Experiments in Corn Growing.

To the Editor FARMER'S ADVOCATE:

DEAR SIR,—I notice in the last few numbers of the FARMER'S ADVOCATE that you have given a considerable amount of practical information on the very important subject of corn growing in Ontario. In addition to what you have already furnished your readers, I might add a few words by referring to the results of two or three experiments conducted at the Agricultural College, which might be of both interest and service to your readers.

Hills vs. Drills.—Several experiments have been conducted at the College, and also by Ontario farmers through the medium of the Experimental Union, in growing corn in hills and in drills. These tests have been carefully made, there being exactly the same number of grains used in both methods of planting. The result of every experiment shows that in total crop per acre the corn which was planted in rows gave a little larger yield than that which was planted in hills; but in grain per acre the corn planted in hills gave a slight increase in yield over that which was planted in drills. It might be given as a general rule that corn planted in drills is likely to produce a total crop a little larger in quantity and a little poorer in quality than that produced from corn planted in hills, when the same amount of seed per acre is used in both cases.

Varieties.—During the past six years much careful work has been done in the experimental department in testing different varieties of corn. Fifty-three varieties have been grown under uniform conditions in each of these six years, and in 1896 one hundred and thirty-two varieties were grown, and the yield of each variety was accurately determined. For the results of this experiment the reader is referred to the annual report of the Agricultural College for 1896, page 182. Twelve of the most promising varieties have been tested over Ontario since 1892 with very gratifying results. Some of the very best varieties for quantity and quality combined are as follows, commencing with the latest variety: Cloud's Yellow Dent, Mammoth Cuban, Wisconsin Earliest White Dent, Salzer's North Dakota, and Compton's Early. The Cloud's Yellow Dent seems well adapted to the warmest portions of Ontario, and the Compton's Early to the more northerly sections. Several of the sweet corns have given good satisfaction for green fodder purposes, such as the Mammoth Sweet fodder among the late varieties, and the Hickox Sweet among the early kinds. In selecting varieties of corn for any locality, not only is it important to select those which produce large yields of total crop and of grain, but also to select the varieties which are sufficiently early for the particular locality in which the corn is to be grown. I wish to make it clearly understood that the Mammoth Cuban is a yellow dent corn, and is very different from the Cuban Giant, which is a white dent corn. The three varieties of corn so highly recommended by Mr. D. M. Macpherson, M. P. P., in a recent issue of the FARMER'S ADVOCATE, are included in the fifty-three varieties which we have grown for six years in succession, and were obtained by him after he learned the results of the experiments conducted at the Agricultural College.

Mixing Varieties.—When good seed of the varieties best adapted to any particular soil and locality is secured, I think there is not much need in mixing the varieties together. When varieties of different habits of growth are planted together one kind is almost sure to be injured to a greater or less degree by the other, and the results are sometimes quite disappointing. We now have varieties well adapted in themselves for almost any requirement, whether for the production of grain, green fodder, dry fodder or ensilage. When a careful study is made of the characteristics of the different varieties of corn, I believe it will generally be found that more satisfactory results can be obtained by growing the varieties of corn separately than by growing them in mixtures.

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The Use of Potash Upon the Farm.

