

THE 2700 MULCH RIPPER: A FLEXIBLE, MULTI-ELEMENT COTTON TILLAGE TOOL FOR OPTIMAL RESIDUE MANAGEMENT, IMPROVED SOIL BREAKOUT, AND VERSATILE SOIL CONDITIONING

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Abstract

The 2700 mulch ripper is a combination primary tillage tool designed to size residue, shatter sub-soil compaction, mix mulch and stalks with soil, and condition the soil surface in a single pass. (See Figure 1.) Ground working elements include front mounted mulching disk blades followed by ripper standards spaced 24-in. or 30-in. apart. The 2700 mulch ripper also provides an exclusive feature called Active Hydraulic Down Pressure™ system. This system is utilized on the front mulching disks to allow the operator to increase the down pressure for better penetration in hard soils. The active hydraulic down pressure system is also utilized to protect the mulching gangs from obstructions. Ripper points of 2 ¾, 5, 7, and 10-in. widths are offered. An optional rear disk conditioner allows the operator to achieve either smooth or rough surface profiles.

The 2700 provides unmatched flexibility in residue management, soil fracture, and surface profile management. Mulching disk and rear disk conditioner depths are hydraulically adjustable and can be raised completely out of the ground at all ripping depths. Flexibility offered by the 2700 is especially fitting for customers who farm both Highly Erodible Land (HEL) and fields where soil erosion is not a concern. In cotton, the 2700 provides ease of operation from field-to-field with hydraulic adjustability and manages touch cotton residue, destroying weed and insect habitats along the way.

Introduction

The 2700 mulch ripper combines three functions into a one-pass tillage system to meet variations in residue levels, to improve soil fracturing, and to provide versatility in soil conditioning or leveling. The 2700 has the ability to leave as much as 70% residue in meeting Highly Erodible Land (HEL) requirements. The 2700 Mulch Ripper offers farmers flexibility in crop residue management, flexibility in sub-soil fracture, and flexibility in soil profile management. The 2700 mulch ripper has been designed to perform in primary tillage conditions, which typically occur in the fall.

Cotton producers will benefit by using the 2700 mulch ripper in their operation. The 2700 mulch ripper will allow cotton producers to shred stalks, fracture soil, and level soil all in one-pass. They will also benefit by saving fuel with one tillage trip across their fields in the fall. Additionally, cotton producers will save time by changing the hydraulic adjustments from field-to-field from within the cab. At the same time, cotton producers will receive the benefits of tillage—bury insects and diseases, break-up compaction, and cut and size residue. Breaking up compaction increases water infiltration and improves root penetration for next year's crop production.

Discussion

Markets

The 2700 Mulch Ripper is a good fit with the traditional disk ripper market where maximum corn stalk sizing and incorporation with sub-soil fracture is desired. Additionally, it is also a good fit in the cotton market where traditional V-rippers and disks are used to size, cut, and bury cotton residue.

The 2700 can combine these applications into one-pass, saving time and fuel. In addition to these markets, flexibility provided with the 2700 make it an excellent choice where surface residue and soil profile management are used to control soil erosion on Highly Erodible Land (HEL).

Retail (List) Price

Base Unit List Prices for the 2700 are as follows:

5S30	\$21,793
7S24	\$26,032
7S30	\$29,905
7S30 Folding	\$32,533
9S24	\$32,662
9S24 Folding	\$35,290

Functional Areas

The product is a new, innovative application of existing technology. The 2700 mulch ripper is configured with mulching blades on the front of the machine that are mounted to a draft frame. An Active Hydraulic Down Pressure System allows the operator to control the amount of down pressure exerted on the mulching blades. In harder ground conditions or higher residue levels, down pressure can be increased to help keep the blades in the ground. This system also protects the disks from rocks or other field obstructions by providing a cushion. This is the same proven technology that is currently used on the John Deere 750 and 1560 No-Till Grain Drills as well as Hydraulic Wing Control on the 637 Disk, but it is the first time on a tillage tool.

Residue Management

The 2700 provides unmatched flexibility in residue management, soil fracture, and surface profile management. Doing more with one tillage tool allows a farmer to reduce machinery costs, save fuel and improve operating efficiency. Mulching disk and rear disk conditioner depth are hydraulically adjustable and can be raised completely out of the ground at all ripping depths. Flexibility offered by the 2700 is especially fitting for customers who farm both Highly Erodible Land (HEL) and fields where soil erosion is not a concern. The 2700 can be adjusted to incorporate maximum crop residue and leave a smooth surface profile, as many growers prefer for non-HEL. (See Figure 2.) When moving to HEL, it can be adjusted to retain crop residue for soil conservation. A rough surface profile can be produced to control water runoff when contour farming hill sides. With a growing concern of phosphorus contamination in lakes and streams, meeting HEL requirements becomes critically important. Phosphorus binds to soil particles and sedimentation occurs in lakes, streams, and ponds. The 2700 mulch ripper leaves more residue and, therefore, prevents runoff into lakes and streams. A rough surface may also be desired in other field conditions to accelerate spring drying. (See Figure 3.) In the Delta, flexibility provided with the 2700 allows a grower to raise the mulching disks completely out of the ground when minimum surface disturbance is desired ripping rotational soybean stubble.

