NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

DEEP TILLAGE

(Acres)
CODE 324

DEFINITION

Performing tillage operations below the normal tillage depth to modify the physical or chemical properties of a soil.

PURPOSES

This practice may be applied as part of a conservation management system to support one or more of the following:

- Fracture restrictive soil layers.
- Bury or mix soil deposits from wind or water erosion or flood overwash.
- Reduce concentration of soil contaminants, which inhibit plant growth.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to land where adverse soil conditions in the root zone such as restrictive layers, deposits from flooding, or contamination inhibit plant growth and development. Restrictive layers include traffic or plow pans, clay pans, or fragi pans or hot spots.

This standard includes tillage operations referred to as deep plowing, subsoiling, chiseling, ripping, or vertical mulching performed at regular intervals below the normal tillage depth.

CRITERIA

General Criteria Applicable to All Purposes

Deep tillage operations should be performed in late summer and fall when soils in Louisiana are normally their driest. Ideally, soil moisture should be less than 30% of field capacity at the maximum depth to which tillage will be performed.

Additional Criteria to Fracture Restrictive Soil Layers

Deep tillage shall be performed when soil compaction tester readings exceed 300 psi or the soil is difficult to penetrate with a firm wire (survey flag) or welding rod (18”long).

Tillage equipment shall be designed and constructed to operate at least one inch deeper than the depth of the restrictive layer. Chisel plows are sufficient to depths of 12 – 16 inches. Subsoilers are needed for depths greater than 16 inches. Fracturing shall be sufficient to permit root penetration below the restrictive layer.

Chisel or subsoiler shanks should not be set more than 40 inches apart, except for surgarcane (70 –72 inches). The fractured zone does not need to extend to the row middles and should be limited to the area near the rows. For row crops,

run chisels or subsoilers parallel to row
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direction either in or under the old bed. For crops drilled or broadcast planted, total tillage zone fracturing may be desirable. Make the second pass at right angles to the first.

Additional Criteria to Bury or Mix Deposits From Water Erosion or Flood Overwash

Tillage implements such as mold board plows, disk plows, or chisels with twisted points shall be used to reach the depth necessary to mix sediment or overwash thoroughly into the soil.

The tillage operation shall uniformly mix soil 6 inches deep or 2 times (2 X) the depth of the overwash, which ever is deeper, to achieve a desirable available water holding capacity (AWC) and to break the hydrologic barrier caused by an overwash layer.

Additional Criteria to Reduce Concentrations of Soil Contaminants Which Inhibit Plant Growth

Tillage implements such as mold board plows, disk plows, or chisels with twisted points shall be used to incorporate contaminated soil to the desired depth.

The depth of contamination should be confirmed by sampling soil in 3 inch increments to a depth of 18 inches. The tillage operation should mix a sufficient amount of uncontaminated soil with the contaminated soil so that the concentration of the contaminant is below the crop tolerance level. Crop tolerance levels will be in accordance to LSU Agricultural Center guidance and recommendations.

The soil contaminant shall be uniformly mixed throughout the deep tillage layer.

CONSIDERATIONS

Where restrictive layers are a concern, the effects of this practice can be enhanced by including a deep rooted crop in the rotation which is capable of penetrating the restrictive layer.

Tillage excessively deeper than necessary does not increase yield, requires excessive amounts of energy, and increases compaction caused by vehicle traffic.

Develop a permanent row pattern where feasible to facilitate use of a controlled traffic system to reduce the amount of vehicle traffic and to restrict it to certain areas of the field.

When infertile flood overwash is mixed into the soil profile the rebuilding process can be enhanced by the addition of manure or green manure crop. Rotations including high residue crops and tillage systems which minimize residue loss can also expedite this process.

If overwash material is greater than 6 inches thick, it should be redistributed to a uniform depth to facilitate thorough mixing into the soil profile.

Where undesirable elements such as aluminum, manganese or sodium are within the anticipated deep tillage depth and could be brought to the surface by the deep tillage operation, this practice should be avoided.

It is best to use chisels and subsoilers equipped to operate in heavy residue so that disking will not be required prior to deep tillage. When deep tillage is practical in the fall, it is important to leave at least 30 percent of the residue on the surface of the soil to reduce sheet and rill erosion.

Avoid tillage operations when soil moisture is greater than 50 percent of field capacity.

Avoid deep tillage of row middles or crops which are frequently harvested during inclement weather (sugarcane).

Follow NRCS national policy and state operating procedures if application of this practice has the potential to impact cultural resources.

Large tractors with ample horsepower are needed to limit wheel slippage and ensure uniform depth of shattering. Parabolic and low-angle subsoilers require 20 percent less horsepower and result in 40 percent less slippage of the tractor tires than straight shank implements.

PLANS AND SPECIFICATIONS

Specifications for the establishment and operation of this practice shall be prepared for each applicable field and recorded in narrative statements in the conservation plan according to the criteria, considerations, and operation and maintenance put forth in this standard.

Refer to Louisiana Job Sheet – Agronomy 35 (Revised 10/96) for additional information.

OPERATION AND MAINTENANCE

Deep tillage for reduction of soil compaction shall be performed whenever compaction problems re-occur (soil compaction tester readings >200 psi).

Where deep tillage has been performed to reduce concentration of soil contaminants, the contaminant level in the root zone shall be monitored by labaoratory analysis to determine when or if treatment will be re-applied.