Moisture and Soil Fertility

[An Address given before the Convention of Agricultural Secretaries of Saskatchewan at Regina, by T. L. Guild, Field Representative

The Western Provinces of Canada have long enjoyed the reputation of being very fertile. This has attracted many to our land. Our heritage is attracting the attention and admiration of many at the present day as the land of opportunity. Success at farming has come to those who have followed some of the fundamental laws connected with their profession. Little attention or thought was given to maintaining the fertility in the soil. The idea was prevalent that the soil would produce indefinitely, but this idea has proven to be erroneous. Not only by theory, but in actual practice it has been shown that altho our soils are rich in plant food, it could not be drawn from without depleting the store, that at some stage sooner or later a time would be reached where crops would not yield as high as formerly. So when we have already experienced this, when our foremost agricultural specialists know that a bushel of grain represents so much nitrogen, potash, phosphoric acid, etc., it behoves us to pay attention, to awaken and to realize that we have to stop this depletion if we wish to remain as successful agriculturalists. In returning these elements, we can do so by applying special manures, but this is only recommended in rare cases on account of the expense. We can assist by ploughing under green manures, by growing leguminous crops, all good in themselves, but it can be more economically done by applying barnyard manure—a complete manure—complete because it contains these three necessary elements. When you have sufficient stock to add those necessary elements to the land by manuring, and the growing of fodder, root and grass crops, it is then that your business will be on a more permanent basis, in so far as the fertility of the soil is concerned. But no matter how fertile our soil is unless we get moisture; unless we get sufficient rain we will always be at a disadvantage in growing crops.

Water Requirement of Crops

Let us look for a moment at the amount of water that crops require. The amount varies, of course, but on the average it is 750 pounds of water per pound of dry matter. For every pound of wheat, it takes 750 pounds of moisture to produce that 1 pound of dry matter. As one bushel of wheat weighs 60 pounds, this would bring the amount of water to produce one bushel of wheat up to 45,000 pounds. But this only allows for the grain, and as it takes almost as much to produce the straw, this would require 90,000 pounds of water to produce one bushel of wheat, including the straw. Bringing this figure to tons, we can count upon at least 45 tons of water. This seems a tremendous amount of water, and when you consider that from 20 to 40 bushels of wheat are grown per acre, the amount of water required to produce it is almost beyond belief. But in figuring out the amount of rain that falls in a season, the highest percentage falling during the growing season, and knowing the relation of water that falls in tons, we find that a considerable number falls in our annual precipitation. One inch of water over an acre of land weighs 226,875 pounds, which is equivalent to over 113 tons. With a rainfall of 10 inches, this would mean 1,130 tons and sufficient to produce 25 bushels per acre. With twice that amount of rain, some districts enjoy an annual precipitation of 20 inches, hence, according to our computation, we would receive 50 bushels per acre. But we know that with the best known methods of tillage it is not possible to save all the rain that falls, so that altho we know approximately the amount of water it takes to produce a pound of dry matter and the amount that falls per year, yet there are so many ways that this water can escape from us that we cannot get the results we might wish. We can do much, however, to minimise the waste of water and it is necessary and imperative for our success as dry farmers to hold all the moisture in the soil we can for crop production.

Principles of Soil Management

The first requisite of soil management is deep ploughing. This may be done in the fall or during summer-fallowing. In ploughing deep we make the soil loose and porous, it will take more water to saturate that depth of soil than it would take to saturate a soil that was only ploughed to half that depth. It therefore stands to reason that the more water we can get the soil to hold, instead of allowing it to drain away, the better we are going to be. If the subsoil is in a receptive condition; if it is moist, the water is going to go downward and be stored there for future use. Many experiments have been conducted with soil moisture and they all prove this contention. A soil may be ploughed deeply 6 to 8 inches and yet not be in a condition to allow water to enter the subsoil. Land ploughed year after year at a certain depth may form a hardpan, or this may be due to the texture and structure of the soil. In any case it should be loosened and to remedy this the subsoil plough is very efficient, altho it is rather an expensive operation. The growing of deep and coarse rooted plants, by following a suitable rotation, is very good in improving such soils. It is also claimed by some exponents that the ploughing of that field with a disk plough, which leaves a corrugated bottom, allows more moisture to enter the soil than if it was ploughed with the ordinary mould board plough. Thus by these three methods the hard pan can be removed.

To Retain Moisture

We now have the soil in a position to hold a great deal more moisture than it previously did and the question is, how shall we hold it? There are three ways that water will escape from our control. First, by seepage, but in dry arid climates such as that of Saskatchewan, it is very rare that any is lost this way. The next way we lose water is by evaporation from the soil. This evaporation occurs from the first 12 inches. Evaporation directly caused by the sun does not occur to any extent below the first foot of soil. Now it is necessary for us to save all the moisture possible and a great amount that has been lost thru the surface soil by evaporation could have been prevented if proper methods had been employed. It is known that very dry soils and water have not an affinity for each other. This can easily be seen in a sandpit; scrape off 2 inches of soil and you come to moisture. After a rain the top soil dries off so quickly that the capillary action is not fast enough to send the moisture up to meet the demand. The top soil gets drier and drier until there is a repulsion. The initial evaporation was great, but now the condition is reversed. The maximum amount of moisture is retained with the minimum amount evaporating. This is exactly what occurs with our great sand areas, the hot scorching winds automatically seal the moisture below. To get this condition in soils other than sand is not so easy. We cannot get land containing a high percentage of clay to dry out so fast; the consequence is that it does not arrive at that stage where there is repulsion and the moisture escapes steadily in a constant vapor if conditions are favorable. But by forming a mulch; by having a more or less loose coating of earth from 3 to 5 inches in depth, bringing it to that state by cultivation, harrowing, discing, etc., and by stirring this and getting it dried quickly, we can hold our moisture. This is the only mulch that is practicable for our present farming conditions, any others are suitable only for market gardening and truck farming.

Moisture Evaporation

The conservation of soil moisture depends upon the vigorous stirring of the soil. Cultivation, cultivation and more cultivation should be the war cry of the dry farmer, says one authority, but this cannot be done without using reason. Every district suffers from land blowing, the best soil, humus and organic matter is blown away to the great detriment of the farmer, and what is of great importance today is that the farmer should grow crops that will place fibre in his soil. But even with good cultivation, with deep ploughing, keeping a moist subsoil and having an effective dust mulch, we might easily have relatively poor crops in certain soils. You know

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