

# For More Soybeans, Dig Deep

**S**oybeans are becoming an economically important crop in the Mid-south. However, many soybean crops don't yield enough for growers to make a decent profit. The culprit: clayey soils.

Clay soils make up about 50 percent—some 9.5 million acres—of the land in the lower Mississippi River alluvial floodplain, which extends from Cape Girardeau, Missouri, through Louisiana to the Gulf Coast.

Farmers find these soils often hard to manage. When water is lacking, the clay shrinks and cracks, damaging the plant's existing root system and subjecting it to severe stress that shrinks yield.

Agricultural engineers Richard A. Wesley and Lowrey A. Smith, who are in the ARS Application and Production Technology Research Unit at Stoneville, Mississippi, have found the cure for farmers' soybean blues. In dryland production systems, they found that using subsoiling—a type of deep tillage—to a depth of 12 to 16 inches in the fall, when the soil profile is dry, produces higher soybean yields.

Current recommendations for soybean production on heavy clay soils call for tillage down only to 4 to 6 inches.

"Clay soil is like building blocks stacked together," says Wesley. "When it dries, it forms a blocky structure with large cracks between, representing the weakest part of the soil profile. Deep tillage breaks up and rearranges the structural blocks that occur below the surface."

With subsoiling, the tool penetrates the soil's blocky structure, creating areas of loose soil and large pores without



Soybeans ready for harvest.

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## Subsoiling Boosts Yields, Protects Soil in Clayey Areas

disturbing crop residue on the soil surface. Subsoiling allows water to infiltrate the lower regions of the profile quickly, where more is stored than would be without subsoiling. This additional water-holding capacity contributes to higher yields and environmental bonuses: less runoff, less erosion, and less sediment in lakes and streams.

Most importantly, since subsoiling doesn't destroy crop residues on the surface and probably is not required every year, the practice is compatible with conservation tillage.

In a 5-year study conducted on Tunica clay with both optimal and extremely dry seasonal weather, Wesley and Smith

found that soybeans planted in the deep-tillage system without irrigation produced, on average, 43 bushels per acre—compared to a conventional tillage system that produced 29 bushels without irrigation and 45 bushels with irrigation.

Net returns, however, were \$129 an acre from non-irrigated deep tillage, compared to \$48 from nonirrigated conventional production and \$83 from the more costly irrigated system. "This was a huge return for soybean farmers," says Wesley.

Smith conducted similar studies with cotton, though it was previously thought that deep tillage of clay soil planted to cotton was not beneficial.

"Many of those studies were done in the spring when the clay was still wet from rain," says Smith. "Cotton, like soybeans planted on fall deep-tilled clay soil, also makes significant yield improvements."

"This production practice will give Midsouth farmers a chance to produce a high-yielding crop on perceived inferior soils," says Wesley.—By **Tara Weaver**, ARS.

*This research is part of Soil Quality and Management, an ARS National Program described on the World Wide Web at: <http://www.nps.ars.usda.gov/programs/202s2.htm>.*

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