is a fact officially stated, that in the regions where pasture lands abound, farming is more flourishing than elsewhere. In presence of such data, examination becomes a necessity. Connected with the matter is the rearing of stock, which also has largely increased of late, owing to the cost involved in the cultivation of wheat, the supplies of grain exported from other countries, and the assured demand for wheat in the home market. Many agriculturists have not hesitated to solve the question practically, by converting their land into meadows, or pasturages. M. de Gasparin has made a profound remark: many farmers are ruined in consequence of having too much land, but not one has ever come to misfortune by having too much meadow. In all good grass land, whether artificial or permanent, there must be a relative proportion between the gramineous and leguminous plants. Taking as a base ten tons of hay, produced from such a mixture of plants, that eminent chemist M. Joulie, finds therein 376lbs. of nitrogen, 156lbs. of phosphoric acid, 211 of lime, 59 of magnesia, and 303 of potash; thus compared with other cultivated crops, it is not the most exhausting; with sugar beet, for example, which extracts the largest quantities of chemical substances from the soil—20 tons of sugar beet per acre, carry off from the soil 163lbs. of nitrogen and 136 of phosphoric acid, then follow many varieties of wheat which are also exhausting. Now, manurings are reserved for root and grain crops, grass land receiving none. How then does it arise that meadows retain their fertility? They become poorer, but do not disappear; the valuable grasses die out, and are succeeded by inferior kinds; it is then not so much the quantity of the return that is affected, as the quality. Further, meadows are generally established in the best soil, often in valleys, where the filtering waters bring down nutrition from the more elevated lands. In 2 cwts. of dry ordinary arable soil, there are: nitrogen, 3½ oz.; phosphoric acid, 5½; lime 17; magnesia, 10½; potash, 8¾ ounces; taking the average depth of a cultivated soil at 8 inches, an acre would contain about 32 cwts. of nitrogen and the same quantity of phosphoric acid; the other chemical elements in proportion. There is here an enormous difference between what the soil has in store of chemical food and what vegetation exacts. An acre of beet requires as we have seen 163 lbs. of nitrogen, while the soil contains 32 cwts. of this element, or a sufficiency for 22 crops of beets. A like observation will apply to the other inorganic nutriments. M. Joulie explains this disproportion by the fact that each chemical element exist in the soil in two forms, assimilable and unassimilable. Did the soil contain all the food in the former state, it would be washed away and the land rapidly exhausted; existing in an insoluble or fixed form, the azote, phosphoric acid etc., yield only each year their treasures to vegetation in fractional quantities. M. Joulie draws a comparison between grazing and cutting meadows. He inclines to the former, because the animals find in the succulent, and above all, the young grasses, more nitrogenous matters, and of greater digestibility than when in the form of hay, where so much is woody matter passing through the system, without undergoing any transformation. Hence, why weight for weight of stock, pasture land will support a greater number of cattle, than if the crop was converted into hay. The chemist also avers that, in an economical point of view, the droppings of the animals restore immediately to the soil all the nutritive elements that the animal has not utilized, thus saving the labor of being converted into farm-yard manure. Chemically, all soils are not suited for grass culture, but they cannot the less be made so, by judiciously selecting the kinds of grass and clover most propitious; resorting to fossil phosphates, lime, marl, and fertilizers to supply richness. M. Joulie belongs to the school which believes in the atmosphere supplying azote to the nutrition of plants. In the department of the Nièvre, the rearing of stock is the chief feature of agriculture, and the farmers have become immensely rich since half a century; meadows there are not permanent, and the land receives no other manuring than the droppings of the cattle; lime is added largely to stimulate clover, and when after eight years a meadow is broken up, oats are sown on the lea, then three grain crops, the fourth, oats along with clover and selected grass seeds; the meadows are never worn, and one head of cattle per acre is the ratio allowed. The stock are duly sent to the beet sugar grower of the North to be fattened. The general rotation in the Nièvre is eight or ten years grass, then oats, two wheat, and oats as above, but no manure is ever added to the soil; the soil is a sandy clay and lets readily for 32 to 40 francs per acre.

Professor Kühn of Halle is occupied with the crossing of the cow with the Yak. There is nothing new to be demonstrated that animals of different species will breed; the evidence exists in the affirmative in the case of the goat and the sheep, of the hare and the rabbit. A cow, the product of a mother crossed by a yak, was covered by a short horn, and in turn produced a calf with all the traits of the yak at the tail and head. The products of these crossings however, are not fruitful between themselves, simply because they are hybrids and not crosses, the male of a hybrid is next to never so. Mules have been successfully crossed by asses and horses, but the same has not been the case with a male mule, although the researches of Balbini invite caution in this respect. (1)

There was a Gascon once who boasted that he gradually reduced the rations of his mare to a point where the animal lived upon nothing, only at this stage the mare died—which constituted a drawback. Discussions are taking place as to the practicability of diminishing the rations of horses in the cavalry or in the omnibuses, by employing maize-cake, beans, etc., in place of costly oats; or feeding the horses more highly, and by exacting more work from them, require fewer to feed. Professor Muntz lays down there is a point in the feeding of horses that cannot be overstepped; that high rations to one horse, will not produce a result of work equal to that produced by two moderately fed. In the case of the omnibus horses, the animals exceptionally over-worked, though well fed, are ever those first on the sick list.

In the conservation of green food, maize, clover, etc., in *siloes*, a fermentation ensues, of which the seat is the vegetable cell; carbonic acid, alcohol and acetic acid are produced at the expense of the immediate principles contained in the forage. Over 2 per cent of carbonic acid in the case of maize, and nearly 1½ per cent for clover, is given off during fermentation; if a part of the nutritive principles be lost, the remainder are made more utilizable. Also, the fatty matters are increased during the fermentation.

M. Deberain has repeated de Saussure's and Corenninder's experiments, that of testing the influence of carbonic acid on vegetation. But little of this acid is contained in the atmosphere: 10,000 quarts of it containing not more than 3 or 4; the professor placed haricots, colza, and tobacco plants under bell glasses, so as to exclude all communication with the external air; then pure carbonic acid, in measured daily quantities, was introduced. The beans and colza showed any excess of acid to be unnecessary, but the tobacco leaves became very plethoric, owing to immense deposit of starchy matter in the leaves. The experiment was controlled by kindred plants also placed under bell glasses, but supplied with common air. The tobacco leaves assimilated more carbon, than was supplied by the introduced acid: from whence did

(1) The *Yak* is sometimes called "the grunting cow."

A. R. J. F.