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## Reducing Soil Compaction of Tennessee Valley Soils in Conservation Tillage Systems

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Inadequate rooting systems due to excessive soil compaction have prevented farmers in the Tennessee Valley region of northern Alabama from adopting conservation tillage systems. Cotton (*Gossypium hirsutum* L.) yields declined on many farms when conventional tillage systems were replaced with strict no-till systems. Experiments were initiated in 1994 to develop conservation tillage systems that incorporated in-row tillage and rye (*Secale cereale* L.) cover crops as methods of maintaining surface cover and alleviating extreme soil compaction conditions. Depth of in-row tillage [18 cm (7 in.) or 33 cm (13 in.)] and timing of tillage (fall or spring) were also investigated in this experiment. Cone index measurements taken in the spring and fall of 1997 prior to tillage and bulk density measurements taken in fall 1998 immediately after harvest were used to examine changes in soil condition resulting from several years of experimentation. The results showed reduced cone index and bulk density from either shallow or deep in-row tillage performed in the spring or fall of the year. Although fall measurements in no-till plots showed no effect of cover crops, the spring measurements of cone index were reduced substantially by the use of cover crops, most likely due to increased soil moisture. Therefore, reduced soil compaction beneath the row to depths adequate to sustain proper root growth was achieved by either shallow in-row tillage and/or cover crops.