibility coefficients have been used for calculation.

** In calculating these values, the dry matter content has been assumed as follows:

	Per cent.
(a) All air dry materials, such as dry roughage, cake grain, etc.	90
(b) Succulent silage	30
(c) Green pasture, green maize, etc.	25
(d) <i>Jowar</i> (prime)	30
Ditto (ripe)	40
(e) Green legumes like berseem and lucerne	20

The nutritive values given in these columns are therefore approximate.