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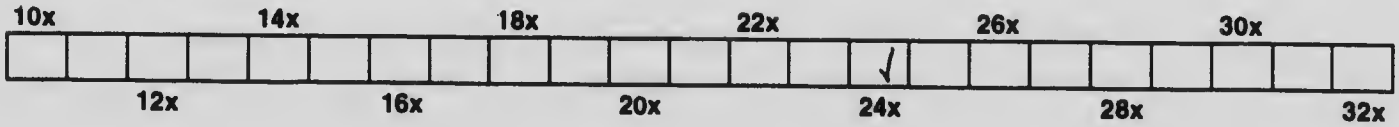

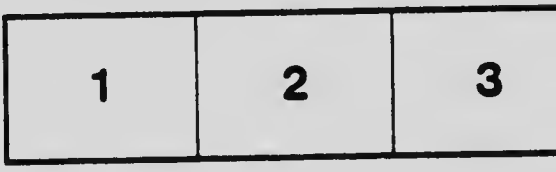

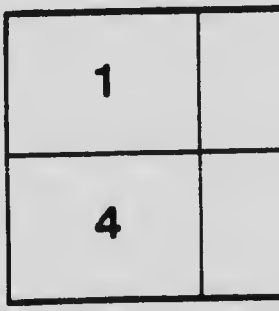

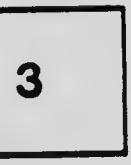

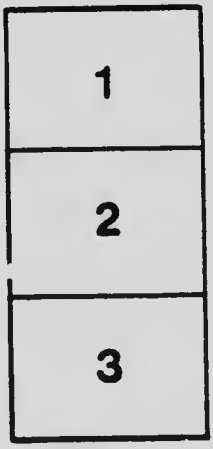

CROP PRODUCTION

BY

J. H. GRISDALE, B.AGR.

SOIL CULTIVATION.

We cultivate our fields and sow our seed to produce crops. The quality and quantity of our yields depend upon the strength and rapidity of the growth made by the crop. The requirements of strong, rapid plant growth are (1) Moisture, (2) Warmth, (3) Plant Food.

Let us briefly consider these requirements and the extent to which they may be controlled or influenced by the farmer through cultural or other farming operations.

MOISTURE.

The moisture supply depends primarily on precipitation. Precipitation, or rainfall, is, however, not controllable. It is necessary, therefore, to so handle soils as to enable them to conserve or retain the moisture received until required for crop production.

Drainage a Factor in Moisture Conservation.—Several factors influence moisture conservation in soils. Of these, good drainage is probably the most important. Well drained soils are free from the danger of baking or puddling; that is, they are friable and loose on the surface, so preventing evaporation. Well drained soils being free from hydrostatic or free water to a considerable depth are in shape to absorb rain as it falls and preserve it in the form of capillary or hygroscopic water. It is only as capillary or hygroscopic water that moisture can be retained for any length of time in the soil in dry weather, hence good drainage is an absolute necessity where moisture conservation is a matter of importance, just as it is an indispensable condition where seasons are short or rainfall very great in order to carry off the surplus water and allow air to enter the earth to reach plant roots and raise the soil temperature.

Ploughing and Cultivating as Methods of Controlling Soil Moisture.—Shallow ploughing and deep cultivation are, after drainage, probably the most important influences making for moisture conservation. Shallow ploughing by keeping the humus near the surface greatly increases the moisture-holding power of that, the most important soil layer. Deep cultivation by stirring the lower stratum of soil helps disintegrate the stiff and probably water-logged upper subsoil, and so very greatly increases the amount of capillary water readily available near the surface layer for crop requirements.

Surface Cultivation Conserves Moisture.—No matter what the condition of the surface soil and upper subsoil as influenced by ploughing and subsoil stirring, no matter how well drained the lower subsoil, if no precaution be taken to prevent evaporation, a very large amount of moisture is sure to be carried off from the surface by every faintest breeze and weakest sun ray. To prevent this, the maintenance of a soil mulch on such surfaces as are exposed to the moving air or direct sunshine is a necessary precaution. A soil mulch may

DOMINION EXPERIMENTAL FARMS

J. H. GRISDALE, B.AGR., (Director.)

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be made by means of a light harrow. Sometimes, too, it may be made by a roller. The roller has usually just the opposite effect; under certain conditions, however, it is of value in this connection. To illustrate, it often happens that two or three weeks after seeding, before the grain is up high enough to protect the soil surface from winds and sunlight, a crust forms and moisture evaporation goes on apace. Going over such a field with a light roller breaks the crust and forms a soil mulch which effectually stops the loss.

