XXVI. *Supplement to former Paper, entitled—"Experimental Inquiry into the Composition of some of the Animals Fed and Slaughtered as Human Food."—Composition of the Ash of the entire Animals, and of certain separated parts.*

By Sir JOHN BENNET LAWES, *Bart., LL.D., F.R.S., F.C.S., and*
JOSEPH HENRY GILBERT, *Ph.D., LL.D., F.R.S., V.P.C.S.*

Received June 13,—Read June 21, 1883.

IN our former paper (Phil. Trans., Part II., 1859), we considered the analytical results which had then been obtained illustrating the actual and comparative composition of certain collective portions, and of the entire bodies, of animals of the farm, of different descriptions, and in different stages of growth and fatness. The results were given relating to ten animals, namely—a fat calf, a half-fat ox, a fat ox, a fat lamb, a store sheep, a half-fat old sheep, a fat sheep, a very fat sheep, a store pig, and a fat pig. The constituents which had been determined were—the total fat (by melting, expression, and ether-extraction), the total nitrogen, and the total mineral matter (ash). These were given in detail for certain separated parts, and in summary for all those parts collectively which are usually classed by the butcher as "carcass," for all those collectively classed as "offal," and for the entire animal (fasted live-weight). At that time the analyses of the ashes of the different animals, and their separated parts, were not completed. It is the object of this supplementary paper to record the results of forty complete ash-analyses, and to indicate their connexion with the main inquiry, and their importance as an element of it. To do this it will be desirable in the first place briefly to summarise the results and conclusions previously given.

From the data above referred to, the composition of some of the separated parts, and of the entire bodies, of the ten animals was given, so far as the total mineral matter, the total nitrogenous substance, the total fat, the total dry substance, and the water are concerned.

From these results the composition of the increase in weight, during the fattening period, of numerous animals was estimated. Also, in numerous cases in which the amount and the composition of the food consumed had been determined, the relation of the constituents stored up in the increase to those so consumed was calculated. Finally, the relation of the non-nitrogenous, or non-flesh forming, to the nitrogenous constituents in animal food and in bread was compared.

For the study of the subject from a more physiological point of view, the actual weights, and the percentage proportion in the entire body, of the individual organs, and of certain more arbitrarily separated parts, were determined. To this end in all 326 animals were experimented upon—namely, 2 calves, 2 heifers, and 14 oxen; 249 sheep, in five classes as to age, maturity, fatness, and mode of feeding; and 59 pigs, in seven classes, arranged chiefly according to the food consumed. The following is a very condensed summary of some of the results obtained in this part of the inquiry:—

TABLE I.—Percentage (in fasted live-weight) of certain collective parts.

	Oxen.	Sheep.	Pigs.
Stomachs and contents	11·61	7·43	1·28
Intestines and contents	2·74	3·53	6·24
Total	14·35	10·96	7·52
Heart and aorta, lungs and windpipe, liver, gall bladder and contents, pancreas and spleen	2·96	3·30	3·01
Blood	4·01	3·97	3·63
Total	6·97	7·27	6·64

These facts are of considerable interest viewed in connexion with the great difference in the character of the food of the different animals; the ruminants consuming such a large proportion of fibre, much of which is indigestible; and the well-fed pig but little indigestible matter, and a relatively large proportion of starch, the primary transformations of a large part of which are supposed to take place after leaving the stomach, and more or less throughout the intestinal canal. With the great variations which the figures show in the proportion of the receptacles and first laboratories of the food, with their contents, the further elaborating organs (if we may so say), with their fluids, appear to bear a much more uniform relation by weight to the entire body in the different descriptions of animal.

The results further showed that whilst during the fattening process the total "carcass" parts increased both in actual weight and in percentage in the entire body, the remaining parts, constituting the so-called "offal," also increased in actual weight, but in a much less degree than the carcass parts, and they actually diminished in percentage proportion to the total live-weight.

The following is a summary of the composition of the ten animals analysed:—

TABLE II.—Summary of the Composition of the Ten Animals Analysed.

	Mineral matter (Crude ash).	Dry nitrogenous substance.	Fat.	Total dry matter.	Water.	Contents of stomachs and intestines (in moist state).
PER CENT. IN CARCASS.						
Fat Calf	4·48	16·6	16·6	37·7	62·3	
Half-fat Ox	5·56	17·8	22·6	46·0	54·0	
Fat Ox	4·56	15·0	34·8	54·4	45·6	
Fat Lamb	3·63	10·9	36·9	51·4	48·6	
Store Sheep	4·36	14·5	23·8	42·7	57·3	
Half-fat old Sheep	4·13	14·9	31·3	50 3	49·7	
Fat Sheep	3·45	11·5	45·4	60·3	39·7	
Very fat Sheep	2·77	9·1	55·1	67·0	33·0	
Store Pig	2·57	14·0	28·1	44·7	55 3	
Fat Pig	1·40	10·5	49·5	61·4	38·6	
PER CENT. IN OFFAL (SUM OF PARTS EXCLUDING CONTENTS OF STOMACHS AND INTESTINES).						
Fat Calf	3·41	17·1	14·6	35·1	64·9	
Half-fat Ox	4·05	20·6	15·7	40·4	59·6	
Fat Ox	3·40	17·5	26·3	47·2	52·8	
Fat Lamb	2·45	18·9	20·1	41·5	58·5	
Store Sheep	2·19	18·0	16·1	36·3	63·7	
Half-fat old Sheep	2·72	17·7	18·5	38·9	61·1	
Fat Sheep	2 32	16·1	26·4	44·8	55·2	
Very fat Sheep	3·64	16·8	34·5	54·9	45·1	
Store Pig	3·07	14·0	15·0	32·1	67·9	
Fat Pig	2·97	14·8	22·8	40·6	59·4	
PER CENT. IN ENTIRE ANIMAL (FASTED LIVE-WEIGHT).						
Fat Calf	3·80	15·2	14·8	33·8	63·0	3·2
Half-fat Ox	4·66	16·6	19·1	40·3	51·5	8·2
Fat Ox	3·92	14·5	30·1	48·5	45·5	6·0
Fat Lamb	2·94	12·3	28·5	43·7	47·8	8·5
Store Sheep	3·16	14·8	18·7	36·7	57·3	6·0
Half-fat old Sheep	3·17	14·0	23·5	40·7	50·2	9·1
Fat Sheep	2·81	12·2	35·6	50·6	43·4	6·0
Very fat Sheep	2·90	10·9	45·8	59·6	35·2	5·2
Store Pig	2·67	13·7	23·3	39·7	55·1	5·2
Fat Pig	1·65	10·9	42·2	54·7	41·3	4·0

We must refer to our former paper for the detailed discussion of the composition of the animals, and their different parts, of which the foregoing Table gives a very condensed view. We need only call attention here to some of the most prominent indications.

It will be observed that there is a very much larger proportion of total fat than of total nitrogenous substance, in all the animals excepting the calf; that the percentage of nitrogenous substance diminishes, and that of the fat greatly increases, as the animals mature; also that the percentage of the total mineral matter decreases as the animals mature.

It is obvious that the increase during the fattening period will consist in still less proportion of nitrogenous substance, and in still greater proportion of fat. In fact the amount of fat stored up may be 8 or 10 times as much as that of the nitrogenous substance; and in the case of very fat pigs even more. The proportion of the total mineral matter, like that of the nitrogenous substance, is also much less in the fattening increase of the animal, than in the entire body.

Calculation further showed that the proportion of the nitrogenous substance of the food which was finally retained was very small. For example, sheep fattening on a good mixed ration will probably so retain in increase less than 5, or even less than 4 per cent. of the nitrogenous substance consumed in their food. If, however, the food is low in nitrogenous substance, more than 5 per cent. of that consumed may be stored up. In the case of pigs a larger proportion of the nitrogenous substance of the food is stored up, perhaps on the average $7\frac{1}{2}$ per cent. If the food be low in nitrogen, consisting chiefly of cereal grain for example, perhaps nearly 10 per cent., or if high in nitrogen perhaps not more than 5 per cent. of that consumed will be finally retained.

The amount of fat stored up was shown to be very much greater than the amount of ready formed fat in the food. Fat was, therefore, largely formed within the body; and the results led to the conclusion that it was largely produced from carbohydrates.

It has been stated that the amount of mineral matter stored up in fattening increase is very small. Further, the proportion of that consumed which is retained depends so much on the character of the food that no general estimate can be safely given. The amount is at any rate almost immaterial, and the proportion will probably be always considerably less than that of the consumed nitrogenous substance retained. In connexion with this point it may be mentioned that in the case of each of the oxen and sheep the amount of mineral matter to one of nitrogenous substance was almost exactly 0·3 in the collective carcass parts, but it was lower in the other parts, and in the entire bodies. The results which it is the special object of the present communication to put on record will throw more light on the mineral composition of the animals.

Before closing this summary statement, and entering upon the special subject-matter of the present paper, brief reference should be made to some conclusions of importance to which the consideration of the composition of the animals as so far given, led.

It was estimated that of the total nitrogenous substance, and of the total fat, of the bodies of the animals, the following proportions would be consumed as human food :—

TABLE III.

	Per cent. consumed as human food.	
	Of the total nitrogenous compounds of the body.	Of the total fat of the body.
Calves	60	95
Oxen	60	80
Lambs	50	95
Sheep	50	75
Pigs	78	90

Thus, not only do the bodies of the fattened animals contain much more fat than nitrogenous substance, but a much larger proportion of the total fat than of the total nitrogenous substance is estimated to be consumed as human food. It results that, taking the average of the fat and the very fat animals, nearly four times as much dry fat as dry nitrogenous substance would be so consumed.

Finally, a comparison of the composition of the estimated consumable portions of the fattened animals, with that of wheat-flour bread, led to the conclusion that, taking into consideration the much higher oxidable capacity of the fat of the animal food than of the starch of the bread, the animal food contributed a considerably higher proportion of non-nitrogenous substance, reckoned as starch, to one of nitrogenous substance, than bread. We said :—"It would appear to be unquestionable, therefore, that the influence of the introduction of our staple animal foods, to supplement our otherwise mainly farinaceous diet, is, on the large scale, to reduce, and not to increase, the relation of the assumed flesh-forming material, to the more peculiarly respiratory and fat forming capacity, so to speak, of the food consumed."

It was concluded that the admitted advantages of a mixed animal and vegetable diet were essentially connected with the amount, the condition, and the distribution of the fat in the animal portions of the food ; that concentration and digestibility were probably elements in the explanation of the facts ; that the liberal distribution of the ready-formed fat with the transforming nitrogenous matters throughout the body, will modify the character of the changes constantly going on ; and that the difference in the condition of the nitrogenous substance in the animal and vegetable foods, has also to be taken into account.

Quantity and Composition of the Mineral Matter (Ash) in certain separated parts, and in the entire bodies, of the ten animals analysed.

In our former paper the actual quantity of ash was given for the bones, and for certain soft parts separately, of the carcass ; also for each separate internal organ, and for other separated parts constituting the offal (Appendix-Tables I.–X., pp. 580–589); and the percentage of ash in each separated part is given in Appendix-Table XII., p. 591. At that time the ashes had not been analysed; but the work has now been long completed, and the results have only waited for leisure for adequate discussion. It is not proposed even now to treat the subject exhaustively, but to submit the results obtained with so much explanation and comment as will suffice to give a clear idea of their character, to indicate some of their most important bearings, and to direct the further study of them.

The ashes that have been analysed are, for each of the ten animals—1. Of a proportional mixture of all carcass parts; 2. Of a proportional mixture of all offal parts; 3. Of a proportional mixture of all parts, both carcass and offal, representing the ash of the entire animal.

As separated by the butcher, there is but little difference in the apportionment of the different parts to the carcass and offal respectively, in the case of oxen and sheep; but whilst with these animals the head and feet go with the offal, in the case of the pigs they are weighed with the carcass. Accordingly, the head and feet of the pigs were separately treated, and the ashes of these parts separately analysed. In the Tables, for the sake of comparison with the results for the other animals, those relating to the head and feet of the pigs are not included with the carcass; but they can, of course, be reckoned either with the carcass or with the offal as may be desired.

In the case of the oxen and sheep, the portions yielding carcass-ash are—the greater part of the skeleton, the flesh, the kidneys, and the fat membrane of the parts. In the case of the pigs the skin also is included with the carcass. The offal parts yielding ash are—the stomachs and intestines (without contents and washed), the heart, aorta, lungs, windpipe, blood, liver, pancreas, thymus gland, the glands about the throat, the spleen, the bladder, gall-bladder, bile, brains, tongue, head flesh, head bones, head skin and ears, pelt, hair or wool, leg bones, feet and hoofs, tail flesh, tail bones, diaphragm, &c.