As most of our soils have been formed by the decomposition of rocks containing a large amount of potash, we would naturally think they were rich in this element. This is quite true with heavy lands. The results of many experiments show wide differences in the needs of different soils. The question may be asked, What classes of soils are in need of potash fertilization? The farmer should put the question to the soil itself and then get the answer in the crop produced. As a rule, peaty soils, sandy soils, and soils rich in lime are deficient in potash. The most practical way of finding out the special needs of particular soils with regard to potash is to make a "field test." The farmer can set apart two small plots of land. On one plot he should apply potash in addition to nitrogen and phosphoric acid; on the other plot he should leave out potash. The growth and yield of the crops upon the plots thus treated will indicate to what extent potash is needed. Some cultivated crops require more potash than others, and this may be shown by the following examples. Take the effects of potash upon peas grown in clay soil and again in sandy soil. The clay soil, as we would expect, is naturally somewhat rich in potash, while the potash in the sandy soil is considerably less. The difference in the growth of the peas is just what we would expect. The good results of potash fertilization are more pronounced in the sandy than in the clay soil, and yet even in the clay soil potash fertilization has produced a considerable increase of yield. We will take a similar case with rye growing under conditions the same as in the peas. Here the difference between the growth of rye in plots fertilized with potash and those not so fertilized is striking. We would naturally imagine that rye requires more potash than peas. This is true of all grain crops, and the use of potash for all grain crops is now known to be a necessity. This is contrary to an old notion that such crops were not much in need of potash fertilization. Of course some grain crops require less potash fertilization than others. As an example of this we will conduct an experiment with oats under the same conditions as with rye and peas; that is, two kinds of soil to be used—clay and sandy. And in this case potash fertilization gives considerable increase of oats, but it is less than in the case of rye. The conclusion is that oats do not require quite as much potash as rye. Of all grain crops, barley is the one that seems most in need of potash. In fact, the yield of barley follows very closely the amount of potash in the soil and in the fertilizer applied, other conditions being favorable. Sometimes a nitrogenous fertilizer does not produce the result naturally expected. This should not be taken to indicate that barley is not much in need of nitrogen. It only goes to show that the nitrogen application to barley does not give full effect when potash is deficient in the soil.

The potato, as most of us are aware, is a plant that requires a large supply of potash in order to produce good yields. It seems to respond best to the application of potash indirectly—that is, applied to a preceding crop, which converts potash salts into organic compounds. If direct application of potash to potatoes is unavoidable, the best time to apply it is in the fall. Practically, a great deal of potash is returned to the land upon farms in the form of stable manure. And the true economy of manure can be understood only when we are acquainted with the special characters of the crops we produce.

In conclusion it may be stated that the sooner a farmer gets his manure on the land the greater benefit he will derive from it, especially in clay loam. This practice will also prevent, to a great extent, leaching, so common on many farms.

York Co., Ont. F. L. SMYTH.

Underdraining.

[A Farmers' Institute paper by Mr. Simpson Rennie, York Co., Ont.]

The most important of all sciences is that of farming, to know how to cultivate the soil so as to raise the largest crops with the least expense and without permanent injury to the soil. The best authorities on agriculture say that thorough drainage will increase the produce at least one third. Drainage will often convert useless land into the most productive. Rain water should not be permitted to run off the surface of the soil, but should filter through it and then be removed, thus imparting to vegetation the valuable properties it contains so necessary to the support of vegetable life. All soils of ordinary richness which contain a fair amount of clay will withstand a severe drought without great injury to the crops growing thereon if thoroughly underdrained. Land which requires draining hangs out the sign of its condition to the practiced eye. Sometimes it is in the broad banner of standing water or dark, wet streaks in plowed land when all should be dry and of even color; sometimes only a fluttering rag of distress, such as the curling of the leaves of corn or wide crack in clay, or feeble, spindling grain. To recognize these conditions is the first office of the drainer; the second is to remove the causes from which they arise. Land which requires draining is that which at some time during the year becomes filled with water that does not naturally find a ready outlet, but remains until removed by evaporation, which is a slow process and becomes more slow as the level of the water recedes from the surface. Often in midsummer the top of the water of saturation is within a few inches of the surface, preventing the natural descent of roots, and by reason of the small space to receive fresh rains, causing an interruption of work for some days after each storm.

With regard to durability of underdrains, all I shall say is, if properly constructed there is no fear of them wearing out in man's lifetime. They seem to work better year after year, and the satisfaction obtained from walking on dry ground instead of wading through water and mud each spring and fall is certainly very great. I am sure that any person who is willing to risk a few dollars in underdraining some wet piece of ground will be well pleased with the result. The length of time it will take to repay the cost of draining depends on several conditions: the need for draining, the nature of the subsoil, the depth of the drains and the distance they are apart. Generally it will repay the cost in from three to five years.