Humus Conserves Moisture.—Humus absorbs and retains moisture much more readily than any other constituent of the soil. Hence one of the best methods of improving the moisture-storing and moisture-conserving powers of a soil is to increase its humus content. This may be done by the frequent turning under of sod and by the use of barnyard manure.

WARMTH.

For plants to grow rapidly, warmth as well as moisture is an absolutely necessary condition.

Drainage Warms Soils.—Drainage was shown to be probably the most important factor in making for moisture conservation. Drainage as an influence affecting soil temperature is of even greater importance. Undrained soils are always cool, usually too cold to favour plant growth, save in the case of certain species accustomed to such peculiar conditions. Practically all cultivated plants require warm soils. Drainage will warm the soil by carrying off surplus moisture and enabling air to enter.

Soil Mulch Affects Soil Temperature.—Once a crust has formed on the surface of the soil, water escapes rapidly through the pores, evaporating as it passes off. The change from liquid to gaseous form means the absorption of large quantities of heat by the escaping water, and in this way much heat is taken out of the soil. Thus in spring, when heat is of such paramount importance, it not infrequently happens that a field lying under a bright sun is going down in temperature rather than rising, for the reason that much moisture is escaping from the surface by evaporation. To prevent this and stop the cooling-off process, all that is necessary is a cut with a common harrow; that is, a mulch should be formed.

Humus Warms the Soil.—After drainage and the soil mulch, the colour of the soil is an important factor affecting soil temperature. Dark soils absorb heat readily and rapidly. Humus has the effect of darkening soils, hence the increasing of the humus content of a soil is an important and practical method of raising the temperature of a soil that, due to its colour, might otherwise be slow in warming up.

PLANT FOOD.

The supply of plant food in a soil is very commonly supposed to be [illegible] of its crop-producing powers. Such, however, is not exactly the case. Even the [illegible]rren soils, so far as plant food is concerned, may in a few years be made to produce most excellent crops provided the other conditions of plant growth be right. Any soil to which humus can be added at not too great expense will shortly be found to yield profitable crop returns.

Commercial fertilizers might be of some value in building up a worn-out or barren soil, in as much as they will supply more or less immediately available plant food, and in the case of certain fertilizers being used, such as land plaster, lime or ashes, will do something toward rendering available such plant food as may be already in the soil. They will also correct any acidity in the soil, and in the case of ashes and lime will do something to improve the physical condition.

Humus, however, is the material required to get the soil in good crop producing shape. The farmer's aim should be, therefore, not to find out by chemical analysis what elements of plant food appear to be lacking in whole or in part, but rather to improve the physical condition of his soil by adding humus, draining properly and performing the necessary cultural operations in the right way, at the right time.

CULTURAL OPERATIONS AND IMPLEMENTS.

The following notes on cultural operations and implements will probably serve to supplement the preceding paragraphs.

Ploughing.—Ploughing is admittedly the foundation operation in all crop production effort. Ploughing has been performed with many different kinds of plough and in many different styles. No definite rule can be laid down as to the best method of ploughing. A safe rule, however, is to plough only when the soil is in shape, that is when not too wet; this rule, of course, applying to heavy soils only. Ploughing deeply in autumn, turning an upstanding furrow, and ploughing shallow in spring, turning a low-lying or flat furrow, is another general rule, and is applicable to a greater variety of soils than the first. Ploughing should, in my opinion, be done whenever possible with the two-furrow gang plough, using four, or at least three horses. In this way, the cost of the operation is materially reduced.

Disc ploughs recently put on the market afford a means of performing this operation at times and under conditions where it would probably be impossible for the common mouldboard plough to operate, as for instance, ploughing heavy clay lands when hard and dry. They are also useful in burying manure, grass or weeds and in exposing heavy soils to the action of the frost, since they leave a very rough surface exposed to the air.

Subsoil ploughing is a cultural operation very seldom practised, and one that should be more frequently performed by the farmer, and serves, as indicated in preceding paragraphs, to open up the upper subsoil and so increase the water-containing capacity of the root-holding soil strata. The subsoil plough may to a certain extent be replaced by what is known as the subsoil hook, a cheap, light affair, that can be readily attached to the beam of any plough and passing over between the handles do a good job in the way of stirring to a depth of three or four inches the upper subsoil.