Of the ashes from the carcass parts twelve complete analyses have been made; that is, one for the carcass of each of the ten animals, and two duplicates. The duplicates are of the fat ox, and of the fat sheep, carcass ashes.

Of the ashes from the offal parts, seventeen complete analyses have been made; one for the offal parts of each animal, one for the head and feet ash of each of the two pigs, and five duplicates.

Of the ashes representing the entire bodies of the animals, eleven analyses have been made; that is one for each animal, and one duplicate.

In all, therefore, forty complete ash analyses have been made; and there have frequently been duplicate determinations of individual constituents. The detailed results of the analyses are given in Appendix-Table I. (p. 885) for the ashes of the carcass parts; in Appendix-Table II. (p. 886) for the ashes of the offal parts; and in Appendix-Table III. (p. 887) for the entire animal ashes. In the upper division of each Table the actual analytical results are given; in the middle division the same calculated to exactly 100; and in the lower division the results are calculated to 100 excluding sand and charcoal—that is, showing the composition of what may be called the *pure ash*.

In E. WOLFF'S two volumes—'Aschen-Analysen'—he excludes carbonic acid, as well as sand and charcoal, in calculating the composition of what he terms "Reinasche." This exclusion could hardly be avoided in arranging for comparison the recorded results of various analysts, in many of which carbonic acid was not included; and from the point of view of the chemical statistics only, of crops and other products, it is of little consequence. As, however, in many cases, the amount of carbonic acid represents, more or less exactly according to circumstances, the quantity of base which has been in combination with organic acids, its amount, and the differences in its amount, in different descriptions of ash, are indications of considerable interest. Obviously, in the case of ashes of such heterogeneous mixtures as those now in question, the record is of less importance from this point of view; whilst in some of the animal matters carbonates doubtless exist as such. But, as in other cases it is important to include the carbonic acid among the constituents of the pure ash, it is included here also for the sake of uniformity of plan.

It is freely admitted that results relating to carbonic acid require very careful consideration, if misinterpretation is to be avoided. Not that the determination of the amount of it actually existing in an ash is a matter of difficulty in experienced hands; but, according to the character of the ash, and to the conditions of the incineration, more or less of the carbonates may have been converted into more fixed salts, or the carbonic acid may be expelled and the ash causticised.

It is in fact very difficult, if not impossible, with some descriptions of ash, such for example as contain much silica, or phosphates with less than three of fixed base, so to conduct the incineration as to retain what may be termed the normal amount of carbonic acid. Indeed, after an ash has been kept for some time, and has acquired water, and perhaps regained carbonic acid, it is in some cases extremely difficult finally to heat it before weighing out for analysis, so as to ensure, on the one hand the expulsion of all water, and on the other the retention of the normal amount of carbonic acid. These points have been very fully investigated in connexion with the analyses of about 700 ashes, of various products, of known history, prepared at Rothamsted.

In the ashes of the mixed animal matters the amount of carbonic acid is in all cases small; but the differences in the amounts obtained according to the methods of preparation for analysis well illustrate the difficulties involved. Thus, in five of the carcass ashes, and in eight of the entire animal ashes, carbonic acid was determined:—1, in the ash some time after preparation and without re-ignition (but calculated on re-ignited ash); 2, after re-ignition preparatory to weighing out for the determination of other constituents; 3, after treatment with ammonium carbonate and exposure to very low red heat. The average amount in the five carcass ashes was—determined in the not re-ignited ash 2·59, in the re-ignited ash 0·87, and in the ash treated with ammonium carbonate and very gently heated 1·52; the average amount in the eight entire animal ashes was—determined in the not re-ignited ash 2·20, in the re-ignited ash 0·87, and in the ash treated with ammonium carbonate 1·48. After much comparative study of the results, the determinations after treatment with ammonium carbonate have been adopted throughout the series of animal ash analyses. Judging, however, from the recorded amounts of carbonates in numerous analyses of bones, and also from the analytical results themselves, as will be seen further on, it seems very probable that even the amounts so determined are too low. On the other hand, it is obvious that they are higher than in the ash in the re-ignited condition as weighed out for the determination of other constituents, and the generally high totals which the actual analyses show, are largely due to this cause. In fact, if the determinations of carbonic acid in the re-ignited ash had been entered in the Tables, not only would the totals have ranged considerably lower, but those for the carcass and entire animal ashes would range lower than those for the offal ashes, which is as it should be considering that fluorine was not determined in the ashes.

Thirty-seven of the forty animal ash analyses recorded in this paper were made, chiefly in the Rothamsted Laboratory, by Mr. RICHTER, now of Charlottenburg, Berlin; the remaining three were made by Mr. R. WARINGTON. Partly in the Rothamsted Laboratory and partly at Charlottenburg, Mr. RICHTER has conducted nearly the whole of the several hundred ash analyses above referred to, as well as numerous investigations of method, with a view to testing the limits of accuracy of previous work, and to attain greater accuracy in future. Besides the points already alluded to, he has analysed mixtures of precipitates obtained in precisely the same way in series of analyses, to determine their degree of purity, and so on. It is not intended to go into these matters of detail of method on this occasion. Satisfactory evidence will, however, be afforded in the course of the discussion of the results as to the degree of accuracy and trustworthiness of the analyses; and a comparison of the duplicates given in the Appendix-Tables I., II., and III. will afford further evidence on the point.*

Before considering the composition of the ashes it will be well to show at one view the amount, and to some extent the distribution, of the total ash in the different animals. The following Table (IV.) shows the amount of total ash in 100 fasted live-weight of each of the animals, and the proportion of the whole yielded by the carcass parts and the offal parts respectively. The first three columns show the amounts of crude ash, and the second three the amounts of pure ash. As already stated, the contents of stomachs and intestines are not included in the parts analysed.

* It need only further be remarked in reference to the analyses as such, that the subsequent investigations of method referred to above, lead to the conclusion that the phosphoric acid determinations made by the magnesium process (nearly the whole) may perhaps be too high, to an extent not exceeding 0·35 per cent. The actual results obtained are, however, recorded in the Tables; nor would any of the conclusions drawn be affected were the supposed correction adopted.

TABLE IV.—Percentage of Crude Ash, and of Pure Ash, in the fasted Live-Weight.

	Crude ash.			Pure ash.		
	From carcass parts.	From offal parts.	From total parts.	From carcass parts.	From offal parts.	From total parts.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Fat Calf	2·782	1·018	3·800	2·772	1·006	3·779
Half-fat Ox	3·603	1·061	4·664	3·568	1·044	4·612
Fat Ox	3·019	0·901	3·920	2·997	0·882	3·879
Fat Lamb	2·173	0·763	2·936	2·162	0·719	2·881
Store Sheep	2·325	0·839	3·164	2·317	0·747	3·064
Half-fat Old Sheep	2·214	0·959	3·173	2·207	0·848	3·055
Fat Sheep	1·982	0·829	2·811	1·970	0·700	2·670
Very fat Sheep	1·748	1·155	2·903	1·744	1·123	2·867
Store Pig	1·708	0·961	2·669	1·699	0·954	2·652
Fat Pig	1·062	0·587	1·649	1·054	0·581	1·635

When referring to the amounts of crude ash as given in Table II., attention was called to the fact that the percentage of mineral matter, like that of the nitrogenous substance, decreases as the animals mature. This is more clearly seen in the figures in Table IV. relating to the pure ash. Thus, comparing the fat ox with the half-fat ox, there is not only a lower percentage of pure ash in the entire animal, but a lower proportion of the whole contributed both by the carcass parts and the offal parts. Comparing, again, the store sheep, the fat sheep, and the very fat sheep, there is a considerably lower percentage of mineral matter (pure ash) contributed from the carcass parts of the fat than of the store sheep, and less still from those of the very fat sheep. There is also less from the offal parts of the fat sheep than of the store sheep; but there is a considerable excess in the case of the offal parts of the very fat sheep; and, in consequence, some excess in the percentage in the entire animal. Lastly, comparing the store pig and the fat pig, the latter shows a considerably lower proportion of mineral matter from carcass parts, from offal parts, and from all parts.

Referring to the Appendix-Tables I., II., and III. (pp. 885-87), for any further details, the following Table, V., shows the percentage composition of the *pure ash* (that is, excluding sand and charcoal), of the classified parts and of the entire bodies of the ten animals analysed. The upper division of the Table gives the results for the ash of the carcass parts, the middle division for that of the offal parts, and the lower division for the ash of the entire bodies of the animals (excluding contents of stomachs and intestines). When duplicate analyses have been made the mean results only are here given. At the head of each division of the Table are given the percentages of crude ash and of pure ash, not as in Table IV. in each case calculated to the weight of the entire body, but to the weight of the collective parts to which the division refers.

It should be further explained that, for comparison with the results relating to the same parts of the other animals, the composition of the ash of the collective offal parts of the two pigs is calculated from the analyses of the ash of the parts exclusive of the head and feet, and of that of the head and feet, the details of which are given in Appendix-Table II. Again, it will be observed that the results relating to the entire animal ash of the very fat sheep are given in brackets, the figures not being those of the actual analysis, but calculated from the results of the analyses of the ash of the carcass parts and of the offal parts separately. The results of the actual analysis of the entire animal ash are given in the Appendix-Table III.; but although there is no reason to doubt the accuracy of the analysis, there can be no doubt that there has been some omission of parts in making the mixture for burning to ash. Some item rich in potash has obviously been omitted.

TABLE V.—Percentage of Crude Ash, and of Pure Ash (excluding Sand and Charcoal), and Percentage Composition of the Pure Ash.

	Fat Calf.	Half-fat Ox.	Fat Ox.	Fat Lamb.	Store Sheep.	Half fat old Sheep.	Fat Sheep.	Very fat Sheep.	Store Pig.	Fat Pig.
COLLECTIVE CARCASS PARTS.										
	Per cent.	Per cent.	Per cent	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Crude ash	4·48	5·56	4·56	3·63	4·36	4·13	3·45	2·77	2·57	1·40
Pure ash	4·46	5·51	4·53	3·61	4·34	4·12	3·43	2·76	2·56	1·39
Peroxide of iron	0·39	0·62	0·56	0·43	0·36	0·49	0·40	0·39	0·63	0·64
Lime	43·93	46·89	47·02	46·83	45·43	46·21	46·65	47·36	40·25	38·59
Magnesia	2·09	1·71	1·70	1·79	1·86	1·76	1·81	2·05	2·13	2·08
Potash	5·90	4·87	4·54	4·62	5·18	5·07	4·65	3·78	8·47	9·68
Soda	3·08	2·60	2·59	2·47	2·97	2·65	2·80	2·74	3·72	4·40
Phosphoric acid	41·54	40·00	40·40	40·37	40·36	40·62	40·84	41·00	40·02	40·19
Sulphuric acid	1·03	0·66	0·69	0·81	1·24	0·50	0·53	0·47	1·96	1·26
Carbonic acid	1·14	1·80	1·68	1·82	1·40	1·84	1·47	1·63	1·17	1·26
Chlorine	1·02	0·75	0·88	0·93	1·46	1·02	0·93	0·70	1·81	2·25
Silica	0·11	0·27	0·14	0·14	0·07	0·07	0·13	0·04	0·15	0·17
Total	100·23	100·17	100·20	100·21	100·33	100·23	100·21	100·16	100·41	100·52
Deduct O = Cl.	0·23	0·17	0·20	0·21	0·33	0·23	0·21	0·16	0·41	0·52
Total	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
COLLECTIVE OFFAL PARTS (EXCLUDING CONTENTS OF STOMACH AND INTESTINES).										
Crude ash	3·41	4·05	3·40	2·45	2·19	2·72	2·32	3·64	3·07	2·97
Pure ash	3·37	3·98	3·33	2·31	1·95	2·40	1·96	3·54	3·04	2·93
Peroxide of iron	1·10	1·32	1·78	2·41	3·68	3·73	4·87	2·09	0·90	1·31
Lime	41·39	44·51	41·16	35·91	36·42	37·35	35·22	36·97	41·77	41·07
Magnesia	1·68	1·42	1·28	1·67	1·77	1·57	1·81	1·69	1·79	1·59
Potash	4·46	3·10	4·80	9·28	7·25	7·37	7·89	8·23	5·60	5·99
Soda	6·53	5·56	6·41	6·91	6·99	5·58	6·03	7·29	4·81	4·86
Phosphoric acid	39·26	38·12	39·27	34·86	33·60	35·24	33·15	35·07	40·87	39·85
Sulphuric acid	1·19	1·23	1·59	3·42	2·87	3·07	3·36	1·82	1·23	1·50
Carbonic acid	1·14	1·76	0·90	0·39	0·92	0·99	1·07	1·81	0·67	1·40
Chlorine	3·80	3·30	3·07	4·74	5·31	3·38	3·72	4·76	2·58	2·99
Silica	0·31	0·41	0·43	1·48	2·40	2·38	3·72	1·34	0·34	0·28
Total	100·86	100·73	100·69	101·07	101·21	100·76	100·84	101·07	100·56	100·84
Deduct O = Cl.	0·86	0·73	0·69	1·07	1·21	0·76	0·84	1·07	0·56	0·84
Total	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
ENTIRE ANIMAL, FASTED LIVE-WEIGHT (BUT CONTENTS OF STOMACH AND INTESTINES EXCLUDED).*										
Crude ash	3·80	4·66	3·92	2·94	3·16	3·17	2·81	2·90	2·67	1·65
Pure ash	3·77	4·61	3·88	2·88	3·06	3·06	2·69	2·86	2·65	1·64
Peroxide of iron	0·53	0·97	0·41	0·84	1·24	1·35	1·00	(1·05)	0·91	0·76
Lime	43·95	45·26	46·62	44·57	43·12	44·39	44·61	(43·29)	40·58	38·49
Magnesia	2·20	2·03	1·53	1·82	1·82	1·72	1·79	(1·90)	2·01	2·04
Potash	5·40	4·41	4·46	5·74	5·64	5·27	5·53	(5·53)	7·39	8·57
Soda	3·82	3·08	3·04	3·58	3·90	3·35	3·56	(4·52)	4·16	4·36
Phosphoric acid	40·37	40·22	39·80	38·96	38·96	39·15	38·72	(38·68)	40·12	40·14
Sulphuric acid	1·08	0·86	0·79	1·18	1·78	1·06	1·01	(0·99)	2·33	2·15
Carbonic acid	1·34	1·97	2·13	1·53	1·09	1·83	1·67	(1·70)	0·60	1·20
Chlorine	1·55	1·24	1·47	1·86	2·31	1·61	1·61	(2·30)	2·22	2·78
Silica	0·12	0·24	0·08	0·33	0·67	0·63	0·86	(0·56)	0·18	0·14
Total	100·36	100·28	100·33	100·41	100·53	100·36	100·36	(100·52)	100·50	100·63
Deduct O = Cl.	0·36	0·28	0·33	0·41	0·53	0·36	0·36	(0·52)	0·50	0·63
Total	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00

