

No-Till Farming in Agroforestry

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Introduction

Tillage is an ancient farming technique that involves agitating the top layer of soil by digging, stirring, or overturning to prepare farming areas for propagation of new crops. Typically, this is done using a plow or hoe. The process of tilling soil is an important step for farmers as it aids in preparing seedbeds, controls weeds, and aerates soil. Though mechanical tilling has been a technique used for many years, farmers are seeing environmentally negative effects from it in terms of soil, water, and crop conservation.

Because of this, farmers have adopted a new farming technique that encourages agricultural activity. No-till is a farming system that plays an important role in agricultural conservation. Originating in the United States in the 1960s, no-till farming was proven through research to be successful in crops that grew in sloping, well-drained soils, and overtime the technique became widely used on all soil types (Islam and Reeder, 2014).

What is No-Till Farming?

No-till farming systems involve planting seeds directly into undisturbed or untilled soils to benefit the environment and climate (Bertrand, Roberts, and Walker, 2022). No-till farming practices agricultural conservation. The approach enables crop residues to protect soils from wind and water erosion. Through this system, seeds are planted in a narrow slot trench using the appropriate width and depth to properly cover the seed (Gattinger, Jawtusch, Muller, and Mader, 2011).

Advantages of No-Till Farming

Less Soil Erosion

Soil erosion is essentially caused by wind and water, which remove crucial nutrients from the topsoil and reduce crop yield overtime. No-till farming encourages the soil to be more resistant to erosion. In a study done by doctoral student Sanghyun Lee, no-till farming significantly reduces soil erosion and sediment yield by more than 70 percent (Stein, 2021).

Better Water-Holding Capacity of Soil

Soil health plays an important role in its water-holding



Figure 1

Young soybean plants thrive in the residue of a wheat crop on non-tilled soil. Source: [RegenerationInternational.org](https://regenerationinternational.org)

capacity. When soil is healthy, the rate at which it can hold water is higher. Soils remain intact so root channels can infiltrate and store water. This allows for soils to be able to absorb water during heavy precipitation and drought.

Less Carbon Dioxide Released from Soil

When carbon is held in the soil, it prevents its release as greenhouse gas emissions (Gattinger, Jawtusch, Muller, and Mader, 2011). Because no-till farming does not utilize tractors to plow soil, it allows soils to retain carbon and also reduces the need for fossil fuel to power machinery.

Improved Soil Health

When soil is repeatedly churned using plowing or digging, the natural soil structure is disrupted, and previous crop debris is buried below the surface. No-till farming allows for crop residues to remain on the soil and decompose naturally on the soil surface, which provides organic matter and creates a healthier field ecology (Exapta Solutions Inc., 2022). Soil that is constantly agitated also makes the soil more vulnerable to compaction.

Reduces Need for Fuel and Labor Costs

No-till farming reduces the need for fuel-powered machinery that is necessary for conventional tilling. In turn, this saves the farmer in fuel, equipment, and labor-related costs.

Disadvantages of No-Till Farming

- Conventional tilling helps mechanically with weed control, and adopting no-till farming may increase the use of chemical herbicides.
- Initial costs of no-till equipment can create major

drawbacks when making the switch from conventional tilling to no-till farming practices. Additional equipment may be needed to penetrate the soil to plant seeds.

- Gullies may become a problem overtime as soil becomes deeper. Conventional tilling allows for gullies to be smoothed out and drains excess water.
- Adapting to no-till farming takes time and can be a learning curve for farmers. Essentially, it could take 3-4 years to see greater yields in crop production because the soil needs to recover to its natural structure.



Figure 2
Comparison of no-till soil (left) and compacted, tilled soil (right).
Source: [NoTillAgriculture.com](https://notillagriculture.com)

Pros and Cons of Tilling vs. No Tilling		
	Pros	Cons
No-Tilling	• Reduces soil erosion • No soil disturbance of substance • Increases soil organic matter • Uses less fuel and labor expenses • Higher water-holding capacity • Improves soil health	• May require heavy-duty planters to penetrate soil • Does not break up pest cycles • Can develop herbicide resistance overtime
Conventional Tilling	• Loosens soil and incorporates crop residue to improve cash crops • Increases soil porosity allowing soil to be aerated • Controls weed growth • Integrates fertilizers into soil at a better rate	• Requires field operations and labor efforts • Leaves soils vulnerable to erosion • Can bury carbon and increase carbon storage

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