Soil Fracturing

Flexibility in soil fracture is achieved with a choice of 24-in. or 30-in. ripper standard spacing combined with a family of ripper points including 2 ¾, 5, 7, & 10 in. widths. When equipped with 10" wide LaserRip™ ripper points, the 2700 mulch ripper provides maximum soil breakout of the compaction layer in heavily compacted cotton fields. (See Figure 4.)

Soil Conditioning

The Rear Disk Conditioner has disk blades that are mounted with the new John Deere TruPosition™ standard. This standard has no side-to-side movement and eliminated nine parts prone to wear or failure compared to the previous standard. This standard provides 280 lbs. of vertical trip force in this application for positive depth control. Mulching blades and rear conditioner blades are mounted to standards using a single-arbor bolt and

maintenance-free bearings for unmatched reliability. This design has significantly reduced lubrication points compared to competitive machines. Both the mulching disk blades and the rear disk conditioner are hydraulically controlled and can individually be raised completely out of the ground. This allows the operator to run the machine in many different configurations depending upon what is required for their conditions. The soil profile can be adjusted to the customer's preference. (See figure 5.)

Tractor Compatibility

The 2700 mulch ripper is a complete combination primary tillage machine designed to be pulled behind 185 to 425+ horsepower tractors, or John Deere 8010 and 9000 series tractors.

Design Engineering

The 2700 Mulch Ripper was designed utilizing Pro/ENGINEER (ProE) computer modeling. ProE models were then used to perform Finite Element Analysis of component stresses to gain confidence in structural integrity. Lab cycle testing was performed on selected systems. Strain gage stress evaluation provided data that was then used to predict component fatigue life under real world load cases. Multiple machines were placed with customers for durability and functional verification.

Although no new patents have been applied for, several existing patented designs are utilized, including:

- Ripper points
- Walking tandem wheels
- Tru-position spring cushion
- Hydraulic down pressure
- Single point depth control

Although no new trademarks have been registered, there are also several existing component trademarks, which are included in this design such as LaserRip™ Points, WalkOver™ Tandems, TruPosition™, and Single Point™ Depth Control.

Summary

In conclusion, the 2700 mulch ripper completes three functions in one fuel-saving pass. For the cotton producer, these functions are (1) stalk shredding and residue sizing, (2) soil fracturing and breakout, and (3) soil leveling. The 2700 also provides improved soil fracturing on 24" shank spacing when equipped with 10" LaserRip ripper points. Through our Deere & Company Technical Center, we have also proven that we reduce draft loads by 5% with the LaserRip ripper points. The hydraulic adjustments increase productivity for the cotton producer by significantly reducing the time required to make field adjustments. Finally, the 2700 is equipped with maintenance free bearings on each individually mounted disk hub. Because the 2700 mulch ripper has 80% fewer lubrication points than competitive models, this will significantly reduce the amount of service time for the producer.



Figure 1. The 2700 mulch ripper configuration from fore-to-aft of the tool consists of the following: disk-disk-ripper-conditioner.



Figure 2. Working in standing stalks, the 2700 mulch ripper has the ability to leave a "smooth and level" soil profile. The right side of the tractor shows the smooth soil profile produced by the 2700.



Figure 3. Working after stalks have been shredded, the 2700 mulch ripper has the ability to leave a "rougher" soil profile to meet Highly Erodible Land (HEL) requirements.

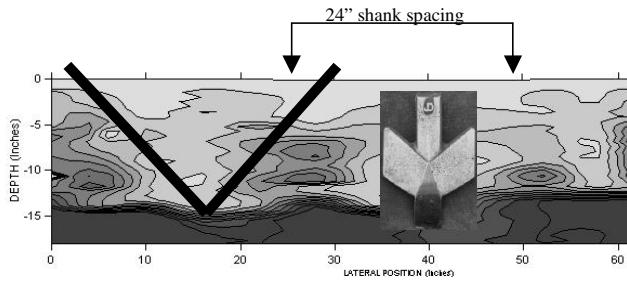


Figure 4. The optional 24-inch shank spacing provides improved soil breakout over traditional V-rippers. The black V-shape above represents traditional V-rippers. The area above the gray, wavy line represents the soil fracturing of the 2700 mulch ripper equipped with 24-inch shank spacing and 10-inch wide LaserRip ripper points. The 24-inch shank spacing pattern offers significantly more soil fracturing than traditional V-rippers on 30-inch, 38-inch, 40-inch shank spacing.

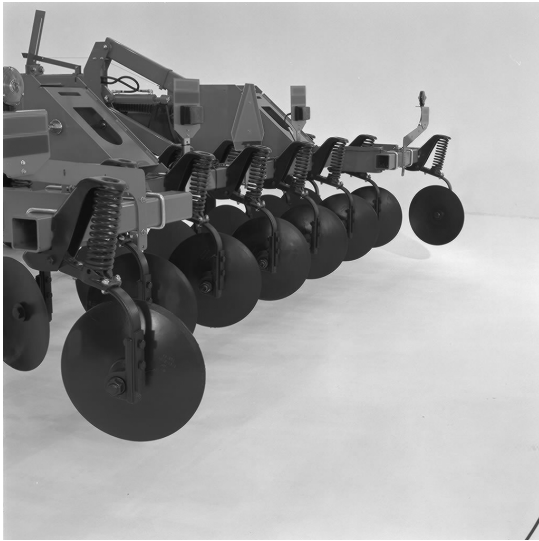


Figure 5. The TruPosition™ rear disk conditioner can be hydraulically raised and lowered to meet the producers' preferences on soil leveling.