* See p. 874, in reference to the entire animal ash of the very fat sheep.

The first point to notice in the analytical results is that the amount of iron peroxide is much higher in the ash of the offal parts than in that of the carcass parts, and that it is much higher in the offal ash of the sheep, than in that of either the oxen or the pigs. This is doubtless due to adventitious matter in the wool, which it was extremely difficult to clean. Indeed, alumina was found, clearly indicating the presence of ferruginous clay. Further, the amount of ferric oxide (as also that of silica) has a very obvious relation to the amount of "sand" found in the ashes. Notwithstanding, therefore, that the offal ash of the animals included that of the blood, the amount of ferric oxide found in the offal ashes must not be relied upon. Reference to Appendix-Table III. will show, however, that the ashes of the offal parts of the pigs, exclusive of the head and feet, do contain a very high percentage of ferric oxide; but if, as in the case of the oxen and sheep, the ash of the head and feet, with its very low percentage of ferric oxide, be included in the collective offal ash, the percentage of ferric oxide in the so-reckoned offal ash of the pig is much lower than in that of the sheep.

The records of the amounts of ferric oxide in the ashes of the carcass parts are only very little open to the same objection as in the case of the offal ashes; but it is obvious that the high percentage in the latter will unduly raise the amount in the entire animal ashes.

Referring to the more important constituents, it is at once seen that the animal ashes consist very largely of phosphate of lime. In the case of ashes of crude products, and particularly of mixed animal substances like those now under consideration, it would be out of place to attempt to arrange the constituents as salts. But it may nevertheless be useful to indicate the general relation of base to acid in the ashes. The lime and magnesia may be taken as essentially, though of course not exclusively, representing the bases of the bone-ash; whilst the potash and soda may in the same general, though not in an exclusive sense, be classified as the flesh and blood bases. Again, by far the larger proportion of the phosphoric acid will be due to the bones; whilst some of it as such, and probably some as the product of the oxidation of phosphorus in the burning, will be connected with the nitrogenous constituents in the non-bony portions of the body. The sulphuric acid, again, will in part be due to the oxidation of sulphur in the burning.

It may be stated, by way of illustration only, that if the phosphoric acid found be calculated as wholly tribasic, the lime of the ashes, excepting in the case of the pigs, would be nearly, and the lime and magnesia together, quite, or more than, sufficient to combine with the whole of the phosphoric acid. The potash and soda again, would be considerably more than sufficient to combine with the sulphuric acid, chlorine, and carbonic acid. It is thus indicated that, notwithstanding some of the phosphoric acid found may be due to the oxidation of phosphorus, and some of the sulphuric acid to the oxidation of sulphur, in the burning, there is upon the whole, according to the above mode of reckoning, an excess of base in the ashes of the ruminants, whilst figures obtained in the same way do not indicate a similar result in the case of the pigs. In the ashes of the pigs the phosphoric acid is considerably in excess of the quantity required to give tribasic phosphates with the whole of the lime and magnesia; the former of which is in relative deficiency. The result is that, upon the whole ash of the pigs, the figures show a deficiency rather than an excess of base, especially in the case of the fatter animal.

The consistency of the result with the ruminants, and again the consistency, but in the opposite direction, with the pigs, would lead to the conclusion that the indication is not simply due to the conditions of incineration, or to error of any kind. As bearing upon the point it is in the first place to be borne in mind that fluorine was not determined in the ashes; but certainly its amount would not be sufficient to turn the scale. Then there is the question whether organic acid salts, and carbonates existing as such, are adequately represented by the amount of carbonic acid determined in the ashes; and there is the further question whether sulphuric acid, and possibly phosphoric acid, may have been reduced, or sulphuric acid or chlorine expelled, in the burning.

According to direct experiments of WAY and OGSTON (Jour. Roy. Ag. Soc. Eng., vol. ix.), sulphuric acid is expelled by silica, but not by acid phosphates, in incineration. They conclude, however, that there is no loss of phosphoric acid; nor of chlorine in careful burning. Others have concluded that the expulsion of both sulphuric acid and chlorine is dependent both on the character of the ash, and on the conditions of the incineration; and in this Mr. RICHTER's experience leads him to concur. On the other hand it has to be considered whether the phosphoric acid and sulphuric acid found in the ashes are not in excess of the amounts existing as such in the substances burnt. On this point WAY and OGSTON and others have long ago concluded that sulphur is oxidated in incineration in very variable amounts according to circumstances; and quite recently GROUVEN has concluded that sulphur is converted into sulphuric acid in the ordinary methods of incineration in free air, and that under the same circumstances sulphates existing in the organic substance burnt are not reduced. GROUVEN concludes that about half of the sulphur may be converted into sulphuric acid in the burning. Again, according to Dr. VOELCKER's experiments (Rep. Brit. Ass., 1857, abstract, p. 60) at any rate a large proportion of the sulphur and phosphorus is not oxidated in the incineration; and FRESENIUS has obtained similar results so far as phosphorus is concerned. Lastly, with regard to the question whether sulphuric acid is reduced by charcoal in the burning, Mr. RICHTER has found in some parallel experiments with wheat grain ashes high sulphuric acid with high charcoal, and low sulphuric acid with low charcoal; but on the other hand he has not observed sulphuretted hydrogen on dissolving such ashes in hydrochloric acid.

It may be stated that the foregoing observations as to the relation of base and acid in the ashes apply generally to those of the collective carcass, of the collective offal, and of the entire bodies of the different descriptions of animal. But where, as in the case of the pigs, the ash of the head and feet, and that of the other offal parts, were analysed separately, the ash of the former, due largely to bone, showed some excess of base even calculating the whole of the phosphoric acid as tribasic, whilst the ash of the other offal parts (the soft parts, blood, &c.) showed, on the same mode of reckoning, about one and a half time as much acid as base; indeed of phosphoric acid alone there is, so reckoned, very much more than is equivalent to the total bases. Here then there is evidence that the ash of the soft parts contains phosphoric acid with less than three of fixed base, and probably some due to the oxidation of phosphorus. In further elucidation of the point in question it may be stated that, although the oxen and sheep show a higher percentage of total nitrogenous substance than the pigs, yet the amount of pure ash yielded from the non-bony parts is higher in proportion to that from the bones in the case of the pigs than in that of the ruminants. That is to say, there is with the pigs a higher proportion of the ash due to parts containing more potash and soda, and less lime and magnesia as base; and so far as phosphoric acid may have existed in the animal substance in combination with potash and soda as ortho-phosphates with water or ammonia also as base, the calculation of the whole of the phosphoric acid of the ash as tribasic (as in our illustration) would necessarily show a relative deficiency of base.

Examination of the Table will show, as might be expected, that the ash of the carcass parts contains a much higher percentage of potash than of soda. This is the case with both the ruminants and the pigs. But with the relative deficiency of lime in the carcass-ash of the pigs, there is a higher percentage of both potash and soda than in that of the ruminants. The distinction between the different animals on these points is chiefly due to the less proportion of ash from bone in the case of the pigs; but it may in part be due to the thick skin being included with the carcass in the case of the pigs, whilst in that of the other animals the skin is not so included.

The ash of the offal parts, including that of the blood, but comparatively little of that of bones, contains, in the case of the ruminants, generally a much higher percentage of both potash and soda than that of the carcass parts, but the proportion of soda to potash is much greater. In the offal ash of the pigs on the other hand (which does not include the ash of the skin) the percentage of both potash and soda is considerably lower than in that of the sheep, and the soda considerably lower than in that of the oxen also.

Reference to Appendix-Table II. (p. 886) will show that in the ash of the offal parts of the pigs excluding the skin and the head and feet, there is only between 3 and 4 per cent. of lime, but about 25 per cent. of potash, and nearly 15 per cent. of soda; whilst in the ash of the head and feet there is nearly 50 per cent. of lime, only between 1 and 2 per cent. of potash, and between 2 and 3 per cent. of soda. Again, as above referred to, there was a considerable excess of acid, especially phosphoric, in the ash of the non-bony portions.

Comparing the percentage composition of the ashes of the entire bodies of the different animals, the chief points of distinction are that, in the case of the pigs there is a lower percentage of lime, a higher percentage of potash and soda, and a higher percentage of sulphuric acid than in the corresponding ash of the ruminants. There is also generally a somewhat higher percentage of phosphoric acid in the entire animal ash of the pigs and the oxen than in that of the sheep.

With these few remarks suggested by a consideration of the percentage composition of the different ashes, we turn now to the bearing of the results as brought to view on applying them to calculate the amount, and as far as practicable the distribution, of the several constituents in a given live-weight of the different animals.

Accordingly, there is given in Table VI. (p. 880), not as before the quantity in 100 of ash, but the quantity in lbs. of each ash constituent, in the actual weight of the collective carcass parts, in the actual weight of the collective offal parts, and in the actual weight of all parts of each of the ten animals. The results are given in more detail in the upper portions of Appendix-Tables IV., V., and VI. (pp. 888-90); in IV. for the calf and oxen, in V. for the lamb and sheep, and in VI. for the pigs. There will be found, besides the amounts in the carcass parts, and in the offal parts respectively, those in the entire animal—first, by addition of the quantities in the carcass and offal parts; secondly, calculated from the direct analysis of the entire animal ashes; and thirdly, the mean of the two last quantities. For the composition of the entire animal, as given in Table VI. (p. 880), this *mean result* is adopted.

Again, in Table VII. (p. 881), is given the quantity of each constituent, not in the actual weight of the separated parts, and the entire bodies of the animals, but calculated in each case to 1,000 lbs. fasted live-weight; thus giving a comparative view of the composition of a given live-weight of the different animals, so far as the mineral or ash constituents are concerned. The particulars are given in detail in the lower divisions of the Appendix-Tables IV., V., and VI.

In the Tables VI. and VII. (pp. 880-81), as in former ones, the upper division gives the results for the carcass parts, the middle division those for the offal parts, and the lower division those for all parts collectively.

