

No-till Tobacco Transplanter

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Grower interest in no-till tobacco has been increasing due to the potential advantages of no-till practices including; soil and water conservation, reduced field preparation time, and potentially cleaner cured leaf. One of the keys to success with no-till tobacco is transplant establishment. A no-till transplanter must be able to place a seedling in the soil with good soil/root contact without causing damage to the tender seedling.

Early attempts to develop a no-till transplanter utilized a finger type transplanter built on heavy frame with added weight for ground penetration (Morrison et al. 1973). This transplanter had a front coulter added to cut residue, a double disk opener, and flat press wheels. In addition to the weight from the water barrel (55 gallon drum), 190 lbs. of ballast weight was added to the front of the unit and an additional 160 lbs was added to the press wheels. While such weight was needed for soil penetration this transplanter was found to be difficult to manage with the small tractors typical of tobacco growers at the time. Under wet soil conditions compaction in the planting furrow was found to be a problem.

In the mid-nineties a new effort was undertaken, with financial support from the Council for Burley Tobacco, to develop a no-till tobacco transplanter. The objectives of this effort were:

1. To develop a design that would work with both finger type and the newer carousel type transplanters.
2. To simplify the design such that growers could easily modify stock models.
3. To reduce the amount of weight needed and provide tillage in the root zone of the young transplants.

This was a cooperative effort between the Department of Agronomy (Bob Pearce and Jack Zeleznik) and the Department of Biosystems and Agricultural Engineering (Larry Swetnam [presently employed by Rickard Seeds] and Carl King). The photos and descriptions below are the result of this effort.

We started with a Mechanical Model 6000 as the base unit for this design. Other makes and models have been successfully modified. The basic principles and functions of each component remain the same on different models, but the attachment points and mounting brackets may need to be considerably different from what is shown.

Modifications made to this unit include ([figure 1](#)):

1. The addition of a coulter at the front of the unit.
2. The extension of the frame to provide room for coulter
3. The addition of a subsurface tillage shank.
4. Cutting and re-enforcing the press wheels

The function of the front coulter is to cut residue and to provide tillage in a narrow zone where the seedling will be placed. The mounting bracket shown is for a 2"x 2" toolbar turned on edge ([figure 2](#)). The coulter blade being used is a 1 inch ripple ([figure 3](#)). Our experience has been that wide-wave coulters tend to bring up larger clods that interfere with the operation of the press wheels.

On this particular model making room for the coulter involved the addition of an extension plate on each side of the bracket where the unit mounts to the tool bar ([figure 4](#)).

The major difference between this design and earlier no-till transplanters is the subsurface tillage shank ([figure 5](#)). The shank not only serves to provide tillage in the root zone, it also provides the down force necessary to pull the unit into the ground and to put pressure on the press wheels. In order to accomplish these functions the shank must be mounted directly on the frame of the unit. Note the view shown in [figure 5](#) is of an experimental design with a pivot bolt (right) and shear bolt designed to minimize damage to the unit in the event a large rock is encountered. This design has only had limited testing. In the case of smaller rocks the unit will generally ride up and over them.

The press wheels have been modified by cutting off the flanged edge and re-enforcing the remaining rim ([figure 6](#)). This leaves about a 1 to 1.25 inch wide flat wheel which funnels and packs loose soil around the seedling root ball.

This transplanter has been used for the last five years for transplanting no-till tobacco tests all over Kentucky, and has been found to perform satisfactorily under a range of soil types. Proper soil moisture is one of the keys to achieving desired results with this transplanter. It is often thought that because the ground is firmer no-till tobacco can be transplanted before conventional. Our experience has been just the opposite; the no-till retains moisture better than conventional and therefore is slower to dry out. Setting under wet soil conditions can lead to poor root coverage and compaction in the planting furrow.

For more information on no-till tobacco production contact Dr. Bob Pearce (rpearce@uky.edu).

References:

Morrison, J. E., J. H. Smiley, W. O. Atkinson, and D. C. Milbocker. 1973. A no-tillage transplanter. *Tobacco Science*. Vol 17. pg. 44-46.



Figure 1. Two row Mechanical Model 6000 transplanter modified for use in no-till conditions.



Figure 2. Coulters mounting bracket on to 2x2 toolbar.



