DEVELOPMENT OF A GROUND DRIVEN ROTARY SUBSOILER FOR CONSERVATION TILLAGE SYSTEMS

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ABSTRACT

Compacted soil hard-pans restrict crop growth by limiting root access to nutrient and moisture in the subsoil. Subsoiling is the main annual soil tillage practice for conservation systems which should be performed without excessively disturbing the soil surface. Various types of subsoilers are being investigated for this purpose. The objective of this study was to develop an effective subsoiler for conservation tillage systems that minimized soil disturbance and energy requirements. For these purposes, a ground-driven rotary subsoiler was designed and manufactured by dividing a 1.2 m diameter coulter into multiple shanks. Minimizing the sliding soil resistance on the side of the coulter was one of the main considerations in forming the shape of the shanks and the number of shanks. An experiment was conducted in the soil bins of the National Soil Dynamics Laboratory in Auburn, AL with different operating conditions to determine the effect of the subsoiler on soil disturbance and energy consumption. Treatments were three different subsoiler surface areas, which consist of different numbers of shanks (5, 7 and 9), different tilling depths (0.3, 0.4 and 0.5 m) and different forward speeds (5.4, 7.2 and 9 km/h). Soil cone index, bulk density and draft force were measured and statistical analysis was applied to obtained data.