Before commenting on these Summary-Tables, we would call attention to the close accordance which the Appendix-Tables IV., V., and VI. show in the mineral composition of the entire bodies, calculated in the one case by the addition of the constituents determined separately in the carcass and in the offal parts, and in the other from the direct analysis of the ash from all parts. It is to be observed that this accordance is satisfactory confirmation not only of the correctness of the ash analyses, but of the preparation of the proportional mixtures of the different parts for burning, representing, respectively, the collective carcass parts, the collective offal parts, and the mixture of all parts. The result of the comparison will, we think, be found very satisfactory in every case excepting that of the entire animal ash of the very fat sheep, to the probable source of error in which reference has already been made (p. 874).

TABLE VI.—Quantities, in lbs., of Pure Ash, and of each Ash Constituent, in the Collective Carcass Parts, in the Collective Offal Parts, and in the Entire Body (fasted live-weight) of each Animal.

	Fat Calf.	Half-fat Ox.	Fat Ox.	Fat Lamb.	Store Sheep.	Half-fat Old Sheep.	Fat Sheep.	Very Fat Sheep.	Store Pig.	Fat Pig.
COLLECTIVE CARCASS PARTS.										
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Fresh weight	160·560	797·688	939·375	50·500	52·063	56·259	73·063	159·250	62·403	140·546
Pure ash	7·173	43·945	42·531	1·831	2·262	2·319	2·505	4·399	1·598	1·949
Peroxide of iron	0·027	0·275	0·240	0·008	0·008	0·011	0·010	0·017	0·010	0·012
Lime	3·151	20·606	19·998	0·857	1·027	1·071	1·169	2·083	0·645	0·752
Magnesia	0·150	0·754	0·724	0·033	0·042	0·041	0·045	0·090	0·034	0·041
Potash	0·423	2·139	1·932	0·085	0·117	0·117	0·117	0·166	0·135	0·189
Soda	0·221	1·141	1·105	0·045	0·067	0·061	0·070	0·120	0·060	0·085
Phosphoric acid	2·980	17·574	17·174	0·739	0·913	0·942	1·023	1·804	0·640	0·783
Sulphuric acid	0·074	0·293	0·296	0·015	0·027	0·012	0·013	0·021	0·031	0·025
Carbonic acid	0·082	0·790	0·715	0·033	0·032	0·043	0·037	0·072	0·019	0·025
Chlorine	0·073	0·328	0·373	0·017	0·033	0·024	0·023	0·031	0·029	0·044
Silica	0·008	0·120	0·060	0·003	0·002	0·002	0·003	0·002	0·002	0·003
Total	7·189	44·020	42·617	1·835	2·269	2·324	2·510	4·406	1·605	1·959
Deduct O = Cl.	0·016	0·075	0·086	0·004	0·007	0·005	0·005	0·007	0·007	0·010
Total	7·173	43·945	42·531	1·831	2·262	2·319	2·505	4·399	1·598	1·949
COLLECTIVE OFFAL PARTS (EXCLUDING CONTENTS OF STOMACHS AND INTESTINES).										
Fresh-weight	77·114	322·766	376·036	26·331	37·433	37·110	45·408	80·113	29·492	36·541
Pure ash	2·604	12·869	12·522	0·603	0·730	0·891	0·890	2·839	0·893	1·069
Peroxide of iron	0·029	0·170	0·223	0·015	0·027	0·033	0·043	0·059	0·008	0·014
Lime	1·077	5·728	5·153	0·217	0·266	0·333	0·313	1·050	0·373	0·439
Magnesia	0·044	0·183	0·161	0·010	0·013	0·014	0·016	0·048	0·016	0·017
Potash	0·116	0·399	0·601	0·056	0·053	0·066	0·070	0·234	0·050	0·064
Soda	0·170	0·715	0·802	0·042	0·051	0·050	0·054	0·207	0·043	0·052
Phosphoric acid	1·022	4·905	4·916	0·210	0·244	0·314	0·295	0·996	0·365	0·426
Sulphuric acid	0·031	0·160	0·200	0·021	0·021	0·028	0·030	0·051	0·011	0·016
Carbonic acid	0·030	0·226	0·113	0·002	0·007	0·009	0·010	0·051	0·006	0·015
Chlorine	0·099	0·425	0·385	0·028	0·039	0·030	0·033	0·135	0·023	0·032
Silica	0·008	0·052	0·054	0·009	0·018	0·021	0·033	0·038	0·003	0·003
Total	2·626	12·963	12·608	0·610	0·739	0·898	0·897	2·869	0·898	1·078
Deduct O = Cl.	0·022	0·094	0·086	0·007	0·009	0·007	0·007	0·030	0·005	0·009
Total	2·604	12·869	12·522	0·603	0·730	0·891	0·890	2·839	0·893	1·069
ENTIRE ANIMAL, FASTED LIVE-WEIGHT (BUT CONSTITUENTS OF CONTENTS OF STOMACHS AND INTESTINES EXCLUDED).*										
Fresh-weight	258·750	1232·000	1419·000	84·406	97·625	105·063	127·156	239·363	93·938	185·000
Pure ash	9·765	56·818	55·094	2·438	2·991	3·217	3·411	7·238	2·491	3·022
Peroxide of iron	0·054	0·499	0·346	0·022	0·036	0·044	0·044	(0·076)	0·021	0·025
Lime	4·257	26·026	25·428	1·082	1·291	1·418	1·505	(3·133)	1·014	1·177
Magnesia	0·204	1·043	0·886	0·044	0·055	0·055	0·061	(0·138)	0·050	0·060
Potash	0·533	2·521	2·496	0·141	0·170	0·177	0·189	(0·400)	0·185	0·256
Soda	0·382	1·802	1·790	0·087	0·117	0·110	0·123	(0·327)	0·104	0·135
Phosphoric acid	3·969	22·668	22·015	0·950	1·161	1·259	1·322	(2·800)	1·002	1·211
Sulphuric acid	0·105	0·471	0·465	0·032	0·051	0·037	0·039	(0·072)	0·050	0·053
Carbonic acid	0·122	1·068	1·004	0·036	0·036	0·055	0·052	(0·123)	0·020	0·039
Chlorine	0·162	0·730	0·782	0·045	0·070	0·053	0·056	(0·166)	0·053	0·080
Silica	0·014	0·155	0·080	0·010	0·020	0·021	0·033	(0·040)	0·005	0·005
Total	9·802	56·983	55·272	2·449	3·007	3·229	3·424	(7·275)	2·504	3·041
Deduct O = Cl.	0·037	0·165	0·178	0·011	0·016	0·012	0·013	(0·037)	0·013	0·019
Total	9·765	56·818	55·094	2·438	2·991	3·217	3·411	(7·238)	2·491	3·022

* See p. 874, in reference to the entire animal ash of the very fat sheep.

TABLE VII.—Quantities, in lbs., of Pure Ash, and of each Ash Constituent, in 1,000 lbs. Fasted Live-Weight in each case.

	Fat Calf.	Half-fat Ox.	Fat Ox.	Fat Lamb.	Store Sheep.	Half-fat old Sheep.	Fat Sheep.	Very Fat Sheep.	Store Pig.	Fat Pig.
COLLECTIVE CARCASS PARTS.										
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Fresh-weight	621	647	662	598	533	536	575	630	664	760
Pure ash	27·742	35·643	29·973	21·682	23·158	22·094	19·715	17·402	17·003	10·539
Peroxide of iron . . .	0·104	0·223	0·169	0·095	0·082	0·105	0·079	0·067	0·106	0·065
Lime	12·187	16·713	14·093	10·148	10·514	10·204	9·200	8·240	6·863	4·066
Magnesia	0·580	0·611	0·512	0·391	0·430	0·391	0·354	0·356	0·362	0·222
Potash	1·636	1·735	1·361	1·006	1·198	1·115	0·921	0·656	1·436	1·022
Soda	0·855	0·925	0·779	0·533	0·686	0·581	0·551	0·475	0·638	0·460
Phosphoric acid . . .	11·526	14·254	12·103	8·751	9·347	8·974	8·051	7·136	6·810	4·234
Sulphuric acid	0·286	0·238	0·208	0·178	0·287	0·114	0·102	0·083	0·330	0·135
Carbonic acid	0·317	0·641	0·504	0·391	0·328	0·410	0·291	0·285	0·202	0·135
Chlorine	0·282	0·266	0·263	0·201	0·338	0·229	0·181	0·123	0·309	0·238
Silica	0·031	0·098	0·042	0·035	0·020	0·019	0·024	0·008	0·021	0·016
Total . . .	27·804	35·704	30·034	21·729	23·230	22·142	19·754	17·429	17·077	10·593
Deduct O = Cl. . .	0·062	0·061	0·061	0·047	0·072	0·048	0·039	0·027	0·074	0·054
Total . . .	27·742	35·643	29·973	21·682	23·158	22·094	19·715	17·402	17·003	10·539
COLLECTIVE OFFAL PARTS (EXCLUDING CONTENTS OF STOMACHS AND INTESTINES).										
Fresh weight	298	262	265	312	383	353	357	317	314	197
Pure ash	10·063	10·447	8·824	7·145	7·469	8·476	6·998	11·234	9·488	5·756
Peroxide of iron . . .	0·112	0·138	0·157	0·177	0·276	0·314	0·338	0·234	0·086	0·076
Lime	4·162	4·650	3·631	2·571	2·722	3·168	2·461	4·155	3·960	2·363
Magnesia	0·170	0·148	0·114	0·118	0·133	0·133	0·126	0·190	0·170	0·091
Potash	0·448	0·324	0·424	0·664	0·542	0·628	0·550	0·926	0·532	0·344
Soda	0·657	0·580	0·565	0·498	0·522	0·476	0·425	0·819	0·457	0·280
Phosphoric acid. . . .	3·949	3·982	3·464	2·488	2·496	2·987	2·319	3·941	3·878	2·294
Sulphuric acid	0·120	0·130	0·141	0·249	0·215	0·266	0·236	0·202	0·117	0·087
Carbonic acid	0·116	0·184	0·080	0·024	0·072	0·086	0·079	0·202	0·064	0·080
Chlorine	0·383	0·345	0·271	0·332	0·399	0·285	0·259	0·534	0·245	0·172
Silica	0·031	0·042	0·038	0·107	0·184	0·200	0·259	0·150	0·032	0·017
Total . . .	10·148	10·523	8·885	7·228	7·561	8·543	7·052	11·353	9·541	5·804
Deduct O = Cl. . .	0·085	0·076	0·061	0·083	0·092	0·067	0·054	0·119	0·053	0·048
Total . . .	10·063	10·447	8·824	7·145	7·469	8·476	6·998	11·234	9·488	5·756
ENTIRE ANIMAL, FASTED LIVE WEIGHT (BUT CONSTITUENTS OF CONTENTS OF STOMACHS AND INTESTINES EXCLUDED).*										
Fresh-weight†	919	909	927	910	916	889	932	947	978	957
Pure ash	37·759	46·094	38·826	28·876	30·615	30·634	26·836	28·636	26·501	16·320
Peroxide of iron . . .	0·207	0·405	0·244	0·261	0·369	0·419	0·343	(0·301)	0·218	0·133
Lime	16·463	21·114	17·919	12·808	13·214	13·503	11·844	(12·395)	10·792	6·359
Magnesia	0·788	0·846	0·611	0·515	0·558	0·524	0·484	(0·546)	0·532	0·324
Potash	2·061	2·045	1·759	1·664	1·735	1·681	1·483	(1·582)	1·963	1·380
Soda	1·477	1·461	1·261	1·030	1·197	1·043	0·968	(1·294)	1·101	0·727
Phosphoric acid . . .	15·349	18·390	15·514	11·257	11·883	11·988	10·404	(11·077)	10·660	6·544
Sulphuric acid	0·406	0·382	0·328	0·386	0·522	0·352	0·307	(0·285)	0·532	0·288
Carbonic acid	0·470	0·867	0·708	0·427	0·369	0·529	0·409	(0·487)	0·213	0·208
Chlorine	0·625	0·592	0·552	0·533	0·722	0·505	0·437	(0·657)	0·570	0·432
Silica	0·054	0·126	0·056	0·119	0·205	0·204	0·255	(0·158)	0·053	0·028
Total . . .	37·900	46·228	38·952	29·000	30·774	30·748	26·934	(28·782)	26·634	16·423
Deduct O = Cl. . .	0·141	0·134	0·126	0·124	0·159	0·114	0·098	(0·146)	0·133	0·103
Total . . .	37·759	46·094	38·826	28·876	30·615	30·634	26·836	(28·636)	26·501	16·320

* See p. 874, in reference to the entire animal ash of the very fat sheep.

† Excluding evaporation, and contents of stomachs and intestines.

