## FARMERS' CLUBS

*Gloucester*,—The following paper on The Best and Cheapest Means of Carrying Stock through Winter during Scarcity of Hay and Roots, was read by Mr. Gyde, of Painswick, at the late meeting of this Club.

My object is to draw attention to those substances produced on the farm, which are capable of being substituted for hay and roots as food for cattle, and to point out the quantities which practice, as well as science, would indicate as equivalent to good meadow hay, in feeding properties. In a paper which I formerly read before you, I showed you how the doctrines of Animal Physiology might be applied to the feeding of cattle. It will be necessary to briefly review the leading points then alluded to. The body of an animal may be divided into three distinct classes of matter, namely, the muscular portion, including all those structures containing nitrogen; the fatty portion, which is devoid of nitrogen; and the earthy and saline portion, consisting of saline matter and bone. Until within the last few years physiologists supposed that the food underwent, in the stomach of the animal, some change during the process of digestion; that the stomach, in fact, had the power of making out of the Grass and roots taken as food, those substances of which its body was composed; this power they termed the *vis vitæ*. But the investigations of modern chemists show that no chemical alteration takes place in the constituents of substances during digestion, but that the elements of the animal body are prepared and elaborated in the vegetable. In the vegetable, we find a principle identical in composition with the muscle of the animal, and known as gluten, vegetable albumen and casein. We have carbon for combustion in the lungs to keep up animal heat, supplied in the starch, gum, and sugar of the plant; and we have also oil for the purpose of forming fat, with earthy and saline matter for the bone and blood; these substances are all that the animal requires, of which to build up its structure. This being admitted, it only becomes necessary to ascertain the amount of those constituents of the body daily thrown out of the system by the various channels of waste, to enable us to point out, with some truth, the quantities of each substance that is necessary to replace the daily loss in the animal economy: or, in other words, to say how much gluten and starch of the vegetable will be required to supply the waste of muscular and other constituents of the animal. Practice says that an ox requires 2 per cent. of his live weight in hay per day; if he works, he requires 2½ per cent; a milch-cow, 3 per cent: a fatting ox, 5 per cent. at first, 4½ per cent. when half fat, and only 4 per cent. when fat; or 4½ on an average. Sheep grown up take 3½ per cent. of their weight in hay per day to keep in store condition; and growing animals should never be stinted. Science has ascertained, by the most carefully-conducted experiments, that a full-grown man voids, in his urine alone, about ½ oz. of nitrogen every 24 hours, and that a small quantity passes off in the solid excretions and by the skin. The carbon consumed by the lungs to keep up animal heat, averages about 11 ounces in the 24 hours; and the saline and earthy matter voided is in direct proportion to the amount taken in the food. It appears that the food consumed by an ox, horse, or sheep, is in direct proportion to their weights when compared with man. Hence we find that an ox would require, to replace the daily loss of muscular fibre, from 20 to 24 ounces of dry gluten or vegetable albumen which would be supplied in

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| 120 lbs. of Turnips | 17 lbs. of Clover-hay |
| 115 lbs. of Wheat-straw | 12 lbs. of Pea-straw |
| 75 lbs. of Carrots | 12 lbs. of Barley |
| 67 lbs. of Potatoes | 10 lbs. of Oats |
| 20 lbs. of Meadow-hay | 5 lbs. of Beans |

The consumption of carbon by a cow amounts to 70 ounces; and that of a horse to 80 ounces on an average in 24 hours, which is supplied by the starch, gum, and sugar of the food consumed.—Fatty matter is required to supply the fat of the animal, and this also exists more or less abundantly in all vegetable food. Earthy phosphates and saline substances are found in the organic portion of all vegetables, and these supply the daily waste of bone, &c., of the body. Hence we see that the animal requires a variety of substances, all of which exist in greater or less abundance in its daily food. In one article of diet we find one substance in abundance, and in another other substances. Thus, farinaceous seeds are made up of starch and vegetable albumen or gluten, with much fatty matter and phosphates. In the oily seeds, as Lint-seed, Hemp-seed, &c., the predominating ingredient is oil, and matter called casein, which is capable of supplying muscle. In the Potato, starch is the ingredient in greatest quantity, combined with vegetable albumen. In the Turnip, sugar and gum supply the place of starch; and in the Grasses and Clovers, woody fibre with albumen, a little starch, and much saline and earthy matter. From a knowledge of these facts, with the assistance of the accompanying Tables, which show the quantities of water, woody fibre, starch or gum, gluten, albumen or casein, fatty matter, and saline matter, contained in 100 lbs. of most of the products of the farm (See Table, No. 1,) and the amount of these constituents contained in the produce per acre (see Table, No. 2,) the judicious feeder will be enabled so to mix those crops which he has at his command as to render everything available as food. He may keep his stock in condition by supplying with gluten, starch, and saline matter, the natural waste of the body, or he may fatten, by increasing the amount of food, particularly those articles containing much fat; always remembering that a mixture of food is better than adhering to one article of diet, since it rarely occurs that one contains all those substances required by the animal, and without which healthy and vigorous life cannot be sustained for any considerable time.