Figure 3. No-till coulters showing ripple blade

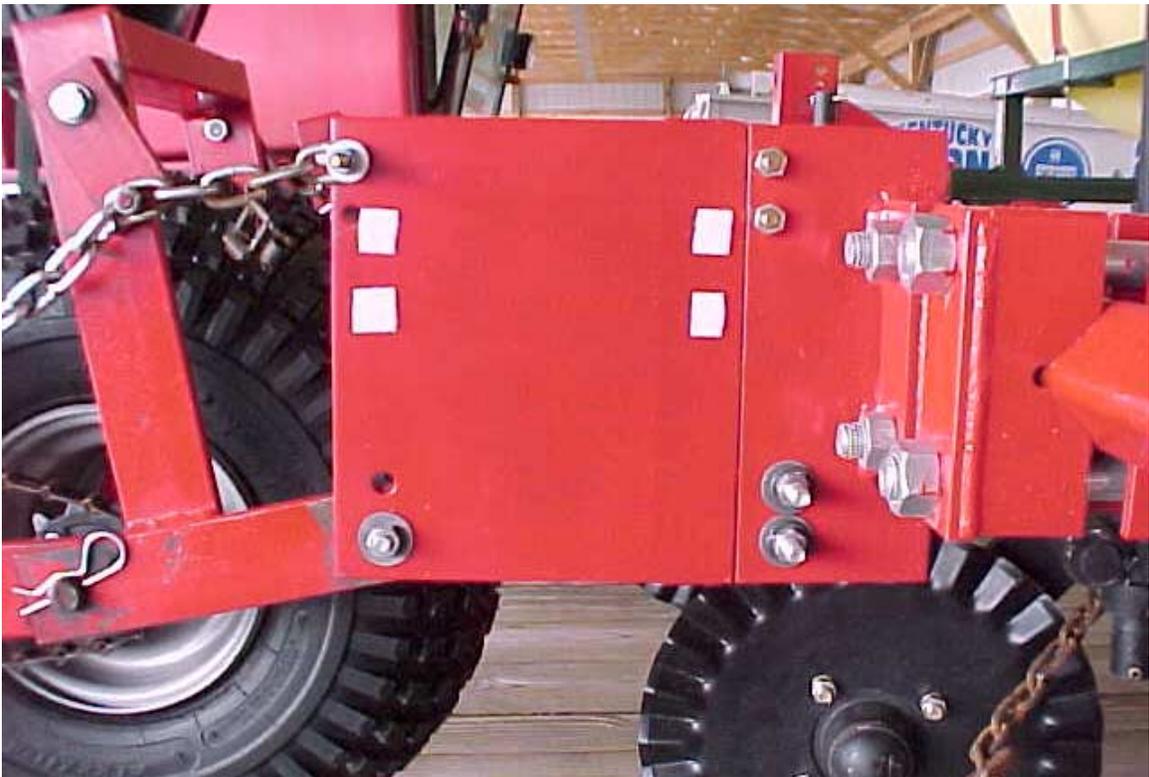


Figure 4. Extension plate to make room for coulters



Figure 5. Subsurface tillage shank attached to unit frame.

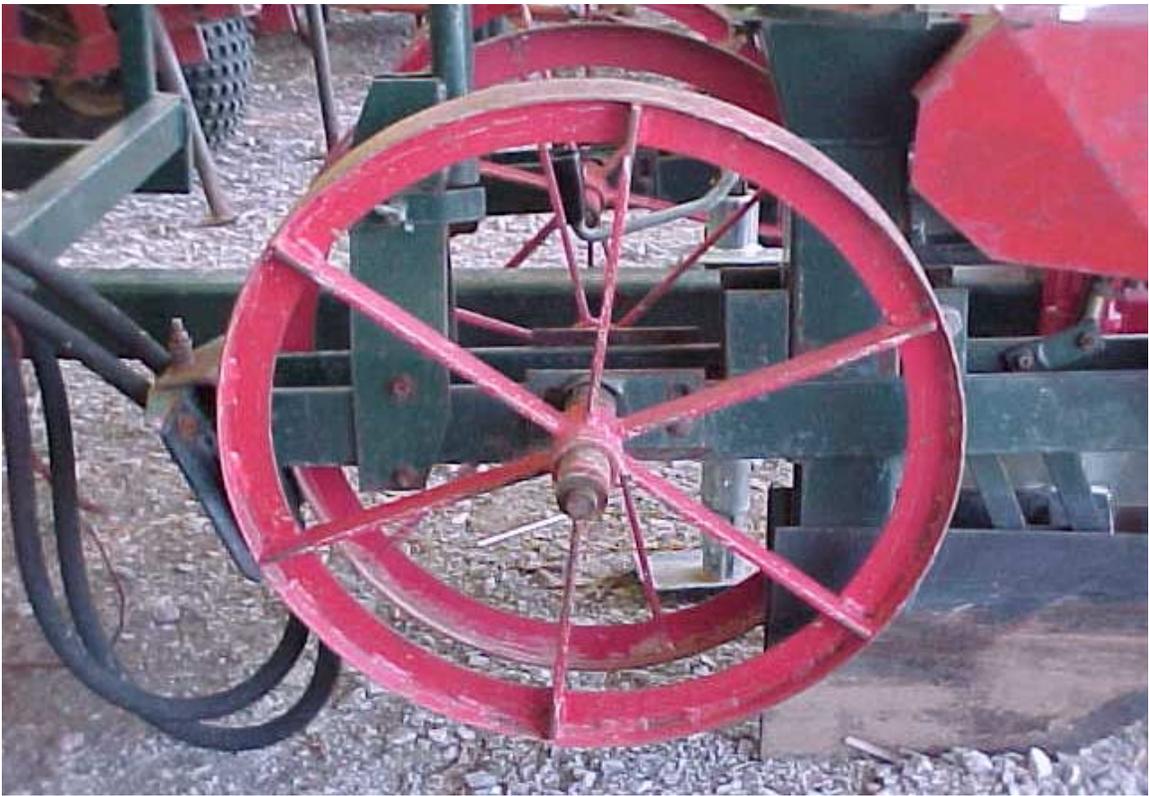


Figure 6. Modified press wheels