Not much stress should be laid on the exact quantities of the total ash, or of the individual mineral constituents, in the actual weights of the particular animals analysed, as shown in Table VI., as the actual weights and condition of animals coming under similar designations may vary considerably. Subject to the reservation here implied, it may be stated that a calf weighing 160 lbs. carried off less than 10 lbs. of total mineral matter; oxen weighing from 1,200 to 1,400 lbs. from 55 to 60 lbs.; a fat lamb about $2\frac{1}{2}$ lbs.; a store sheep under 3 lbs; a fat sheep from $3\frac{1}{4}$ to $3\frac{1}{2}$ lbs.; and a very fat sheep of nearly 240 lbs. live-weight, twice as much, or more than 7 lbs. The pigs again, contained less than sheep in proportion to their weight.

The calf carried off about 4 lbs. phosphoric acid=between 8 and 9 lbs. of phosphate of lime, little more than half-a-pound of potash, and immaterial amounts of other mineral constituents. The oxen carried off between 22 and 23 lbs. phosphoric acid=less than 50 lbs. of phosphate of lime, and about $2\frac{1}{2}$ lbs. of potash. The fat lamb carried off less than 1 lb. phosphoric acid=only about 2 lbs. of phosphate of lime, the store sheep and an ordinary fat sheep rather more=between $2\frac{1}{2}$ and 3 lbs. phosphate of lime, whilst the amount of potash in any of these animals would only be from $2\frac{1}{4}$ to 3 ounces. There would be proportionally greater variation in the actual weight of pigs sold off the farm than of sheep; and, for this reason, it is especially in their case, though it is so in that of the other animals also, better to consider the amount of mineral constituents lost to the farm in them in relation to a given live-weight rather than in the actual live-weight.

Table VII. which shows the amount of the different constituents in carcass, in offal, and in the entire body, *of* 1,000 *lbs. fasted live-weight,* of the different animals, is much more instructive.

In the first place 1,000 lbs. live-weight of calves or oxen is seen to carry off much more mineral matter than 1,000 lbs. live-weight of lambs or sheep, and 1,000 lbs. live-weight of pigs much less than sheep. In the particular cases in question, there were 46 lbs. of total mineral matter per 1,000 lbs. live-weight of the lean ox of less actual weight, and scarcely 39 lbs. in an equal weight of the fatter animal. The difference is in the right direction, but doubtless somewhat excessive; the fatter and heavier animal having actually less total mineral matter. Whilst 1,000 lbs. live-weight of oxen may thus contain 40 lbs. or even nearly 50 lbs. of mineral matter, the same weight of sheep will carry off only about 30 lbs. or less, and the same live-weight of pigs less still, and sometimes very much less. In all cases by far the larger proportion of the total mineral matter is in the collective carcass parts; and in the case of the pigs the proportion so distributed would be much greater than the Table shows, as there the head and feet are included with the offal, whilst in practice they are weighed with the carcass.

Referring to the amounts of the most important mineral constituents, whilst 1,000 lbs. live-weight of calves or oxen may carry off from 30 to 40 lbs. of phosphate of lime, the same weight of sheep would carry off only about 26 lbs. or less, and an equal live-weight of pigs considerably less still. With each description of animal the quantity of phosphate is less in a given live-weight of the fatter than of the leaner individuals; and this is especially so in the case of the pigs. In round numbers it may be said that 1,000 lbs. live-weight of oxen will carry off only 2 lbs., or less, of potash; 1,000 lbs. of sheep from $1\frac{3}{4}$ to $1\frac{1}{2}$ lb.; and 1,000 lbs. of pigs about the same; in each case the less, the fatter the animal. Of the potash, as of the phosphoric acid, by far the larger proportion of the whole is in the carcass parts. The constituent coming next in amount is soda; but with oxen the quantity in 1,000 lbs. live-weight does not reach $1\frac{1}{2}$ lb., with sheep it is only about 1 lb., and with pigs about the same, or less in the fat condition.

It may be said with regard to each description of animal that a given live-weight will contain less of every constituent the more it is matured or fattened.

So far as the practical bearings of the subject are concerned, it will be seen that the production and sale of the animals of the farm carries off comparatively immaterial amounts of mineral constituents, but an equal weight of oxen more than the same weight of sheep, and an equal weight of sheep more than the same weight of pigs. Again, four-fifths of the whole, or even much more, will be phosphate of lime, and the amount of potash very small. The loss to the land, or to the manure from purchased food, will, however, be considerably more with growing than with only fattening animals.

It is obvious, indeed, that the amount of mineral constituents lost to the farm by mere fattening increase will be almost insignificant. We have elsewhere estimated that the *increase* of oxen and sheep over the final four or six months of the fattening period, will not contain more than about $1\frac{1}{2}$ per cent. of mineral matter; that of pigs over the usually shorter period not more than 1 per cent., and in the case of very fat animals less still.

As conveying a somewhat more definite idea on the point, the amount of some of the most important mineral constituents that would be removed from an acre of fair average pasture and arable land, in animal increase and in some other products, may be compared. Such estimates can obviously be only approximate, and the quantities will be subject to considerable range of variation. Taking them as such, it may be stated in general terms that—of phosphoric acid an acre would lose more in milk, and four or five times as much in wheat or barley grain, or in hay, as in the fattening increase of oxen or sheep. Of lime the land would lose about twice as much in the animal increase as in milk, or as in wheat or barley grain, but, perhaps, not more than one-tenth as much as in hay. Lastly, of potash an acre would yield only a fraction of a pound in animal increase, six or eight times as much in milk, perhaps twenty or thirty times as much in wheat or barley grain, and more than one hundred times as much in hay.

The loss to the land in the animal increase is, in fact, chiefly in phosphate of lime, in amount varying from 5 to 10 lbs. per acre. In milk the loss is higher in phosphoric acid, less in lime, and more in potash. In wheat and barley grain the loss of phosphoric acid is several times as great, and it is chiefly as phosphate of potash; whilst in hay the loss in phosphoric acid is much the same as in wheat or barley grain, but that of both lime and potash is very much greater than in any of the other products.

It is freely granted that the results which have been brought forward are calculated to suggest rather than to answer questions of interest from the point of view of the physiologist. He will ask why the selection of parts submitted to analysis was not more detailed. The answer must be that the agricultural aspects of the subject were necessarily those which guided the course of the investigation; and that, although it would have been carried out in more detail had it been practicable to do so, the pressure of other equally essential work has enforced the limitation which has been adopted. The execution of 40 complete ash-analyses is indeed a matter of no small labour; and however much we may regret that we have not been able to give a wider scope to the inquiry, we must be satisfied that the results do at least form a substantial contribution to the chemical statistics of the feeding of the animals of the farm for human food.

APPENDIX-TABLE I.—Percentage Composition of the Ash of the Collective Carcass Parts of Ten Animals.

	Fat Calf.	Half-fat Ox.	Fat Ox.			Fat Lamb.	Store Sheep.	Half-fat old Sheep.	Fat Sheep.			Very fat Sheep.	Store Pig.	Fat Pig.
			Analysis 1.	Analysis 2.	Mean.				Analysis 1.	Analysis 2.	Mean.			
1. ACTUAL ANALYSES OF CRUDE ASH.														
Iron peroxide	0·39	0·62	0·56	0·56	0·56	0·43	0·36	0·49	0·40	0·40	0·40	0·39	0·63	0·64
Lime	44·25	46·57	46·95	47·00	46·98	46·88	45·60	46·08	46·54	46·73	46·63	47·67	40·42	38·89
Magnesia	2·11	1·70	1·75	1·65	1·70	1·79	1·87	1·76	1·79	1·81	1·80	2·06	2·13	2·10
Potash	5·94	4·84	4·54	4·53	4·53	4 63	5·20	5·05	4·64	4·67	4·66	3·80	8·49	9 76
Soda	3·10	2·58	2·55	2·64	2·60	2·47	2·98	2·64	2·72	2·87	2·80	2·76	3·73	4·43
Phosphoric acid	41 85	39·72	40·42	40·29	40·35	40·42	40·51	40·51	40·77	40·89	40·83	41·28	40·09	40·50
Sulphuric acid	1·04	0·66	0·65	0·73	0·69	0·81	1·25	0·50	0·52	0·54	0·53	0·47	1·96	1·27
Carbonic acid	1·15	1·79	1·68	1·68	1·68	1·82	1·40	1·83	1·47	(1·47)	1·47	1·64	1·17	1·27
Chlorine	1·03	0·74	0·86	0·89	0·88	0·93	1·47	1·02	0·93	0·93	0·93	0·71	1·81	2·27
Silica	0·11	0·27	0·14	0·14	0·14	0·14	0·07	0·07	0·12	0·14	0·13	0·04	0·15	0·17
Sand	0·35	0·98	0·69	0·74	0·71	0·49	0·36	0·30	0·61	0·61	0·61	0·26	0·41	0·76
Charcoal	Trace	Trace	Trace	Trace	Trace	None	Trace	None	Trace	Trace	Trace	Trace	Trace	Trace
Total	101·32	100·47	100·79	100·85	100·82	100·81	101·07	100·25	100·51	101·06	100·79	101·08	100·99	102·06
Deduct O=Cl	0·23	0·17	0·19	0·20	0·20	0·21	0·33	0·23	0·21	0·21	0·21	0·16	0·41	0·52
Total	101·09	100·30	100·60	100·65	100·62	100·60	100·74	100·02	100·30	100·85	100·58	100·92	100·58	101·54
2. COMPOSITION OF CRUDE ASH, CALCULATED TO EXACTLY 100.														
Iron peroxide	0·38	0·62	0·56	0·56	0·56	0·43	0·36	0·49	0·40	0·40	0·40	0·39	0·62	0·63
Lime	43·77	46·43	46·67	46·69	46·68	46·60	45·26	46·07	46·40	46·34	46·37	47·23	40·19	38·30
Magnesia	2·09	1·70	1·74	1·64	1·69	1·78	1·86	1·76	1·78	1·79	1·79	2·04	2·12	2·07
Potash	5·88	4·82	4·51	4·50	4·51	4·60	5·16	5·05	4·63	4·63	4·63	3·77	8·44	9·61
Soda	3·07	2·57	2·54	2·62	2·58	2·45	2·96	2·64	2·71	2·85	2·78	2·73	3·71	4·36
Phosphoric acid	41·40	39·60	40·16	40·03	40·09	40·18	40·21	40·50	40·65	40·54	40·59	40·90	39·86	39·89
Sulphuric acid	1·03	0·66	0·65	0·73	0·69	0·81	1·24	0·50	0·52	0·54	0·53	0·47	1·95	1·25
Carbonic acid	1·14	1·78	1·67	1·67	1·67	1·81	1·39	1·83	1·46	1·46	1·46	1·63	1·16	1·25
Chlorine	1·02	0·74	0·86	0·88	0·87	0·92	1·46	1·02	0·93	0·92	0·93	0·70	1·80	2·24
Silica	0·11	0·27	0·14	0·14	0·14	0·14	0·07	0·07	0·12	0·14	0·13	0·04	0·15	0·17
Sand	0·34	0·98	0·69	0·74	0·72	0·49	0·36	0·30	0·61	0·60	0·60	0·26	0·41	0·75
Charcoal	Trace	Trace	Trace	Trace	Trace	None	Trace	None	Trace	Trace	Trace	Trace	Trace	Trace
Total	100·23	100·17	100·19	100·20	100·20	100·21	100·33	100·23	100·21	100·21	100·21	100·16	100·41	100·52
Deduct O=Cl	0·23	0·17	0·19	0·20	0·20	0·21	0·33	0·23	0·21	0·21	0·21	0·16	0·41	0·52
Total	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
3. COMPOSITION OF PURE ASH (THAT IS EXCLUDING SAND AND CHARCOAL) CALCULATED TO 100.														
Iron peroxide	0·39	0·62	0·56	0·56	0·56	0·43	0·36	0·49	0·40	0·40	0·40	0·39	0·63	0·64
Lime	43·93	46·89	47·00	47·04	47·02	46·83	45·43	46·21	46·69	46·62	46·65	47·36	40·35	38·59
Magnesia	2·09	1·71	1·75	1·65	1·70	1·79	1·86	1·76	1·80	1·81	1·81	2·05	2·13	2·08
Potash	5·90	4·87	4 54	4·54	4·54	4·62	5·18	5·07	4·65	4·66	4·65	3·78	8·47	9·68
Soda	3·08	2·60	2·55	2·64	2·59	2·47	2·97	2·65	2·73	2·86	2·80	2·74	3·72	4·40
Phosphoric acid	41·54	40·00	40·46	40·33	40·40	40·37	40·36	40·62	40·90	40·79	40·84	41·00	40·02	40·19
Sulphuric acid	1·03	0·66	0·65	0·73	0·69	0·81	1·24	0·50	0·52	0·54	0·53	0·47	1·96	1·26
Carbonic acid	1·14	1·80	1·68	1·68	1·68	1·82	1·40	1·84	1·47	1·46	1·47	1·63	1·17	1·26
Chlorine	1·02	0·75	0·86	0·89	0·88	0·93	1 46	1·02	0·93	0·93	0·93	0·70	1·81	2·25
Silica	0·11	0·27	0·14	0·14	0·14	0·14	0·07	0·07	0·12	0·14	0·13	0·04	0·15	0·17
Total	100·23	100·17	100·19	100·20	100·20	100·21	100·33	100·23	100·21	100·21	100·21	100·16	100·41	100·52
Deduct O=Cl	0·23	0·17	0·19	0·20	0·20	0·21	0·33	0·23	0·21	0·21	0·21	0·16	0 41	0·52
Total	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00

APPENDIX-TABLE II.—Percentage Composition of the Ash of the Collective (and some separated) Offal Parts (excluding Contents of Stomachs and Intestines) of Ten Animals.