On commencing to drain, locate the main drains through the lowest ground, unless the grade is very steep and there is danger, at the time of a freshet, of the tiles being washed out and the drain destroyed. In such a case it would be well to keep a few feet to the one side. To cheapen the cost of making the drain, first mark them out with an ordinary plow, and if a draining machine is not to be used, then go back and forth four times. The last twice is better to be done without the moldboard, as the plowing should not be wider than nine inches at the top for an ordinary drain of two and a half to three and a half feet deep. When the loose earth is shoveled out after the plow there will be a drain of nearly one foot, which can be finished in a very short time. After the plowing is done start and dig from the outlet or lowest point, and when a point is reached where a branch or lateral drain is required start the lateral and run it out for a couple of yards, then proceed to dig in main drain. By all means avoid sharp turns or square joints in joining one drain with another. The depth of drains should vary according to the nature of the subsoil. In porous soils the drains should be put down three feet or more, but where there is a hardpan bottom there is no necessity for going so deep. The bottom of the drains should be very carefully graded, avoiding sudden changes in grade. That this may be well done some system for levelling is necessary, but out of the many that I have seen used, to my mind there is none equal to water. Usually when digging, especially in the fall and spring, there will be sufficient ooze from the sides of the drains which can be utilized for levelling purposes, but if the soil should be dry it is an easy matter to take out sufficient water to try the grade of a drain.

As the freezing and thawing is liable to break and destroy the tile at the outlets, I recommend wooden outlets. Take a round cedar, split it through the center, hollow out the heart and then nail it together, and put this in for the outlet. In laying tile always lay from the outlet up grade, place so that they will fit close and lie solid, stand on each tile, and if any places in the drain are found to be soft so that the tile will settle with one's weight, then these soft places should be made solid by tramping in strong clay. This will also prevent quicksand from working up from the bottom and getting in at the joints and probably through time destroying the drain.

In clay soil nothing more need be put on the tile than a portion of the moist clay taken from the sides of the drain and tramped solid before filling in the drain. In sandy soil a layer of dead grass or straw should be put over the tile to prevent the sand from getting into the joints, then tramp a few inches of earth solid on top of the straw, after which an ordinary plow may be used to fill up the drain.

Regarding the distance drains should be apart, no hard and fast rule can be laid down, but in any ordinary porous soil they need not be closer than thirty-five or forty feet, providing they are put down a good depth, for the deeper the drain the greater the pressure, and consequently they will draw further.

Cross-Fertilization.

RY HARRY BROWN, MANITOBA EXPERIMENTAL FARM.

In your issue of Feb. 15th, 1897, one of your subscribers (Mr. A. E. Hoshal, Lincoln Co., Ontario) laments the fact that many people are ignorant that the organs of reproduction are as perfect in the vegetable as in the animal kingdom, and that the work of procreation is carried on on precisely similar lines. With due deference to that gentleman's opinion, I think that at the present day this class of people are in the minority, and with such powerful factors for the dissemination of knowledge as the agricultural and horticultural journals, farmers' organizations, etc., they will soon be unknown.

Cross-fertilization, reduced to its simplest form, is the crossing of two varieties of the same specie possessing distinct characteristics and having for its object the combination of the traits of the two varieties. As most plants with which the agriculturist has to deal produce what are known as perfect flowers (that is, the male and female organs are combined in the individual flower), I will take this class as an illustration of my point. The composite parts of such a flower are: (1) the *calyx* or outer covering (generally green), (2) the *corolla* or colored portion of the flower, (3) the *stamens* or male organs, slender filaments bearing at their tips the small sacs which contain the yellow, dust-like pollen, (4) the *stigma* or female organ, which is borne in the center of the flower, and (5) the *ovary* or seed pod, containing the *ovules* or embryonic seeds, and from which the stigma proceeds. All these parts are readily distinguishable by a casual observation, but perhaps the common garden poppy affords one of the plainest examples. At a certain stage in the development of the flower the receptacles containing the pollen burst and scatter the fertilizing dust on the surface of the stigma, which is at this period covered with a mucilaginous substance, enabling it to retain the pollen long enough to ensure fecundation. If the fertilization has been perfect, rapid changes take place. The ovules commence to grow, and in due time develop into ripe seeds with which to perpetuate the variety.

This would be the result if nature were allowed to follow her course without interruption, and here comes in the cross-fertilizer's art. Before the pollen has been released the stamens are removed with a delicate pair of forceps, and the flower is said to be sterilized. A piece of fine muslin is then tied round it, to ensure the exclusion of foreign pollen, and in this condition it is impossible for it to produce seed. Sterilization must be performed at a comparatively early stage of the flower's development, for the pollen is distributed, in many