

feeding stuff, however, is not *how much* of the crude food constituents it contains, but how much of those constituents is *digestible*. Digestibility can be ascertained only by experiments on animals.* (It should be stated that there are artificial or laboratory methods of testing digestibility, and that they give results closely coinciding with those obtained by actual experiments on animals.) Chemical analysis, therefore, unaccompanied by digestion experiments, is merely suggestive of what may be the value of a feeding stuff.

II. MEANING OF TERMS USED IN THE ANALYSIS OF PLANTS.

PROTEIN.—This term is used to designate all nitrogenous substances in a feeding-stuff. The greater part of these consists of albuminoids, of which there is a large number. Albumin (the white of an egg), fibrin (lean meat), and casein (the basis of cheese) will serve as examples. They are all quite similar in composition. All, whether of vegetable or animal source, consist of nitrogen, carbon, hydrogen, oxygen and sulphur, in about the following proportions :

Carbon	52 to 54 per cent.
Hydrogen	7 per cent.
Nitrogen	15 to 17 per cent.
Oxygen	21 to 24 per cent.
Sulphur	1 to 1.5 per cent.

As previously stated, the muscles, tendons, nerves and the blood (largely)—in a word, that part of the organism subject to the greatest wear and tear and waste is made up of albuminoids. Albuminoids are, therefore, the most important part of feeding stuff; they are also the least abundant and most costly. A plant which furnishes them in greatest quantity is, other things being equal, the most valuable. As a rule, the albuminoids are most abundant in young, tender and growing plants. As the plant becomes mature they accumulate in the seeds. Hence it is that grasses whose seeds are so small as to be largely lost in harvesting, or else so small as to escape mastication and to pass through the system undigested, should be cut while young, before the albuminoids have gone into the seeds.

FIBER.—This is the most abundant of the non-nitrogenous constituents of plant food. The framework of plants consists of cells, sacks or tubes, the walls of which are cellulose or wood fiber. Examples of almost pure cellulose are cotton, flax, unsized paper. Cellulose is noted for its slight solubility—neither water, weak acids or alkalis dissolve it. By the action of strong sulphuric acid (vitriol) it is converted into grape sugar. Cellulose is not, as was formerly supposed, indigestible. But the digestibility decreases the older and more woody a plant is. As much as 30 to 70 per cent. of that contained in most of the common fodders is digestible.

NITROGEN-FREE EXTRACT.—Under this head are included starch, sugar (cane, fruit and milk sugar) and gums. Starch is identical in

*Experiments of this kind require complicated and costly apparatus, as well as much time and a great amount of most painstaking observation and work; and few, if any, have been made, or are being made, in this country. All that is known on the subject is due mainly to German scientists.