	Fat Calf.			Half-fat Ox.				Fat Ox.	Fat Lamb.	Store Sheep.	Lean Sheep.	Half-fat old Sheep.	Very fat Sheep.			Store Pig (excluding head and feet).			Fat Pig (excluding head and feet).	Head and feet.	
	Analysis 1.	Analysis 2.	Mean.	Analysis 1.	Analysis 2.	Analysis 3.	Mean.						Analysis 1.	Analysis 2.	Mean.	Analysis 1.	Analysis 2.	Mean.		Store Pig.	Fat Pig.
1. Actual Analyses of Crude Ash.																					
Iron peroxide	1·16	1·06	1·11	1·12	1·49	1·29	1·30	1·73	2·29	3·29	3·33	4·16	2·09	2·01	2·05	4·25	4·65	4·45	5·70	0·20	0·28
Lime	41·57	41·71	41·64	44·52	43·37	44·05	43·98	40·09	34·15	32·56	33·31	30·08	36·21	36·21	36·21	3·50	3·39	3·44	3·65	49·90	49·83
Magnesia	1·71	1·66	1·68	1·57	1·62	1·03	1·41	1·25	1·59	1·58	1·40	1·55	1·67	1·64	1·66	1·64	2·52	2·08	1·32	1·77	1·65
Potash	4·45	4·53	4·49	3·00	3·11	3·08	3·06	4·68	8·83	6·48	6·57	6·74	8·05	8·08	8·06	23·17	23·53	23·35	24·04	1·66	1·59
Soda	6·61	6·53	6·57	5·37	5·41	5·70	5·49	6·24	6·57	6·25	4·98	5·15	7·14	7·14	7·14	14·25	14·50	14·38	13·58	2·67	2·72
Phosphoric acid	39·47	39·53	39·50	37·80	37·28	37·91	37·66	38·25	33·16	30·04	31·43	28·32	34·32	34·36	34·34	38·24	38·16	38·20	34·62	41·13	40·88
Sulphuric acid	1·20	1·20	1·20	1·28	1·22	1·16	1·22	1·55	3·25	2·57	2·83	2·87	1·77	1·78	1·78	2·53	2·34	2·44	2·70	0·98	1·12
Carbonic acid	1·27	1·02	1·15	1·74	(1·74)	(1·74)	1·74	(0·88)	(0·37)	0·82	0·88	0·91	1·72	1·82	1·77	(0·00)	(0·00)	(0·00)	0·26	0·76	1·59
Chlorine	3·81	3·85	3·83	3·39	3·36	3·04	3·26	2·99	4·51	4·75	3·02	3·18	4·67	4·66	4·66	9·80	7·87	8·83	9·88	1·25	1·33
Silica	0·30	0·31	0·31	0·40	0·33	0·46	0·40	0·42	1·41	2·15	2·12	3·18	1·36	1·25	1·31	1·21	1·02	1·12	1·10	0·14	0·16
Sand	1·22	1·11	1·16	1·49	1·93	1·43	1·62	2·09	5·81	10·99	11·71	15·72	2·75	2·80	2·77	3·62	3·78	3·70	3·81	0·29	0·46
Charcoal	Trace	Trace	Trace	Trace	Trace	Trace	Trace	None	Trace	Trace	Trace	Trace	Trace	Trace	Trace	0·54	0·27	0·40	1·78	Trace	Trace
Total	102·77	102·51	102·64	101·68	100·86	100·89	101·14	100·17	101·94	101·48	101·58	101·86	101·75	101·75	101·75	102·75	102·03	102·39	102·44	100·80	101·61
Deduct O=Cl	0·86	0·87	0·87	0·72	0·76	0·69	0·72	0·67	1·02	1·08	0·68	0·72	1·05	1·05	1·05	2·21	1·78	2·00	2·66	0·28	0·30
Total	101·91	101·64	101·77	100·96	100·10	100·20	100·42	99·50	100·92	100·40	100·90	101·14	100·70	100·70	100·70	100·54	100·25	100·39	99·78	100·52	101·31
2. Composition of Crude Ash, Calculated to exactly 100.																					
Iron peroxide	1·14	1·04	1·09	1·11	1·49	1·29	1·30	1·74	2·27	3·28	3·30	4·11	2·08	2·00	2·04	4·23	4·64	4·44	5·71	0·20	0·28
Lime	40·79	41·04	40·91	44·10	43·32	43·96	43·79	40·29	33·84	32·43	33·01	29·74	35·96	35·96	35·96	3·48	3·38	3·43	3·67	49·64	49·19
Magnesia	1·68	1·64	1·66	1·56	1·62	1·03	1·40	1·26	1·57	1·57	1·39	1·53	1·66	1·63	1·65	1·63	2·51	2·07	1·32	1·76	1·63
Potash	4·37	4·46	4·42	2·97	3·11	3·07	3·05	4·70	8·75	6·45	6·51	6·67	7·99	8·02	8·00	23·05	23·47	23·26	24·09	1·65	1·57
Soda	6·49	6·43	6·46	5·32	5·40	5·69	5·47	6·27	6·51	6·23	4·94	5·09	7·09	7·09	7·09	14·17	14·47	14·32	13·61	2·66	2·68
Phosphoric acid	38·72	38·89	38·80	37·44	37·24	37·83	37·50	38·44	32·86	29·92	31·15	28·00	34·08	34·12	34·10	38·04	38·07	38·05	34·69	40·97	40·35
Sulphuric acid	1·18	1·18	1·18	1·27	1·22	1·16	1·22	1·56	3·22	2·56	2·81	2·84	1·76	1·77	1·76	2·52	2·33	2·43	2·71	0·97	1·11
Carbonic acid	1·25	1·00	1·13	1·72	1·74	1·74	1·73	(0·88)	(0·37)	0·82	0·87	0·90	1·71	1·81	1·76	(0·00)	(0·00)	(0·00)	0·26	0·76	1·57
Chlorine	3·74	3·79	3·77	3·36	3·36	3·03	3·25	3·01	4·47	4·73	2·99	3·15	4·64	4·63	4·64	9·75	7·85	8·80	9·90	1·24	1·31
Silica	0·30	0·31	0·31	0·39	0·33	0·46	0·40	0·42	1·40	2·14	2·10	3·15	1·35	1·24	1·29	1·20	1·02	1·11	1·10	0·14	0·16
Sand	1·20	1·09	1·14	1·48	1·93	1·43	1·61	2·10	5·76	10·95	11·61	15·54	2·73	2·78	2·76	3·60	3·77	3·68	3·82	0·29	0·45
Charcoal	Trace	Trace	Trace	Trace	Trace	Trace	Trace	None	Trace	Trace	Trace	Trace	Trace	Trace	Trace	0·54	0·27	0·41	1·78	Trace	Trace
Total	100·86	100·87	100·87	100·72	100·76	100·69	100·72	100·67	101·02	101·08	100·68	100·72	101·05	101·05	101·05	102·21	101·78	102·00	102·66	100·28	100·30
Deduct O=Cl	0·86	0·87	0·87	0·72	0·76	0·69	0·72	0·67	1·02	1·08	0·68	0·72	1·05	1·05	1·05	2·21	1·78	2·00	2·66	0·28	0·30
Total	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
3. Composition of Pure Ash (that is, excluding Sand and Charcoal), Calculated to 100.																					
Iron peroxide	1·15	1·05	1·10	1·12	1·52	1·31	1·32	1·78	2·41	3·68	3·73	4·87	2·13	2·05	2·09	4·41	4·84	4·62	6·05	0·20	0·28
Lime	41·29	41·49	41·39	44·75	44·18	44·60	44·51	41·16	35·91	36·42	37·35	35·22	36·97	36·97	36·97	3·63	3·52	3·58	3·87	49·78	49·41
Magnesia	1·70	1·65	1·68	1·58	1·65	1·04	1·42	1·28	1·67	1·77	1·57	1·81	1·70	1·68	1·69	1·70	2·62	2·16	1·40	1·77	1·63
Potash	4·42	4·51	4·46	3·02	3·17	3·12	3·10	4·80	9·28	7·25	7·37	7·89	8·22	8·25	8·23	24·04	24·46	24·25	25·52	1·66	1·58
Soda	6·56	6·50	6·53	5·40	5·51	5·77	5·56	6·41	6·91	6·99	5·58	6·03	7·29	7·29	7·29	14·78	15·07	14·92	14·42	2·66	2·70
Phosphoric acid	39·20	39·32	39·26	38·00	37·97	38·38	38·12	39·27	34·86	33·60	35·24	33·15	35·04	35·10	35·07	39·67	39·67	39·67	36·75	41·08	40·53
Sulphuric acid	1·19	1·19	1·19	1·29	1·24	1·17	1·23	1·59	3·42	2·87	3·17	3·36	1·81	1·82	1·82	2·63	2·43	2·53	2·87	0·98	1·11
Carbonic acid	1·26	1·01	1·14	1·75	1·77	1·76	1·76	0·90	0·39	0·92	0·99	1·07	1·75	1·86	1·81	(0·00)	(0·00)	(0·00)	0·28	0·76	1·58
Chlorine	3·78	3·83	3·80	3·41	3·42	3·08	3·30	3·07	4·74	5·31	3·38	3·72	4·77	4·76	4·76	10·17	8·18	9·18	10·49	1·25	1·32
Silica	0·30	0·31	0·31	0·40	0·34	0·47	0·41	0·43	1·48	2·40	2·38	3·72	1·39	1·28	1·34	1·26	1·06	1·16	1·17	0·14	0·16
Total	100·85	100·86	100·86	100·72	100·77	100·70	100·73	100·69	101·07	101·21	100·76	100·84	101·07	101·07	101·07	102·29	101·85	102·07	102·82	100·28	100·30
Deduct O=Cl	0·85	0·86	0·86	0·72	0·77	0·70	0·73	0·69	1·07	1·21	0·76	0·84	1·07	1·07	1·07	2·29	1·85	2·07	2·82	0·28	0·30
Total	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00

Appendix-Table III.—Percentage Composition of the Ash of the Entire Bodies (excluding Contents of Stomachs and Intestines) of Ten Animals.

