

## STRIP TILL: AN ECONOMIC ALTERNATIVE FOR THE HUNGARIAN AGRICULTURE

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### Abstract

Strip till is a preserving, energy and cost efficient seedbed making and nursing technology that – compared to traditional solutions – has many advantages. The method has been widely used in the US for several decades and KITE takes credit for introducing and propagating it in Hungary. The paper sums up both the pros and cons of this method giving a good understanding of some of the experience domestic users encountered so far. According to that, the biggest advantage is the propellant savings: in case of different soil types these were above 50% (11% on cost and 41% on labour) compared to traditional tillage. The article also points out that agro-technical and economic advantages are traceable in case of both early and late plants like corn and sunflower. The initial favourable American and domestic experience proves the adaptation of strip till to be successful resulting in a process innovation with several farming advantage.

### Keywords

innovation, global position system, strip till, technical development.

### 1. Introduction



Figure 1. Basic components of a typical strip-till unit include: (1) opening coulter; (2) residue managers; (3) mole knife/NH<sub>3</sub> injector; (4) covering disks; and (5) seedbed conditioner. (Photo courtesy of Yetter Manufacturing, Hagenstaller, 2103)

Strip tillage is a form of conservation tillage in which only the row zones are tilled, leaving the 9- to 12-inch inter-row zone undisturbed. The soil is not ploughed. It combines the soil drying and warming benefits of conventional tillage with the soil-protecting advantages of no-till by disturbing only the portion of the soil that is to contain the seed row. This type of tillage is performed with special equipment (Figure 1) and can require the farmer to make multiple trips, depending on the strip-till implement used, and field conditions

Typical equipment requirements for strip-till include a heavy tool bar to which row markers, opening coulters, knives and covering disks are attached. Rolling harrow baskets and other seedbed conditioner attachments are often added to the back of the unit as well.

### Benefits of strip till

Strip till warms the soil, it allows an aerobic condition, and it allows for a better seedbed than no-till. Strip-till allows the soil's nutrients to be better adapted to the plant's needs, while still giving residue cover to the soil between the rows. The system will still allow for some soil water contact that could cause erosion, however, the amount of erosion on a strip-tilled field would be light compared to the amount of erosion on an intensively tilled field. Furthermore, when liquid fertilizer is being applied, it can be directly applied in these rows where the seed is being planted, reducing the amount of fertilizer needed while improving proximity of the fertilizer to the roots.

Compared to intensive tillage, strip tillage saves considerable time and money. Strip tillage can reduce the amount of trips through a field down to two or possibly one trip when using a strip till implement combined with other machinery such as a planter, fertilizer spreader, and chemical sprayer. This can save the farmer a considerable amount of time and fuel, while reducing soil compaction due to few passes in a field. With the use of GPS-guided tractors, this precision farming can increase overall yields. Strip-till conserves more soil moisture compared to intensive tillage systems. However, compared to no-till, strip-till may in some cases reduce soil moisture.

The specific advantages of strip tillage include the following:

- Equal or greater crop yields
- Increased profit through elimination of several tillage operations
- Reduced labor, fuel, and fertilizer costs
- Reduced nutrient loss to runoff and leaching

- Reduced soil erosion and soil compaction
- Increased water savings
- Reduced soil temperature (Figure 2) [1]

## 2. Experimental session

At the site in which dry edible beans were grown in 2011, soil temperature sensors were installed at about 4-inch depth in the inter-row zone in order to determine whether or not the residue from the strip tillage would keep the soil cooler. Assuming that the locations where the sensors were installed were representative of the entire field, the conventional tillage consistently reached higher temperatures than the strip tillage between the months of June and September (Figure 2). The soil at 4-inch depth in the conventional tillage area was 4 to 6°F hotter in the early afternoon than with strip-tillage residue growing dry beans. All other things being equal, cooler temperatures should result in decreased evaporation and, ultimately, higher soil moisture. This is especially advantageous for shallow-rooted crops such as dry beans, whose roots do not reach the deeper soil moisture [1].

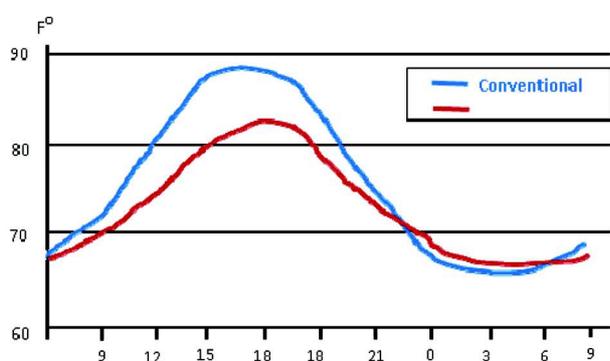


Figure 2. Average daily temperatures at 4-inch depth under conventional and strip tillage for a typical day [1]

### Practical experiences

Mark Kimmel a Nebraska(USA) farmer says:

“Since going strip-till, we’ve cut our fuel use by 60% vs. our old conventional-tillage program. We’ve cut at least three tillage passes, and the time savings is huge.”

