The New Text-Book on Agriculture*

QUOTATIONS FROM ITS CONTENTS, AND COMMENTS, BY J. DEARNESS, LONDON.

(Continued from December Issue.)

The best school-books, like the best teachers, are not necessarily those that impart to the learner *most knowledge*, but rather those that impart knowledge, be it much or little, in the best manner. A fact may be planted in the learner's memory as the mere dictum of a teacher or a text-book, or it may be acquired by the directed exercise of the learner's observing and reasoning faculties. The latter method gives knowledge and, what is even more important, mental discipline—the essentials of true education The scholar thus taught will be disposed towards and trained in learning, not only from books and lectures but also from observation and experience all through life.

It was chiefly as a training book for public school pupils taught by teachers, the majority of whom are not supposed or expected to be versed in the science and practice of agriculture, that the work under notice was adversely criticized. As a manual—a handy knowledge-book—it is a welcome, timely and most creditable contribution to the scanty literature of what has ever been, and must always remain, the most diversely-branched and most important of all human industries.

Excepting the five pages at the end relating to Forestry, the contents of the book might be divided into the chapters treating of the Soil and its Culture, 71 pages; Crops, 44 pages; Live Stock, 129 pages.

To particularize, the first two chapters (pp. 1-18) are chiefly explanatory. Speaking of Seed Formation (p. 18) an important application is made of the fact that the maturing seed, especially of annuals and biennials, exhausts the starch and albumen of the plant. Hence fodder plants—clover, timothy, etc.—deteriorate rapidly in quality with the setting and maturing of the seed. Chapter III. deals with the constitution and classification of soils and the means of remedying defects and restoring fertility. A calculation is made of the enormous quantity of nitrogen, phosphoric acid and potash, the staple plant-foods, in the surface to the depth of 9 inches of an acre of ordinary clay-loam. Chemical analysis is clearly insufficient to determine the productiveness of a soil, because it fails to show what proportion of the plant-food in the soil is in available condition. The part of tillage that most taxes the skill of the farmer is converting the dormant, unavailable plant-food material into active, soluble nutrients. The most important means of effecting the conversion are:—

"*Underdraining*, which admits air into the soil at all times and allows rain-water with carbonic acid in it to pass down through the ground, instead of running off over the surface; *fall plowing*, which exposes the soil so as to have it thoroughly pulverized by the action of frost; frequent *stirring of soil*, as, for instance, among Indian corn, potatoes, and root crops, to let plenty of air with its moisture and oxygen down among the constituents of the soil; *thorough tillage*, which not only cleans land, but exposes it to the action of the atmosphere; *green manuring*, which consists in growing a crop of some kind for the purpose of collecting plant food and then plowing it under for the use of another crop; and *seeding down* grain fields with grass and clover, so as to have young growing crops ready to take up and preserve the elements of plant food, especially the very soluble compounds of nitrogen, which become available after harvest and are apt to suffer loss by 'washing'".—Page 29.

* THE FIRST PRINCIPLES OF AGRICULTURE, by President Mills, M. A., and Professor Shaw, of the Agricultural College, Guelph. Published by the J. E. Bryant Co., Toronto. 250 pages. Price 40 cents.

Nitrogen, an essential plant-food contained in the decaying vegetable matter in the soil and in barnyard manure, is not in condition to nourish plants until it has entered into some of the compounds called nitrates, a process called nitrification. To this are necessary four conditions:—

"(*a*) The soil must be sufficiently porous to let air pass freely down among its particles.

"(*b*) The soil should be moist, but not wet. Moisture is necessary; but an excess of water prevents nitrification.

"(*c*) There must be a certain amount of warmth. We cannot say exactly how much; but we know that nitrification takes place most rapidly at summer temperatures, and it apparently ceases near the freezing point.

"(*d*) The soil must contain lime, potash, soda, or some similar substance, to unite with the nitric acid so as to form nitrates.

"These conditions, so far as the farmer can control them, are best secured by underdraining and thorough tillage; and part of the value of clover and similar crops, which shade and cover the ground during the warm season, is due to the fact that, acting as a mulch, they keep the soil in a moist and porous condition favorable to nitrification."—Page 30.

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"Now, it has been proved beyond doubt that the evaporation from a growing crop is much greater than from a bare soil; and for that reason *a crop on land*, especially during the warm season (when nitrification is most active), helps to preserve the nitrates from waste by washing."

This statement is worth consideration in connection with the subject of summerfallowing.

To entirely prevent loss of nitrates by drainage or washing is impossible:—

"But by *growing and plowing under green crops*, in connection with thorough cultivation of the soil, land may be cleaned, enriched, and prepared for wheat, barley, etc., with very little loss of plant food; and the same object may be obtained by frequently *seeding down with red clover*. Some recommend very strongly the practice of sowing clover with barley, wheat, and oats nearly every year, in order to have clover sod to plow down as a preparation for all ordinary crops. Under that system the ground is covered throughout the whole growing season—first by a cereal crop and then by the young clover. Thus the nitrates are preserved, weeds are destroyed, and the land is put in first-class condition for the growth of grain, roots, or any other kind of crop."—Page 32.