	Fat Calf.	Half-fat Ox.	Fat Ox.	Fat Lamb.	Store Sheep.	Half-fat old Sheep.	Fat Sheep. Analysis 1.	Fat Sheep. Analysis 2.	Fat Sheep. Mean.	Very fat Sheep.*	Store Pig.	Fat Pig.
1. Actual Analyses of Crude Ash.												
Iron peroxide	0·52	0·96	0·41	0·83	1·20	1·32	0·70	1·22	0·96	0·13	0·91	0·77
Lime	43·40	44·85	46·08	43·86	41·90	43·29	42·75	42·75	42·75	53·25	40·43	38·68
Magnesia	2·17	2·01	1·51	1·79	1·77	1·68	1·66	1·77	1·72	1·75	2·00	2·05
Potash	5·33	4·37	4·41	5·65	5·48	5·14	5·30	5·29	5·30	0·37	7·36	8·61
Soda	3·77	3·05	3·00	3·52	3·79	3·27	3·36	3·45	3·41	1·72	4·14	4·38
Phosphoric acid	39·86	39·86	39·33	38·34	37·86	38·18	37·21	37·09	37·11	40·88	39·97	40·34
Sulphuric acid	1·07	0·85	0·78	1·16	1·73	1·03	0·94	0·99	0·97	0·32	2·32	2·16
Carbonic acid	1·32	1·95	2·11	1·51	1·06	1·78	(1·29)	1·61	1·61	2·04	0·60	1·21
Chlorine	1·53	1·23	1·45	1·83	2·24	1·57	1·53	1·54	1·54	0·22	2·21	2·79
Silica	0·12	0·24	0·08	0·32	0·65	0·61	0·81	0·83	0·82	0·04	0·18	0·14
Sand	0·79	1·11	0·89	1·53	3·25	3·32	3·93	4·27	4·10	0·51	0·66	0·79
Charcoal	Trace	Trace	Trace	None	Trace	None	Trace	None	Trace	Trace	Trace	Trace
Total	99·88	100·48	100·05	100·34	100·93	101·19	99·48	100·81	100·29	101·23	100·78	101·92
Deduct O=Cl	0·35	0·28	0·33	0·41	0·51	0·35	0·34	0·35	0·35	0·05	0·50	0·63
Total	99·53	100·20	99·72	99·93	100·42	100·84	99·14	100·46	99·94	101·18	100·28	101·29
2. Composition of Crude Ash, calculated to exactly 100.												
Iron peroxide	0·52	0·96	0·41	0·83	1·19	1·31	0·71	1·21	0·96	0·13	0·91	0·76
Lime	43·60	44·76	46·21	43·89	41·73	42·93	43·12	42·55	42·78	52·63	40·32	38·19
Magnesia	2·18	2·00	1·52	1·79	1·76	1·66	1·67	1·76	1·72	1·73	1·99	2·02
Potash	5·36	4·36	4·42	5·66	5·46	5·10	5·35	5·27	5·31	0·37	7·34	8·50
Soda	3·79	3·04	3·01	3·52	3·77	3·24	3·39	3·44	3·41	1·70	4·13	4·32
Phosphoric acid	40·04	39·78	39·44	38·37	37·70	37·86	37·53	36·92	37·14	40·40	39·86	39·83
Sulphuric acid	1·07	0·85	0·78	1·16	1·72	1·02	0·95	0·99	0·97	0·32	2·31	2·13
Carbonic acid	1·33	1·95	2·12	1·51	1·06	1·77	(1·30)	1·60	1·60	2·01	0·60	1·20
Chlorine	1·54	1·23	1·45	1·83	2·23	1·56	1·54	1·53	1·54	0·22	2·20	2·76
Silica	0·12	0·24	0·08	0·32	0·65	0·61	0·82	0·83	0·82	0·04	0·18	0·14
Sand	0·80	1·11	0·89	1·53	3·24	3·29	3·96	4·25	4·10	0·50	0·66	0·78
Charcoal	Trace	Trace	Trace	None	Trace	None	Trace	None	Trace	Trace	Trace	Trace
Total	100·35	100·28	100·33	100·41	100·51	100·35	100·34	100·35	100·35	100·05	100·50	100·63
Deduct O=Cl	0·35	0·28	0·33	0·41	0·51	0·35	0·34	0·35	0·35	0·05	0·50	0·63
Total	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
3. Composition of Pure Ash (that is, excluding Sand and Charcoal), calculated to 100.												
Iron peroxide	0·53	0·97	0·41	0·84	1·24	1·35	0·74	1·27	1·00	0·13	0·91	0·76
Lime	43·95	45·26	46·62	44·57	43·12	44·39	44·90	44·44	44·61	52·89	40·58	38·49
Magnesia	2·20	2·03	1·53	1·82	1·82	1·72	1·74	1·84	1·79	1·74	2·01	2·04
Potash	5·40	4·41	4·46	5·74	5·64	5·27	5·57	5·50	5·53	0·37	7·39	8·57
Soda	3·82	3·08	3·04	3·58	3·90	3·35	3·53	3·59	3·56	1·71	4·16	4·36
Phosphoric acid	40·37	40·22	39·80	38·96	38·96	39·15	39·08	38·56	38·72	40·61	40·12	40·14
Sulphuric acid	1·08	0·86	0·79	1·18	1·78	1·06	0·99	1·03	1·01	0·32	2·33	2·15
Carbonic acid	1·34	1·97	2·13	1·53	1·09	1·83	(1·35)	1·67	1·67	2·02	0·60	1·20
Chlorine	1·55	1·24	1·47	1·86	2·31	1·61	1·61	1·60	1·61	0·22	2·22	2·78
Silica	0·12	0·24	0·08	0·33	0·67	0·63	0·85	0·86	0·86	0·04	0·18	0·14
Total	100·36	100·28	100·33	100·41	100·53	100·36	100·36	100·36	100·36	100·05	100·50	100·63
Deduct O=Cl	0·36	0·28	0·33	0·41	0·53	0·36	0·36	0·36	0·36	0·05	0·50	0·63
Total	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00

* There has doubtless been some omission of parts in making the mixture for burning to ash in this case, see p. 874.

APPENDIX-TABLE IV.—Mineral Constituents (Ash), in lbs., *per Animal*, and *per* 1,000 *lbs. Fasted Live-Weight*.
1. In Collective Carcass Parts. 2. In Collective Offal Parts. 3. In Entire Animal.
Entire Animal—first by addition of amounts in Carcass and Offal, second by direct analysis, third mean.
In "Offal Parts," and in "Entire Animal," in each case exclusive of contents of stomachs and intestines.

CALF AND OXEN.

	Fat Calf.					Half-fat Ox.					Fat Ox.				
	Carcass.	Offal.	Entire animal. By addition.	Entire animal. By direct analysis.	Entire animal. Mean.	Carcass.	Offal.	Entire animal. By addition.	Entire animal. By direct analysis.	Entire animal. Mean.	Carcass.	Offal.	Entire animal. By addition.	Entire animal. By direct analysis.	Entire animal. Mean.
1. "FRESH-WEIGHTS," AND CONSTITUENTS, PER ANIMAL. FRESH-WEIGHTS OF CARCASS AND OFFAL=SUM OF PARTS; ENTIRE ANIMAL=FASTED LIVE-WEIGHT.															
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Fresh-weight	160·6	77·1	258·8			797·7	322·8	1232·0			939·4	376·0	1419·0		
Pure ash	7·173	2·604	9·777	9·753	9·765	43·945	12·869	56·814	56·822	56·818	42·531	12·522	55·053	55·135	55·094
Iron peroxide	0·027	0·029	0·056	0·051	0·054	0·275	0·170	0·445	0·552	0·499	0·240	0·223	0·463	0·228	0·346
Lime	3·151	1·077	4·228	4·287	4·257	20·606	5·728	26·334	25·719	26·026	19·998	5·153	25·151	25·706	25·428
Magnesia	0·150	0·044	0·194	0·214	0·204	0·754	0·183	0·937	1·149	1·043	0·724	0·161	0·885	0·846	0·866
Potash	0·423	0·116	0·539	0·527	0·533	2·139	0·399	2·538	2·505	2·521	1·932	0·601	2·533	2·459	2·496
Soda	0·221	0·170	0·391	0·373	0·382	1·141	0·715	1·856	1·747	1·802	1·105	0·802	1·907	1·674	1·790
Phosphoric acid	2·980	1·022	4·002	3·937	3·969	17·574	4·905	22·479	22·858	22·668	17·174	4·916	22·090	21·941	22·015
Sulphuric acid	0·074	0·031	0·105	0·105	0·105	0·293	0·160	0·453	0·488	0·471	0·296	0·200	0·496	0·434	0·465
Carbonic acid	0·082	0·030	0·112	0·131	0·122	0·790	0·226	1·016	1·120	1·068	0·715	0·113	0·828	1·179	1·004
Chlorine	0·073	0·099	0·172	0·151	0·162	0·328	0·425	0·753	0·707	0·730	0·373	0·385	0·758	0·807	0·782
Silica	0·008	0·008	0·016	0·012	0·014	0·120	0·052	0·172	0·138	0·155	0·060	0·054	0·114	0·045	0·080
Total	7·189	2·626	9·815	9·788	9·802	44·020	12·963	56·983	56·983	56·983	42·617	12·608	55·225	55·319	55·272
Deduct O=Cl	0·016	0·022	0·038	0·035	0·037	0·075	0·094	0·169	0·161	0·165	0·086	0·086	0·172	0·184	0·178
Total	7·173	2·604	9·777	9·753	9·765	43·945	12·869	56·814	56·822	56·818	42·531	12·522	55·053	55·135	55·094
2. "FRESH-WEIGHTS," AND CONSTITUENTS, PER 1,000 LBS. FASTED LIVE-WEIGHT. "FRESH-WEIGHTS"—EXCLUDING EVAPORATION, AND CONTENTS OF STOMACHS AND INTESTINES.															
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Fresh-weight	621	298	919			647	262	909			662	265	927		
Pure ash	27·742	10·063	37·805	37·712	37·759	35·643	10·447	46·090	46·098	46·094	29·973	8·824	38·797	38·854	38·826
Iron peroxide	0·104	0·112	0·216	0·197	0·207	0·223	0·138	0·361	0·448	0·405	0·169	0·157	0·326	0·161	0·244
Lime	12·187	4·162	16·349	16·577	16·463	16·713	4·650	21·363	20·865	21·114	14·093	3·631	17·724	18·115	17·919
Magnesia	0·580	0·170	0·750	0·827	0·788	0·611	0·148	0·759	0·932	0·846	0·512	0·114	0·626	0·596	0·611
Potash	1·636	0·448	2·084	2·038	2·061	1·735	0·324	2·059	2·032	2·045	1·361	0·424	1·785	1·733	1·759
Soda	0·855	0·657	1·512	1·442	1·477	0·925	0·580	1·505	1·417	1·461	0·779	0·565	1·344	1·179	1·261
Phosphoric acid	11·526	3·949	15·475	15·223	15·349	14·254	3·982	18·236	18·544	18·390	12·103	3·464	15·567	15·462	15·514
Sulphuric acid	0·286	0·120	0·406	0·406	0·406	0·238	0·132	0·368	0·396	0·382	0·208	0·141	0·349	0·306	0·328
Carbonic acid	0·317	0·116	0·433	0·507	0·470	0·641	0·184	0·825	0·909	0·867	0·504	0·080	0·584	0·831	0·708
Chlorine	0·282	0·383	0·665	0·584	0·625	0·266	0·345	0·611	0·574	0·592	0·263	0·271	0·534	0·569	0·552
Silica	0·031	0·031	0·062	0·046	0·054	0·098	0·042	0·140	0·112	0·126	0·042	0·038	0·080	0·032	0·056
Total	27·804	10·148	37·952	37·847	37·900	35·704	10·523	46·227	46·229	46·228	30·034	8·885	38·919	38·984	38·952
Deduct O=Cl	0·062	0·085	0·147	0·135	0·141	0·061	0·076	0·137	0·131	0·134	0·061	0·061	0·122	0·130	0·126
Total	27·742	10·063	37·805	37·712	37·759	35·643	10·447	46·090	46·098	46·094	29·973	8·824	38·797	38·854	38·826

APPENDIX-TABLE V.—Mineral Constituents (Ash), in lbs., *per Animal*, and *per* 1,000 *lbs. Fasted Live-Weight.*
1. In Collective Carcass Parts. 2. In Collective Offal Parts. 3. In Entire Animal.
Entire Animal—first by addition of amounts in Carcass and Offal, second by direct analysis, third mean.
In "Offal Parts," and in "Entire Animal," in each case exclusive of contents of stomachs and intestines.

LAMB AND SHEEP.