“Out here, the wind is blasting our sandy loam soils all the time,” Kimmel says. “Strip-tilling leaves more residue to protect the soil, especially in our corn-on-corn fields.”

Kimmel says he believes that strip-tilled corn yields more than corn grown with conventional tillage, but says that better hybrids also account for yield increases, too. The yield advantage definitely shows up in sugar beets [2].

Károly Józsa is a farmer in Kiskunlacháza (Hungary). He has already been using an Orthman equipment for several years (Figure 3).



Figure 3. The main components of Orthman 1tRIPr equipment (Photo by István Husti)

Based on his experiences he says:

‘His experiences from 2013 also justify the advantages of strip till and conventional tilling, since compared to traditional tilling, water didn’t stay as much on the surface of the land that was cultivated using the former technologies. The surface of the areas not ploughed is covered with residues that help absorb spring rainwater as well as playing a role in keeping the moisture in. In the previous years we experienced that water stayed in the rut after a sudden rainstorm on a sugar beet area that was ploughed, while we could work on areas cultivated through conventional tilling because the cultivated land absorbed the water thus didn’t hinder our work.’

‘According to our latest observations we managed to save almost 10 liter/ha on fuel compared to traditional tilling. On top of that we can mention the savings on second operations of fertilizer spilling as well as additional advantages like the decrease of soil treading. Related to this the operation cost in case of traditional tilling were 16-17 thousand HUF/ha while that of conventional tilling was around 11-12 thousand HU/ha. Considering that the area for conventional tilling was 250 hectare, this fact resulted in a saving of 1 million 250 thousand HUF while the outputs were similar.

Based on our calculations, the amount invested in creating the condition system for conventional tilling would pay back in 4-5 years.’ [3]

## 3. The economic aspects of strip till

With fuel prices soaring, producers may want to look to strip tillage as an option to save fuel, time, and money.

Norberg’s [4] data (Table 1) according to 2007, but these information could be relevant and useful today, as well.

Table 1. Reduced Costs

Reduced Costs			
	Labor and Machinery	Herbicide and Fuel	Total
Disking		\$13.25	\$13.25
Plowing		\$27.00	\$27.00
Disking		\$13.25	\$13.25
Groundhog		\$12.50	\$12.50
Total1		\$66.00	
Added Costs			
Spraying Glyphosate	\$8.45	\$4	\$12.45
Fuel and Labor Strip Till	\$3.50	\$1	\$4.50
Total2		\$16.95	
Savings left per acre to pay for strip till unit		\$49.05/acre	

The economic studies done at KITE help professionals get a reliable picture of the real domestic results and experience of conventional trilling. They started their first experiment in 2011/12 with the new method, and then after it got widespread in 2014, they shared their experiences of their 2012-2013 studies with the professionals in the industry.

They followed an analyzed the results of conditional tilling on a wider scale (in case of corn production they had 198 measuring points in 2012 while 175 in 2013) comparing the results of the traditional tilling method with conventional tilling.

The sites in experiments were taken into three groups based on types of soil (loam, clayey loam, clay). These were connected to the three HP-levels (240, 270, 300 HP). Operating performance (ha/h) and the fuel-consumption (l/ha) are on the Table 2.

Regarding to the whole technology, it’s worth to analyze the results in two areas: after the early and after the late harvested crops. (Table 3 and 4)

Table 2. Data on operating performance and the fuel-consumption [5] A: Loam + 240 HP, B: Clayey loam + 270 LE, C: Clay + 300 LE

	Strip till			Conventional tillage		
	A	B	C	A	B	C
ha/h	3,05	3,05	3,05	1,51	1,51	1,51
l/ha	13,1	14,8	16,4	25,5	28,7	31,8

Table 3. Some characteristics after the early harvested crops [5]

Technology	Number of operations	Operating time (h/ha)	Operating time ratio	Cost (Ft/ha)	Cost ratio
Conventional tillage	11	2,16	100%	80788	100%
Ploughing	9	1,93	89%	76456	95%
Strip till	8	1,4	65%	69448	86%

Table 4. Some characteristics after the late harvested crops [5]

Technology	Number of operations	Operating time (h/ha)	Operating time ratio	Cost (Ft/ha)	Cost ratio
Conventional tillage	9	1,82	100%	68710	100%
Ploughing	7	1,71	94%	65917	95%
Strip till	6	1,18	65%	58909	86%

#### 4. Conclusion

Tips for success:

- Seek information from producers who are already using strip tillage,
- Allow time to learn a new farming system,
- Don't conduct strip tillage or plant when it's too wet,
- Planting in the centre of the strip-tillage row will be worth your time, effort, and money,
- Apply fertilizer in rows for greater efficiency,
- Avoid compaction in the strip-tillage row,
- Anticipate new weed problems [1].

By analyzing the information we can say that conventional tilling compared to traditional tilling is a realistic alternative for domestic farmers. The studies conducted in Hungary based on the results of the analyzed time horizon validated that the positive international results –coming from mostly the US – could be

realized in Hungary as well. It means that in the domestic plant production the adaptation of strip tilling is a realistic and forward-thinking effort.

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