

1861. It will be found interesting and useful to our readers generally. Eps.]

In an address given at the Edinburgh show, in the year 1859, I took up the subject of the feeding of stock as a branch of farm management, and discussed the general principles on which its prosecution depends, referring more especially to the nature of the food and its use in such a manner and in such quantities as are necessary to secure a proper proportion of the great classes of nutritive compounds required to maintain the vital functions in a state of healthy action, and the particular conditions under which the constant wastes of the tissues may be reduced within the narrowest possible limits, and the quantity of food required to supply the place of the effete matters thus diminished to the greatest extent. These matters, in fact, include

the broad principles which must be kept in view in the feeding of all animals, and practice has arrived at conclusions in harmony with them, by studying, in the first instance, the natural instincts of the animals, and observing the kinds of food they prefer, and then by mixing the different substances in different proportions, and otherwise varying the mode in which they are supplied to the animal. It has thus come to be well known that certain foods and mixtures produce a better effect than others, some kinds fattening quickly and giving the animal those qualities which the butcher seeks, and others producing a much less favourable result. Looking at the subject in a practical point of view, it becomes, of course, most important to prosecute it into detail, and to ascertain the most economical method of arriving at the required result, and by a systematic series of trials it is possible to obtain an accurate knowledge of the kinds and quantities of food capable of replacing those in common use, and to make mixtures which fulfil the same end with greater economy. A great part of this knowledge has been attained by experience—that is, by a succession of trials extending over a very long period of time, and many of which have, in one sense, proved failures, inasmuch as they showed that particular mixtures were uneconomical, and a source of loss to those who used them, although in another sense, they were not failures, because they showed what ought to be avoided. If it were possible to go back over the whole range of trials by which our practical knowledge of the best proportions and kinds of food has been acquired, it would, no doubt, be found that, as in most instances, experience has been bought at a very high price. It is only after often-repeated observations that it can arrive at incontestible conclusions, and herein it is that science differs from experience. The results in both are obtained by observation, but science has systematised observation, and has coupled with it the explanation of the facts observed. It starts from the knowledge acquired by experience, seeks to discover the *rationale* of every fact, and

endeavours to generalize and classify them.—Thus, if it has discovered, for example, that a particular food known to give unfavourable results is deficient in some particular element, it then proceeds to try whether the addition of that substance will increase its nutritive effects; and if this proves to be the case, it is justified in inferring that every other food in which that element is wanting will also prove disadvantageous in practice. The tendency of science, therefore, is to diminish the number of trials which end in loss, and thus to acquire practical knowledge with greater rapidity and economy. It is obvious, however, that science cannot in all, or even in many instances, predicate with absolute certainty the exact extent to which particular foods are likely to be advantageous in practice; but this is owing in a great measure to our still imperfect knowledge of the complicated mechanism of the animal frame; and no one who knows either this or the various disturbing causes which interfere with the results when vital processes come into play would for a moment venture to indulge in dogmatic assertions, but would rather look upon science as fitted to direct experiment and supply a class of facts which may form the groundwork of further practical observations.

The position which science is capable of taking may be best illustrated by a particular example, and for this purpose we may select the facts connected with the use of rape cake as a feeding stuff. Chemistry has shown that, so far as the proportion of nutritive matters contained in that substance is concerned, it is completely on a par with linseed cake, which sells at double the price, but it has also established the fact that it contains a small proportion of a peculiar bitter principle of a resinous character associated with its oil. Now, it is well known that some bitters are not unpalatable to cattle, while others are very offensive; but it is not possible by analysis alone to foretell whether any such substance belongs to the one or the other category, that being a matter which can only be decided by observing the effect it produces on the animal itself. At this point, therefore, the function of science ends, and that of practical observation begins; and it has been found in practice that—owing, no doubt, to the presence of this substance—rape cake cannot be given with the same freedom as linseed cake, because, when consumed in large quantity, its disagreeable taste affects the animal, although when used in smaller proportion and mixed with palatable substances it proves highly nutritious. These facts having been determined, a further progress may be made, and science may proceed to inquire whether it lies within its resources to devise a process by which the objectionable constituent may be removed and the substance thus placed on a level with the most favored food, while practice may study the best method of concealing its taste or otherwise palliating its bad effects. When the study of the principles of feeding is