	Fat Lamb.					Store Sheep.					Half-fat old Sheep.					Fat Sheep.					Very fat Sheep.				
	Carcass.	Offal.	Entire animal.			Carcass.	Offal.	Entire animal.			Carcass.	Offal.	Entire animal.			Carcass.	Offal.	Entire animal.			Carcass.	Offal.	Entire animal.		
			By addition.	By direct analysis.	Mean.			By addition.	By direct analysis.	Mean.			By addition.	By direct analysis.	Mean.			By addition.	By direct analysis.	Mean.			By addition.	By direct analysis.	Mean.
1. "FRESH-WEIGHTS," AND CONSTITUENTS, PER ANIMAL. WEIGHTS OF CARCASS AND OFFAL=SUMS OF PARTS; ENTIRE ANIMAL=FASTED LIVE-WEIGHT.																									
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Fresh-weights . .	50·5	26·3		84·4		52·1	37·4		97·6		56·3	37·1		105·1		73·1	45·4		127·2		159·3	80·1		239·4	
Pure ash	1·831	0·603	2·434	2·442	2·438	2·262	0·730	2·992	2·990	2·991	2·319	0·891	3·210	3·224	3·217	2·505	0·890	3·395	3·427	3·411	4·399	2·839	7·238	7·238	7·238
Iron peroxide . .	0·008	0·015	0·023	0·021	0·022	0·008	0·027	0·035	0·037	0·036	0·011	0·033	0·044	0·044	0·044	0·010	0·043	0·053	0·034	0·044	0·017	0·059	0·076	(0·076)	0·076
Lime	0·857	0·217	1·074	1·089	1·082	1·027	0·266	1·293	1·289	1·291	1·071	0·333	1·404	1·432	1·418	1·169	0·313	1·482	1·529	1·505	2·083	1·050	3·133	(3·133)	3·133
Magnesia. . . .	0·033	0·010	0·043	0·044	0·044	0·042	0·013	0·055	0·054	0·055	0·041	0·014	0·055	0·055	0·055	0·045	0·016	0·061	0·062	0·061	0·090	0·048	0·138	(0·138)	0·138
Potash	0·085	0·056	0·141	0·140	0·141	0·117	0·053	0·170	0·169	0·170	0·117	0·066	0·183	0·170	0·177	0·117	0·070	0·187	0·190	0·189	0·166	0·234	0·400	(0·400)	0·400
Soda	0·045	0·042	0·087	0·087	0·087	0·067	0·051	0·118	0·116	0·117	0·061	0·050	0·111	0·108	0·110	0·070	0·054	0·124	0·122	0·123	0·120	0·207	0·327	(0·327)	0·327
Phosphoric acid .	0·739	0·210	0·949	0·952	0·950	0·913	0·244	1·157	1·165	1·161	0·942	0·314	1·256	1·262	1·259	1·023	0·295	1·318	1·327	1·322	1·804	0·996	2·800	(2·800)	2·800
Sulphuric acid . .	0·015	0·021	0·036	0·029	0·032	0·028	0·021	0·049	0·053	0·051	0·012	0·028	0·040	0·034	0·037	0·013	0·030	0·043	0·035	0·039	0·021	0·051	0·072	(0·072)	0·072
Carbonic acid . .	0·033	0·002	0·035	0·037	0·036	0·032	0·007	0·039	0·033	0·036	0·043	0·009	0·052	0·059	0·055	0·037	0·010	0·047	0·057	0·052	0·072	0·051	0·123	(0·123)	0·123
Chlorine	0·017	0·028	0·045	0·045	0·045	0·033	0·039	0·072	0·069	0·070	0·024	0·030	0·054	0·052	0·053	0·023	0·033	0·056	0·055	0·056	0·031	0·135	0·166	(0·166)	0·166
Silica	0·003	0·009	0·012	0·008	0·010	0·002	0·018	0·020	0·020	0·020	0·002	0·021	0·023	0·020	0·021	0·003	0·033	0·036	0·029	0·033	0·002	0·038	0·040	(0·040)	0·040
Total. . .	1·835	0·610	2·445	2·452	2·449	2·269	0·739	3·008	3·005	3·007	2·324	0·898	3·222	3·236	3·229	2·510	0·897	3·407	3·440	3·424	4·406	2·869	7·275	(7·275)	7·275
Deduct O=Cl	·004	·007	·011	·010	0·011	·007	·009	·016	·015	0·016	·005	·007	·012	·012	0·012	·005	·007	·012	·013	0·013	·007	·030	·037	(0·037)	0·037
Total. . .	1·831	0·603	2·434	2·442	2·438	2·262	0·730	2·992	2·990	2·991	2·319	0·891	3·210	3·224	3·217	2·505	0·890	3·395	3·427	3·411	4·399	2·839	7·238	(7·238)	7·238
2. "FRESH-WEIGHTS," AND CONSTITUENTS, PER 1,000 LBS. FASTED LIVE-WEIGHT. "FRESH-WEIGHTS"—EXCLUDING EVAPORATION, AND CONTENTS OF STOMACHS AND INTESTINES.																									
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Fresh-weights . .	598	312		910		533	383		916		536	353		889		575	357		932		630	317		947	
Pure ash	21·682	7·145	28·827	28·924	28·876	23·158	7·469	30·627	30·603	30·615	22·094	8·476	30·570	30·697	30·634	19·715	6·998	26·713	26·960	26·836	17·402	11·234	28·636	28·636	28·636
Iron peroxide . .	0·095	0·177	0·272	0·249	0·261	0·082	0·276	0·358	0·379	0·369	0·105	0·314	0·419	0·419	0·419	0·079	0·338	0·417	0·268	0·343	0·067	0·234	0·301	(0·301)	0·301
Lime	10·148	2·571	12·719	12·897	12·808	10·514	2·722	13·236	13·193	13·214	10·204	3·168	13·372	13·634	13·503	9·200	2·461	11·661	12·028	11·844	8·240	4·155	12·395	(12·395)	12·395
Magnesia. . . .	0·391	0·118	0·509	0·521	0·515	0·430	0·133	0·563	0·553	0·558	0·391	0·133	0·524	0·524	0·524	0·354	0·126	0·480	0·488	0·484	0·356	0·190	0·546	(0·546)	0·546
Potash	1·006	0·664	1·670	1·658	1·664	1·198	0·542	1·740	1·730	1·735	1·115	0·628	1·743	1·619	1·681	0·921	0·550	1·471	1·495	1·483	0·656	0·926	1·582	(1·582)	1·582
Soda	0·533	0·498	1·031	1·030	1·030	0·686	0·522	1·208	1·187	1·197	0·581	0·476	1·057	1·028	1·043	0·551	0·425	0·976	0·960	0·968	0·475	0·819	1·294	(1·294)	1·294
Phosphoric acid .	8·751	2·488	11·239	11·276	11·257	9·347	2·496	11·843	11·924	11·883	8·974	2·987	11·961	12·016	11·988	8·051	2·319	10·370	10·439	10·404	7·136	3·941	11·077	(11·077)	11·077
Sulphuric acid . .	0·178	0·249	0·427	0·344	0·386	0·287	0·215	0·502	0·542	0·522	0·114	0·266	0·380	0·324	0·352	0·102	0·236	0·338	0·275	0·307	0·083	0·202	0·285	(0·285)	0·285
Carbonic acid . .	0·391	0·024	0·415	0·439	0·427	0·328	0·072	0·400	0·338	0·369	0·410	0·086	0·496	0·562	0·529	0·291	0·079	0·370	0·448	0·409	0·285	0·202	0·487	(0·487)	0·487
Chlorine	0·201	0·332	0·533	0·533	0·533	0·338	0·399	0·737	0·706	0·722	0·229	0·285	0·514	0·495	0·505	0·181	0·259	0·440	0·433	0·437	0·123	0·534	0·657	(0·657)	0·657
Silica	0·035	0·107	0·142	0·095	0·119	0·020	0·184	0·204	0·205	0·205	0·019	0·200	0·219	0·190	0·204	0·024	0·259	0·283	0·228	0·255	0·008	0·150	0·158	(0·158)	0·158
Total. . .	21·729	7·228	28·957	29·042	29·000	23·230	7·561	30·791	30·757	30·774	22·142	8·543	30·685	30·811	30·748	19·754	7·052	26·806	27·062	26·934	17·429	11·353	28·782	(28·782)	28·782
Deduct O=Cl	·047	·083	·130	·118	0·124	·072	·092	·164	·154	0·159	·048	·067	·115	·114	0·114	·039	·054	·093	·102	0·098	·027	·119	·146	(·146)	0·146
Total . . .	21·682	7·145	28·827	28·924	28·876	23·158	7·469	30·627	30·603	30·615	22·094	8·476	30·570	30·697	30·634	19·715	6·998	26·713	26·960	26·836	17·402	11·234	28·636	(28·636)	28·636

APPENDIX-TABLE VI.—Mineral Constituents (Ash), in lbs., *per Animal*, and *per* 1,000 *lbs. Fasted Live-Weight.*
1. In Collective Carcass Parts. 2. In Collective Offal Parts. 3. In Entire Animal.
Entire Animal—first by addition of amounts in Carcass and Offal, second by direct analysis, third mean.
In "Offal Parts" and in "Entire Animal," in each case exclusive of contents of stomachs and intestines.

PIGS.

	Store Pig.						Fat Pig.					
	Carcass.	Offal, excluding Head and Feet.	Head and Feet.	Entire Animal. By Addition.	Entire Animal. By direct Analysis.	Entire Animal. Mean.	Carcass.	Offal, excluding Head and Feet.	Head and Feet.	Entire Animal. By Addition.	Entire Animal. By direct Analysis.	Entire Animal. Mean.
1. "Fresh-Weights," and Constituents, per Animal. Weights of Carcass and Offal=Sum of Parts; Entire Animal=Fasted Live-Weight.												
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Fresh-weights	62·4	20·3	9·2		93·9		140·5	23·2	13·4		185·0	
Pure ash	1·598	0·156	0·737	2·491	2·491	2·491	1·949	0·198	0·871	3·018	3·025	3·022
Iron peroxide	0·010	0·007	0·001	0·018	0·023	0·021	0·012	0·012	0·002	0·026	0·023	0·025
Lime	0·645	0·006	0·367	1·018	1·011	1·014	0·752	0·008	0·431	1·191	1·164	1·177
Magnesia	0·034	0·003	0·013	0·050	0·050	0·050	0·041	0·003	0·014	0·058	0·062	0·060
Potash	0·135	0·038	0·012	0·185	0·184	0·185	0·189	0·050	0·014	0·253	0·259	0·256
Soda	0·060	0·023	0·020	0·103	0·104	0·104	0·085	0·028	0·024	0·137	0·132	0·135
Phosphoric acid	0·640	0·062	0·303	1·005	0·999	1·002	0·783	0·073	0·353	1·209	1·214	1·211
Sulphuric acid	0·031	0·004	0·007	0·042	0·058	0·050	0·025	0·006	0·010	0·041	0·065	0·053
Carbonic acid	0·019	0·000	0·006	0·025	0·015	0·020	0·025	0·001	0·014	0·040	0·037	0·039
Chlorine	0·029	0·014	0·009	0·052	0·055	0·053	0·044	0·021	0·011	0·076	0·084	0·080
Silica	0·002	0·002	0·001	0·005	0·005	0·005	0·003	0·002	0·001	0·006	0·004	0·005
Total	1·605	0·159	0·739	2·503	2·504	2·504	1·959	0·204	0·874	3·037	3·044	3·041
Deduct O=Cl.	0·007	0·003	0·002	0·012	0·013	0·013	0·010	0·006	0·003	0·019	0·019	0·019
Total	1·598	0·156	0·737	2·491	2·491	2·491	1·949	0·198	0·871	3·018	3·025	3·022
2. "Fresh-Weights," and Constituents, per 1,000 lbs. Fasted Live-Weight. "Fresh-Weights"—excluding Evaporation, and Contents of Stomachs and Intestines.												
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Fresh-weights	664	216	98		978		760	125	72		957	
Pure ash	17·003	1·663	7·825	26·491	26·512	26·501	10·539	1·068	4·688	16·295	16·346	16·320
Iron peroxide	0·106	0·075	0·011	0·192	0·245	0·218	0·065	0·065	0·011	0·141	0·124	0·133
Lime	6·863	0·064	3·896	10·823	10·761	10·792	4·066	0·043	2·320	6·429	6·290	6·359
Magnesia	0·362	0·032	0·138	0·532	0·532	0·532	0·222	0·016	0·075	0·313	0·335	0·324
Potash	1·436	0·405	0·127	1·968	1·958	1·963	1·022	0·269	0·075	1·366	1·400	1·380
Soda	0·638	0·245	0·212	1·095	1·107	1·101	0·460	0·151	0·129	0·740	0·713	0·727
Phosphoric acid	6·810	0·661	3·217	10·688	10·632	10·660	4·234	0·394	1·900	6·528	6·560	6·544
Sulphuric acid	0·330	0·043	0·074	0·447	0·617	0·532	0·135	0·033	0·054	0·222	0·351	0·288
Carbonic acid	0·202	0·000	0·064	0·266	0·160	0·213	0·135	0·005	0·075	0·215	0·200	0·208
Chlorine	0·309	0·149	0·096	0·554	0·585	0·570	0·238	0·113	0·059	0·410	0·454	0·432
Silica	0·021	0·021	0·011	0·053	0·053	0·053	0·016	0·011	0·006	0·033	0·022	0·028
Total	17·077	1·695	7·846	26·618	26·650	26·634	10·593	1·100	4·704	16·397	16·449	16·423
Deduct O=Cl.	0·074	0·032	0·021	0·127	0·138	0·133	0·054	0·032	0·016	0·102	0·103	0·103
Total	17·003	1·663	7·825	26·491	26·512	26·501	10·539	1·068	4·688	16·295	16·346	16·320