

T1.15 SOIL PROCESSING

What is this?

Soil processing can be represented by two main activities - cultivating and tilling. *Cultivation* is taken as a narrower concept and is associated with creating seedbeds in the soil suitable for sowing and planting crops. In contrast, *tillage* is taken as a concept that includes a range of functions related to soil *cultivation*.

Some additional information...

Cultivation and *tillage* are activities aimed at changing and improving the condition of the soil. Initially, *tillage* is associated with creating better conditions for crop establishment. However, this is far from exhausting the functions of the process. By tilling the soil, it is possible to achieve a change in the structure (by applying fertilisers, liming, and other necessary operations), control plant residues and the degree of weediness, and minimise some climatic and soil limitations. Each of these activities is subject to realization through different operations, and their combination and synchronisation are called a *tillage* system.

The traditional aims of *tillage* are to improve soil structure for crop growth, incorporate organic amendments into the soil, and control weeds. The use of herbicides can often meet the last goal, and this has led to the development of no-tillage systems, where *tillage* is confined to soil disturbance associated with crop seeding or planting. Soil *tillage* is also involved in soil-water conservation and regulation and soil-erosion control. The role of *tillage* in soil structure improvement has various facets related to crop growth and productivity. *Tillage* is conducted to improve soil functions such as water and air regulation and flow, enhance the soil's water-storage capacity, and create a desirable aggregation size distribution conducive to crop seed-soil contact. *Tillage* is often needed to increase soil-water infiltration and, thus, to improve soil drainage.

Tillage consists of breaking up and stirring the surface soil layer to prepare it for sowing and growing different crops. *Cultivation* of the soil can be done manually, with the help of implements such as shovels, hoes, rakes, etc., by using draft animals or by machine *cultivation*. *Tillage* includes various operations such as ploughing, rotary *tillage*, rolling, harrowing, and *cultivation*. *Cultivation* here refers to shallow, narrowly targeted secondary *cultivation* of row crop fields that kills weeds but spares crop plants.

In addition to mixing the concepts of *tillage* and *cultivation*, there is also an intertwining of tilling and *plowing*. In principle, *plowing* is a type of *tillage*, but it refers to a more intensive way of tilling the soil. It involves deeper turning and mashing of the soil, which exposes the soil beneath the topsoil, brings new nutrients to the surface, and buries the residues of previous crops, allowing them to decompose.

Although well-cultivated soil is a prerequisite for good results from cultivated crops, it is necessary to be careful with the amount and type of treatments. *Tillage* above what is needed gives rise to many problems such as compaction, reduced moisture holding capacity, too rapid drying in muddy soils, bringing to the surface a soil layer that has not yet recovered, etc.

From the point of view of frequency, the specialists recommend tilling the soil once or



Source:

<https://www.producer.com/crops/precision-prescription-technology-for-tillage/>

twice a year. From the point of view of the tilling type, the following types are distinguished: *Primary tillage* - to provide an appropriate depth of soft soil, bury food residues, kill weeds, and enrich the soil with air.

Secondary tillage - it is related to the application of fertilizers, finer processing, surface leveling, or weed control.

Reduced tillage - leaves a cover of plant residues on the soil within 15 to 30%.

Intensive/conventional tillage - leaves less than 15% crop residue cover.

Conservation tillage leaves at least 30% of plant residues on the soil surface. The goal is to prevent soil erosion by slowing the movement of water. In addition, this treatment has a good effect on pest control, reduces soil compaction, and saves costs. The main disadvantage is the delay in warming the soil in the spring, which leads to the later sowing of crops. Subtypes of *conservation tillage* are no-till, strip-till, mulching, and technologies.

The so-called *zone tillage* is a modern alternative to both conservation and conventional processing. Only a strip with a width of 10-12 cm is processed, which simultaneously achieves the advantages of conservation agriculture but achieves better aeration and warming of the soil right at the place of sowing the seeds.

The introduction of precision technologies in agriculture also affected soil *cultivation* processes. Highlights of today's machine-oriented software and *tillage* management include



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data collection and processing and their mapping, enabling fine-tuning decisions on where and what *tillage* to be carried out according to soil characteristics and conditions.

The main parameters subject to monitoring and control are the depth and intensity of *tillage*. Farmers now have the option of *variable depth tillage*, which increases work speed, reduces wear and tear on machinery, and results in fuel savings. Pre-set parameters for performing operations allow automatic adjustment of the machine for every aspect of *tillage*. The technology increases the quality of the processing performed, as it limits the potential errors of the human factor.

The collection and accumulation of a database allow the farmer to analyse the rich agronomic information gathered in the tilling process and accordingly make informed decisions about the necessary actions during the rest of the growing season and for the next economic cycle.

Links

<https://www.sciencedirect.com/topics/earth-and-planetary-sciences/cultivation>

<https://en.wikipedia.org/wiki/Tillage>

<https://blog.gardeningknowhow.com/gardening-pros-cons/tilling-advantages-vs-no-till-advantages/>

<https://backyardhomesteadhq.com/the-14-real-pros-and-cons-of-tilling-your-garden/>

<https://gonzalesequipment.com/tilling-vs-plowing/>

<https://www.producer.com/crops/precision-prescription-technology-for-tillage/>

<https://www.agriculture.com/machinery/tillage/the-advancement-of-precision-tillage-technology>

<https://www.bdschapters.com/webshop/a-z-chapters/p/precision-tillage-systems/>

Video

<https://www.youtube.com/watch?v=IAO0fD82MzI&t=6s>

<https://www.youtube.com/watch?v=t9TR87Do6hA>

Keywords

Tillage

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Secondary tillage



Reduced tillage

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