Harrowing.—Many implements have been devised and put on the market wherewith to perform the operation commonly known as harrowing. Of all these implements, the disc harrow is probably the most generally useful and the most effective in the work of preparing soil for seed after it has been ploughed. The larger the disc and the more acute the angle at which it is set in operation, the more effectively will it work. To insure good work, however, with a large sharp-set disc, rolling is necessary in order to crush the soil down that it may remain in place when being carved by the disc.

A new disc harrow, known as the Double Cutaway, has recently made its appearance, and has proven to be a most excellent implement. It consists of two disc harrows, one in front of the other, cutting, the one with an inthrow and the other with an outthrow; the discs are so placed as to prevent their running in the same track, hence a much more thorough cutting up of the surface soil is insured. Considerably more power is necessary to operate this disc than in the case of a single disc. It is, however, an implement capable of materially reducing the cost of preparing the soil for seed after the land is ploughed.

The spring tooth harrow is an implement that cannot be too strongly condemned, where used, as is commonly the case, on sod land or on rough hard land. This implement tears up the sods, exposes the grass and leaves an exceedingly rough surface, very certain to give poor results in crop production.

Harrowing is an operation usually very badly performed, and an operation that is almost always ended up sometime before it should be on any given area. Good ploughing is a necessary condition of the best crop results, but thorough harrowing is an indispensable condition of profitable crop returns from any field. Thorough harrowing does not necessarily mean three or four or ten different harrowings, but it means such treatment as leaves the surface of the seed bed smooth and friable, and leaves the bottom of the seed bed firm and solid. Until these two conditions are fulfilled the harrow should not stop.

Where sod land is being prepared for any crop, possibly the best treatment would be about as follows: Roll with a heavy roller, disc harrow lengthwise and crosswise or on the bias; roll again, disc harrow once more, and then smooth harrow with a common spike-toothed

harrow. If, however, it is found that the land is not yet in perfect tilth, then it might be necessary to repeat the disc harrowing and the rolling. In any case, seed should not be sown until the soil is in perfect shape for crop production. It is usually safe to harrow again after conditions seem nearly perfect for seeding.

The spike-toothed harrow may often be run over the land when the average farmer would consider it utter folly to use it at all; for instance, in the corn field a few days after sowing or planting the corn, and in the same field a few days after the corn is up. Harrowing the field at such times is almost certain to materially help the crop.

Where large areas of corn are grown, an implement likely to prove of considerable value is what is known as the slant-tooth or tilting harrow. This enables one to control the depth to which the harrow shall sink in the soil, and so permit of harrowing the corn or potatoes at times and under conditions when the common spike-toothed harrow might do some small amount of damage.

Seeding.—Seeding is now rarely done by hand. It is, however, in too many districts still done broadcast; that is, what are known as broadcast seeders are used. Such seeders are not nearly so satisfactory as drill seeders. Much of the seed is insufficiently covered, while another part is buried too deeply. Consequently it comes up unevenly, grows unevenly, ripens unevenly, and there is thus considerable loss at harvesting, to say nothing of the seed lost by being buried too deeply or by being insufficiently covered.

The hoe drill and the single disc are the best seeders, and of these, I believe the single disc to be the better. Here, as in the case of the plough and the harrow, as large an implement as possible should be selected, since such implements aid materially in reducing the cost of production.

The Roller.—The roller is commonly looked upon as the implement wherewith to give the finishing touch. It is just at this point, however, that the greatest danger lies. It is as an operation after seeding that rolling is, on the average, of least value. There are, of course, conditions when it is advisable to roll after seeding, but the true value of this implement lies in its usefulness as a means of preparing the land preparatory to seeding, as already mentioned in connection with harrowing. The use of the roller in preparing sod land for grain or corn is much to be commended, and it is here that this implement is of the greatest value to the farmer. In certain soils, as for instance, mucky or peaty soils, it is often advisable to roll once or twice before seeding, and two or more times after seeding; this more particularly, if the land is to be seeded down to grass or clover, at the same time as sown to grain.

No land should be rolled after seeding if the surface is at all damp. The surface should be allowed to dry a few days before the roller is put on. Rolling in this way a few days or even two or three weeks after the grain is up, breaks the crust, forms a mulch, and so helps to conserve moisture, as already mentioned in preceding paragraph.

On light dry soils, rolling is an essential operation after seeding to insure quick germination of both grain and grass seeds. Here again, however, it is often advisable to roll a second time two or three weeks after the grain is up. This helps firm the soil and breaks the crust as before stated.

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