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Terminology and Definitions for Soil Tillage and Soil-Tool Relationships



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ASABE, 2950 Niles Road, St. Joseph, MI 49085-9659, USA, phone 269-429-0300, fax 269-429-3852, hq@asabe.org

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Proposed and developed by the ASAE Cultural Practices Equipment Committee, with assistance by the ASAE Conservation Tillage Methods Committee, and by the Soil Effects Subcommittee of the Society of Automotive Engineers' Construction and Industrial Machinery Technical Committee and the Tillage Terminology Committee of the Soil Science Society of America; approved by the ASAE Power and Machinery Division Technical Committee: adopted by ASAE as a Recommendation June 1965; reconfirmed December 1970; revised June 1972; reconfirmed December 1976; reclassified as an Engineering Practice June 1978; reconfirmed December 1981, December 1986; revised August 1988; reaffirmed December 1993, December 1998, February 2004; revised February 2005; editorial revision and reaffirmed February 2009; reaffirmed November 2013.

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1 Purpose and Scope

1.1 The purpose of this Standard is to provide uniform terminology and definitions for soil tillage and soil-tool relationships in the production of food and fiber.

1.2 This Standard is intended to be consistent with terminology in other ASAE standards including ASAE Standard S414.1, Terminology and Definitions for Agricultural Tillage Implements, and ASAE Standard S477, Terminology for Soil-Engaging Components for Conservation-Tillage Planters, Drills and Seeders.

2 Basic Tillage Goals

2.1 Tillage action: The action of a tillage tool in executing a specific form of soil manipulation such as soil cutting, shattering, or inversion.

2.2 Tillage objective: The desired soil condition produced by one or more tillage operations.

2.3 Tillage requirement: The soil physical condition which can be produced by tillage and is necessary based on utilitarian and/or economic considerations.

3 General Tillage Terms and Kinds of Tillage

3.1 overall tillage: Tillage of an entire area as contrasted to partial tillage as in bands or strips.

3.2 cultivation, soil: A shallow tillage operation performed to promote growth of crop plants by creating a soil condition conducive to aeration, infiltration, and moisture conservation or to pest control.

3.3 earthmoving: Tillage action and transport operations utilized to loosen, load, carry, and unload soil.

3.4 land forming: Tillage operations which move soil to create desired soil configurations. Forming may be done on a large scale such as contouring or terracing, or on a small scale such as ridging or pitting.

3.4.1 land grading: Tillage operations which move soil to establish a desired soil elevation and slope. Examples: leveling, contouring, cutting, and filling.

3.4.2 land planning: A tillage operation that cuts and moves small layers of soil to provide a smooth, refined surface condition.

3.5 rotary tillage: A tillage operation employing power-driven rotary action to cut, break up, and mix soil.

3.6 tillage: The mechanical manipulation of soil for any desired purpose, but in agriculture the term is usually restricted to the changing of soil conditions for the enhancement of crop production.

3.7 tillage depth (tool depth): Vertical distance from the initial soil surface to specified point of penetration of the tool.

3.8 tillage, deep: A primary tillage operation which manipulates soil to a greater depth than 300 mm. It may be accomplished with a very heavy-duty moldboard or disk plow which inverts the soil, or with a chisel plow or subsoiler which shatters soil.

3.9 tillage, primary: That tillage which constitutes the initial major soil-working operation. It is normally designed to reduce soil strength, cover plant materials, and rearrange aggregates.

3.10 tillage, secondary: Any of a group of different tillage operations, following primary tillage, which are designed to create refined soil conditions before seeding to create specific soil surface configurations or to control weed growth.

4 Tillage Systems

4.1 Conventional tillage: Tillage operations traditionally performed in preparing a seedbed for a given crop and grown in a given geographical area.

4.2 Minimum tillage: The least soil manipulation necessary for crop production or for meeting tillage requirements under existing soil conditions.

4.3 Optimum tillage: An idealized system which permits a maximized net return for a given crop under given conditions.

4.4 Intensive tillage: Any tillage or seeding system that maintains less than 15% residue cover on the soil surface after planting or maintains less than 560 kg/ha (500 lb/acre) of small grain residue equivalent on the soil surface during the critical erosion period (see also paragraphs 4.5 and 4.6).

4.5 Reduced tillage: Any tillage or seeding system that maintains 15–30% residue cover on the soil surface after planting or maintains 560–1100 kg/ha (500–1000 lb/acre) of small grain residue equivalent on the soil surface during the critical erosion period - or is a system which consists of fewer or less energy intensive operations compared to conventional tillage (see also paragraphs 4.1, 4.4, and 4.6).

4.6 Conservation tillage: Any tillage or seeding system that maintains a minimum of 30% residue cover on the soil surface after planting to reduce soil erosion by water; or where soil erosion by wind is the primary concern, maintains at least 1,100 kg/ha (1,000 lb/acre) of flat small grain residue equivalent on the soil surface during the critical erosion period (see also paragraphs 4.4 and 4.5).

4.7 No-till: A system where crops are grown in narrow slots or tilled strips in previously undisturbed soil. Soil disturbance is typically limited to that required for placement of fertilizer and/or seed, for clearing residue from the seed row and to no more than one third of row width. Plant residue is maintained on the soil surface year-round.

4.8 Strip tillage: A system where crops are grown in narrow tilled strips in previously undisturbed soil. Seedbed preparation, planting, and fertilizer placement disturb no more than one third of row width. Plant residue is maintained on the soil surface year-round.

