



## BEST MANAGEMENT PRACTICES

### Chapter 12: Land Rolling



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Many South Dakota soybean fields are routinely rolled. Proponents of land rolling argue that the practice improves contact between the seed and the soil, allows soybeans to be harvested closer to the ground, and reduces combine damage and yield losses in fields containing many rocks. Detractors of land rolling argue that yield advantages have not been documented and it may increase wind and water erosion. This chapter investigates the impact of land rolling on soybean yields.

Land rolling is simply pulling a large cylindrical roller over the field to smooth the ground (Fig. 12.1). The land roller has a packing force similar to the pressure from the planter closing wheels (3 lbs/in<sup>2</sup>) (DeJong et al., 2012). A wide assortment of rollers are available ranging from smooth to coil-type drums. Images of drums types are available at <http://pierce.uwex.edu/files/2012/07/Ground-Rolling-in-the-MidWest.pdf>. The drums exert a packing force of about three pounds per square inch similar to the pressure exerted by planter closing wheels.



**Figure 12.1. Land rollers are commonly used in preparing the seedbed in soybean production.** (Photo courtesy of Schuneman Equipment Co., Brookings, S.D., and SDSU)

Proponents have argued that land rolling:

1. pushes smaller rock into the soil;
2. improves contact between the soil and the seed;
3. improve seed emergence rates;
4. increases yields by reducing harvest losses;
5. reduces combine damage; and
6. helps break apart corn rootballs (Lenssen, 2009).

Disadvantages of land rolling are that it may compact the soil and increase erosion. In addition, it costs money, fuel, time, and if applied pre-emergence, land rolling can increase the risk of soil crusting. Benefits from land rolling are decreased if rock picking is conducted separately. Land rollers range in price and can cost up to \$50,000. Custom land rolling rates in Iowa average \$6.55/acre (Wolkowski, 2011).

## Reducing equipment risk and harvest loss

Rollers effectively push rocks into the soil and level mounds left by burrowing rodents, thereby reducing the risk of damage to the combine. Mounds left by burrowing animals, such as pocket gophers, can bounce and jar spraying and harvest equipment, leading to structural or mechanical damage and malfunction. Broken or damaged equipment costs money to fix and can delay harvest. Land rolling can smooth these areas, and avoid undue stress on equipment.

Land rolling may reduce combine yield losses because the soybeans can be harvested closer to the ground. Rocky areas or soil mounds require the operator to raise the combine header and sacrifice low hanging pods, leaving them in the field. Calculating yield loss due to raising the combine head can be estimated with a simple formula (Fig. 12.2).

### Figure 12.2 Calculating yield loss from unharvested lower portions of a soybean plant.

**Step one:** Count the number of pods remaining on plants along a row length. In this example, 50 pods are counted from a 4-foot row. The row spacing is 30 inches.

**Step two:** Calculate the yield loss in bu/acre assuming that 5 beans per ft<sup>2</sup> = 1 bu/acre and each pod contains 3 beans.

#### Yield loss

$$\begin{aligned} &= \frac{\text{number of pods} \times \frac{\text{beans}}{\text{pod}}}{(\text{row length} \times \text{row width})} \times \frac{1\text{ft}^2}{\frac{5\text{beans}}{1\text{bu/acre}}} \\ &= \frac{50\text{pods} \times \frac{3\text{beans}}{\text{pod}}}{(4\text{ft} \times 2.5\text{ft})} \times \frac{1\text{ft}^2 \times 1\text{ bu acre}}{5\text{ beans}} = 3\text{bu/acre} \end{aligned}$$

## Land rolling and soil compaction

Land rolling may increase compaction by pushing rocks into the soil and also increase erosion potential. Compaction has long been recognized to reduce water infiltration and increase erosion. A study at Iowa State University measured water infiltration on several farms (Al-Kaisi et al., 2011). In this study, land rolling either reduced or did not influence water infiltration. One approach to reduce the negative impacts of land rolling is to use precision management. It may be possible to reduce the negative impacts of land rolling on compaction and erosion by targeted activities to areas containing rocks.

## Post-emergence land rolling

Al-Kaisi et al. (2011) reported that at three locations in Iowa and Minnesota, land rolling before the third trifoliolate leaf stage did not increase yields. When rolling was conducted at the sixth leaf stage, land rolling had the potential to reduce yields. Endres and Henson (2003) had slightly different results in North Dakota and reported that land rolling did not influence yield. However, post-emergence rolling delayed plant growth. In conclusion, land rolling can produce both positive and negative impacts on soybean yields. In areas containing many rocks, land rolling has the potential to reduce combine yield losses. The consequences of both factors must be considered prior to investing in this practice.

## References and additional information

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## Acknowledgements

Funding for developing this chapter was provided by the South Dakota Soybean Research and Promotion Council, USDA-AFRI, and South Dakota 2010 research program.

Carlson, C.G., and K. Reistma. 2013. Land rolling. In Clay, D.E., C.G. Carlson, S.A. Clay, L. Wagner, D. Deneke, and C. Hay (eds). *iGrow Soybeans: Best Management Practices for Soybean Production*. South Dakota State University, SDSU Extension, Brookings, SD.

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