

character of that root, and thus facilitating rumination, promoting digestion and rendering it more valuable. In many parts of the country the property of using it in this way even was questioned, and it was never resorted to except in times of scarcity, when other and more nutritive food could not be obtained. Nor is this opinion at all surprising. We are in the habit of considering the moisture and more succulent varieties of food as the most nutritive, and with them the dry and woody straws contrast unfavourably; but they do so not so much on account of the absence of nutritive matters as on their less valuable condition, due to the large amount of woody fibre by which they are protected from the action of the gastric juice, and enabled to pass through the animal in an undigested state. Hence it is that straw, when used alone, must be described as comparatively an in-nutritious food, and was naturally and justly considered to be inferior to hay, which, in the last century and the earlier part of this, was the staple food of fattening cattle. At that time the amount of the hay crop was in fact, the measure of the number of cattle which could be fattened on any farm; but the turnip immediately increased this number, and as its cultivation could be extended more than the hay crop, and the increasing price of meat added to the profits, it was pushed to the extreme, and it then became necessary to use straw to mix with the watery roots. As the advantages of this course became obvious, both in the increased quantity of fat stock, which could be sold off the farm, and the abundance of manure it afforded for the other crops, every inducement was offered to persevere in it, and the consumption of purchased food commenced and rapidly advanced. As most of these foods are of foreign growth, it was, of course, profitable to import only those which contain abundance of nutriment within a small weight, and hence again straw became necessary for the purpose of adding to the bulk of these substances, and enabling the stomach to dispose of them in a more satisfactory manner than it would otherwise do; for a very concentrated food which does not sufficiently distend that organ may pass through the intestines to a great extent undigested.

Such is the history of the use of straw in fattening cattle, and with its extension many questions of interest have arisen. It is now admitted that its nutritive effect is much higher than was formerly supposed, but we are still without any definite information as to its value compared with other feeding substances, such as turnips and the like: and further, as to whether there is any and what, difference between the straws of the different grains and of the same grain grown under different circumstances. It is generally understood that oat straw is superior to either barley or wheat, and it is also believed that the soil and other circumstances have a very important influence upon their feeding

qualities, while it is also possible that there may be an appreciable difference in the straw of different varieties of the same grain. It is sufficiently obvious that a complete reply to all these questions would involve the analysis of many hundred specimens of straw, extending over a considerable period, so as to eliminate the effect of season, which in a single year is very apt to mislead. Still in the present imperfect state of our information a more limited inquiry will be of use; and it is hoped that the following investigation may prove an acceptable addition to our knowledge of this important subject.

In carrying out this inquiry it was of primary importance to devise some method of analysis suited to bring out the differences I wished to detect, and for this purpose the ordinary methods employed with oil-cakes, the cereals, &c., and which answer perfectly well for these concentrated substances, are of comparatively little use. They are founded upon the principle of determining the total amount of the different great classes or sections into which the nutritive elements of plants are divided. Thus, for example, in wheat we determine the amount of albuminous compounds, as measured by the nitrogen, of respiratory principles, and of oil, and in this case, when each group actually consists almost entirely of one substance, the information so obtained is amply sufficient. Thus, in wheat the albuminous matters consist almost entirely of gluten, and the respiratory of starch, and the whole grain is easily digestible. But it is quite otherwise with a straw, where our object is not only to discover what substances are there, but also what proportion of them is likely to be available to the animal and to be assimilated by it in the process of digestion. It then becomes necessary to separate from one another the assimilable and non-assimilable substances, and this touches upon one of those points in chemical analysis which are in an unsatisfactory and imperfect state, and which require and merit further study. I commenced, therefore, by directing my attention to these points, and bestowed upon them a large amount of time, and performed a number of experiments, the results of which it is unnecessary to detail here. The general conclusion to which I came was, that though it might be possible to devise processes by which the proximate principles might be separated in some substances, it would not be practicable in all. Moreover, it did not appear that the separation of each of these compounds would throw any clear light upon their relative digestibility, and that, in the present state of our knowledge, it would be better, as well as safer, to restrict ourselves to a more limited analysis, though still more complete than those usually made.

It is obvious that if a food contains a considerable quantity of any nutritive element, as albumen, for example, but from some peculiarity in the condition in which it is present only a por-