To conserve Moisture.

This is one of the most important features of tillage. Moisture in the soil may be in two forms—free water, which is injurious, and can be removed by underdrainage, and capillary moisture. It is in the latter form that moisture is available to plants, and this is the form which our cultivation is intended to conserve. This capillary moisture is essential to the proper chemical action in the soil. Without it plant-food cannot be brought into the necessary soluble form. In dry seasons commercial fertilizers usually give very small returns on this account. All plants contain a high percentage of water, most of them over 60 per cent. of their total weight. While this amount seems large, it is small compared to the quantity evaporated from the leaves of the plant during the progress of growth. Measurements at the various experimental stations show that the evaporated water is several hundred times the weight of the dry vegetable substance produced, varying from 225 to 912 times the weight of the mature dry plant and its crop. From this the importance of an adequate supply of moisture is apparent. Not only is the water necessary as a part of the composition of the plant and for evaporation, but moisture in the soil is necessary if plants are to grow at all. Plant-food is not available, except in a very dilute solution. Practically all the moisture used up is absorbed in this dilute form through the root-hairs of the plant.

Two types of water are mentioned above—free water, which is subject to gravity, and capillary water, which is not. Part of the water which falls as rain enters the soil, the portion that runs off varying with the character of the rainfall and the absorptive power of the soil. On entering the soil, the water which is visible as water, and which flows down by force of gravity, is known as free or gravitational water. That which is retained by the soil-particles, and which is only apparent by the darkened colour of the soil, is capillary water. On it plants are dependent for both food and water. This water is held in a thin surface film around each soil-particle, and can be attracted from one particle to the other when the particles touch each other. When the surface soil becomes dry by evaporation, this water flows naturally to the dry surface particles from those below, so that there is always a slow continuous movement upward. This upward movement is illustrated in a small way by placing a large, dry clod of earth in a saucer of water, the upward flow becoming at once apparent. This process of upward movement and evaporation is continuously in operation in the soil, and the capillary water not absorbed by the roots of plants eventually evaporates in this way.

The free or gravitational water gradually sinks to its own level. A part of it escapes as seepage or drainage, and, as evaporation takes place from the surface, the free water becomes capillary water, and is so absorbed. The proportions of precipitation which become free or capillary vary with the soil. The greatest loss occurs in sand or gravel; the loams, humus, and clays are capable of absorbing the largest amounts of water.

The two essential points in conserving moisture are, therefore:—

(1.) To have the soil in that condition in which it will take in and absorb, as capillary moisture, the maximum amount of rainfall or irrigation.

(2.) When the water is in the soil, to practise those methods which will retain the greatest amount in available form.

The soil to absorb the greatest amount of moisture must be in a loose, friable condition. The amount of run-off is several times as great when the