THE RELATION OF CULTURAL TREATMENT OF CORN AND SOYBEANS TO MOISTURE CONDITION AND SOIL STRUCTURE

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IN ORDER to meet the increased need for oils in the “Food for Freedom” program, the acreage of soybeans in Iowa has been increased from 1,318,000 acres in 1941 to 2,241,000 acres in 1942, or an increase of 70%. Additional increases may be necessary in 1943. Fortunately, most of the soybean acreage is in the north central part of the state where the land is least subject to erosion. However, as the acreage is expanded, there is an increasing tendency for soybeans to be grown on rolling land, which may cause serious soil depletion through erosion unless precautionary measures are adopted.

It is recognized generally that a crop of soybeans leaves the soil loose and susceptible to erosion. Observations indicate that the entire soil area is loosened up if the soybeans are drilled solid, whereas under soybeans grown in rows and cultivated the looseness is confined largely to a narrow area in the row with the soil between the rows firm and compact. Little or no information is available to show how soybeans cause the soil to become loose and friable or at what time the loosening effect begins to be noticeable. Likewise, little is known regarding the practices that may be used to reduce soil erosion during the time when the soybeans are growing or after they are harvested. Studies were started early this year to obtain data to help answer some of these questions. Although the work has not progressed far enough to justify definite conclusions, it is believed that the data obtained to date may be helpful to other investigators who are working on similar problems.

Three factors may be primarily responsible for the looseness of the soil following a crop of soybeans. The second factor is the desiccating action of the plant roots. Soybeans make a very rapid growth during July and August when rainfall is deficient. The transpiration rate is also high during this period of rapid growth. Furthermore, the system of the soybean is less extensive than that of corn. There is therefore an unusually heavy drain on the moisture supply of a limited soil mass; consequently, the moisture content is reduced to a relative low level within this zone. Extreme desiccation in a manner yet to be explained has a loosening effect on the soil. Since the zone of rapid drying is located on the surface, the soil is frequently rewetted by small rains, only to be dried quickly by the high transpiration of roots. If repeated several times during the growing season, this phenomenon may have an effect on soil structure similar to that which has been reported from desiccation of the soil either by freezing and thawing or by the repeated application followed by drying.

The other factor that may contribute to the looseness of the soil following a soybean crop is an increase in aggregation resulting from decomposition of the tops, roots, and nodules. An increase in aggregation is usually associated with increased water retention, lower volume weight, decrease dispersion, and other properties that reduce the susceptibility of the soil to erosion. However, when the soil is loose and friable, as it is following a crop of soybeans, it takes up water rapidly until saturated, and the soil mass seems to flow down the slope. Loss of soil and water is excessive. This is a situation that exists when soybeans are harvested for seed and the residue is not returned to the surface. Recent widespread use of the combine is making it possible to return the residues to the surface.