The destruction of soil structure through mechanical manipulation in the field has been attributed to the depletion of soil organic matter \((2, 3, 5)\) or to the working of the soil at a moisture content not favorable for tillage or cultivation operation.

The detrimental effects of puddling on soil structure have long been known to agronomists. Puddling reduces the noncapillary porosity of the soil and thus affects the movement of both air and water. Chang \((4)\) observed that puddling increased the dispersion ratio and also reduced greatly the noncapillary porosity of the soil.

McGeorge \((5)\) reported that the working of the soil at the moisture equivalent produced the maximum destruction of the existing soil aggregates and reduced the apparent specific gravity of the soil.

Cultivation, today, is one of the most common cultural practices in agriculture. This particular cultural practice, so essential to the maximum growth of certain crops, eventually brings about a deterioration of the soil structure. Retzer and Russell \((8)\) reported that cultivation resulted in a highly significant decrease in the coefficient of aggregation of a prairie and a gray-brown podzolic soil. Bertramson and Rhoades \((1)\) noted that aggregation was reduced by 73% as a result of cultivation.

The experiment described in this paper was carried out with the object of investigating the effects of puddling and maximum tillage on soil structure and crop growth, as well as of studying the influence of rapidly decomposing mulch on the improvement of soil structure of the puddled soil and its effect on crop yield.

**METHODS AND MATERIALS**

The soil selected for the experiment was a Dunkirk silt loam which was under almost continuous cultivation for the last 10 years. It has about 17.4% clay less than 2 \(\mu\) and about 0.75% organic matter. The experiment was carried out in the field.

The entire area, prior to the lay out of the experiment, was plowed and harrowed twice in July, 1945. It was then divided into several individual plots each 6 feet by 4 feet. After this, the following treatments were applied, each replicated three times: (a) check, fallow and not puddled; (b) puddled and fallow, puddling consisting of working the soil, which was previously wetted with water artificially, with a hoe at the 0 to 0.5 inch depth of its surface; (c) puddled and mulched, puddling being done in the same way as before and mulching consisting of the incorporation with the immediate soil surface of wheat straw at the rate of 2.5 tons of dry matter per acre while the soil was still wet; (d) puddled and seeded, puddling being done in the same way as in treatment b and seeding consisting of fall sowing (August, 1945) of rye and vetch in rows when the soil was dry and workable so that as little of the surface soil as possible was disturbed during planting; (e) not

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2 Graduate Student. The author acknowledges his gratitude to Dr. M. B. Russell and Dr. R. Bradfield for their guidance and inspiration.
3 Figures in parenthesis refer to "Literature Cited", p. 330.