Under the head of tillage is discussed the means of improving the soil and preparing it for seed and rotating crops. In this connection the following statement is worth quoting:—

"The cost of labor is usually the largest item of expense in the production of a crop; but the labor of caring for a good crop is not much more than that which is required to care for a poor one, while the difference between the respective returns may be large. And often it is wise to add to the cost of production in other things besides in labor. Ten dollars of extra expense applied to an acre of land in manuring it properly may increase the value of the wheat grown on it by fifteen dollars, while the cost of caring for the crop will not be equally increased; moreover, the land itself will be left in better condition for the next crop than if it had not thus been manured. So that, speaking generally, it follows that the larger the yield obtained from crops, the greater in production are the profits in growing them likely to be. It is the opinion of competent judges that the average yield of the crops of Ontario would be increased at least by *one-third* if only proper methods of tillage were generally adopted."—Page 39.

The illustrated sections on the construction and tiling of drains, though short, are well worth reading and studying:—

In Chapter V. manures are classified, and the methods of preparing and applying each kind are discussed. As an example:—

"*Lime* exerts a four-fold influence as a fertilizer:—

"(1) It is a direct source of plant food; that is, it supplies the growing plant with an element it needs, namely, the chemical substance called calcium (see section 17 (2)).

"(2) It acts upon the organic matter of the soil (that is, the decayed vegetable matter), neutralizing the 'sour' organic acids that it contains, and rendering the soil 'sweet' and capable of sustaining healthy plant life.

"(3) It unlocks the stores of inert mineral matter in the soil, especially the potash and soda (see sections 35, 38, and 44), and renders them available as plant-food.

"(4) It ameliorates the texture of soils that are too stiff; that is, makes them more easy to be plowed, harrowed, rolled, etc.

"Lime improves the quality of grain, grasses, and other crops; hastens their maturity, destroys insects, and checks the growth of moss. While it improves the texture of strong clays, it also increases the capacity of light soils for absorbing and holding moisture (see section 39.)

"The amount of lime used may vary from one ton per acre to ten tons. One to two tons is an average dressing. A deep soil requires a heavier dressing than a shallow one, and a sandy soil less than a heavy clay. Soils rich in organic matter (that is, decayed vegetable matter) require more than soils poor in the same. A small amount will benefit drained lands more than a large amount will benefit those that are undrained. Small dressings and frequent are preferable to larger ones infrequently applied. The lime intended as manure should be harrowed in rather than plowed in.

"Lime is used both in its natural condition and after being burnt. *Burnt lime*, or '*quicklime*,' as it is called, is much more active in effecting the changes described in (2) and (3) above than *natural lime*, and, indeed, is the form in which lime is generally used in agriculture. But since on some soils quicklime will do much more harm than good, it should always be used with judgment and caution."—Page 55.

The omission may be noted here that the author does not tell us on what soils or under what conditions "quicklime will do much more harm than good."

To the eight strong reasons in favor of a systematic rotation of crops might have been added that it checks the ravages of plant diseases caused by fungi. As general guides the author gives examples of rotations that ordinarily would suit the different clases of soils.

Under the growth and management of the crops there are taken in turn hay, pasture, wheat, barley, rye, oats, peas, mangels, carrots and potatoes. As a rule, each is discussed under the following topics: Leading varieties, suitable soils, place in rotation, preparation of soil, quantity of seed, sowing and harvesting.

Soiling is strongly recommended, if it is practised with judgment, for the following reasons:—

"It effects a saving of land. It effects a saving in the outlay of fencing. It effects a saving in food. It increases the quantity and quality of manure made. It beneficially affects the condition of the animals fed by means of it. It increases in a marked degree both the quantity and quality of the milk and meat products."

The favorite green-crops for soiling out of a dozen recommended would seem to be lucerne, clover (in mixture) and corn.

The chapters on weeds, diseases of crops, and insects, less than 20 pages altogether, are too brief. It is doubtful whether the remedy recommended in the book for smut is the best. (A solution of sulphate of copper or bluestone in the proportion of one to one and one-half pounds to a pailful of hot water.) The Royal Agricultural Society of England a year or two ago published with approval the results of Mr. Jensen's experiments with smut at Copenhagen, Denmark. These went to prove that the smut spores removed by the usual washings do not materially affect the grain. Mr. Jensen's article concludes in the following language:—"Dressing cereals with sulphate of copper causes as a rule a waste of seed. It is, moreover, injurious to the plants, and is unnecessary. Treating the seed with water heated to a temperature of 127° F. for five minutes prevents these diseases (smut and bunt) equally well, and protects barley better, while it has the advantage of not injuring the seed or the resulting crop."

The text-book teaches that there is "no remedy for rust." Many authors, including De Bary and Plowright, teach that the destruction of the barberry (the host of the spring stage) would greatly reduce, if not entirely destroy, the most common species of rust on grain, while Worthington Smith, who denies the connection between *Aecidium berberidis* and *Puccinia graminis*, holding that rust is an hereditary disease, gives five or six methods of preventing rust.

We take exception to the text-book's remedy for black-knot ("all trees on which the black-knot appears should be at once cut down and destroyed by fire"), as being unnecessarily