AGRONOMIC DESIGN

AGRONOMIC DESIGN INSIGHTS

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SEED BED CONDITIONS

Growers must balance eight key agronomic needs to achieve the most yield potential from their crops: timeliness, crop residue management, soil tilth, seed bed conditions, seed placement accuracy, plant food availability, crop protection and harvest quality.

This fact sheet addresses **seed bed conditions** and the effects of a poor seed bed, along with agronomic considerations to look for in equipment design.

Soil with a rough surface hinders proper seed germination and plant growth, ultimately leading to lost yield potential.

Large soil clods can cause planter row units to bounce. This makes it challenging to control planter depth and maintain seed placement accuracy for uniform plant spacing. Large clods also leave holes, which can lead to slow, uneven germination of seeds. The different heights in the soil surface result in variable moisture and temperature levels.

Agronomic Needs for Successful Stands

WHAT'S INSIDE

MAKING THE PERFECT SEED BED

By Chris Lursen, Case IH Training Manager

All growers strive for the perfect growing environment. The ideal seed bed is level, has soil moisture throughout its depth and is adequately firm, with small surface clods or a light mulch of residue to prevent soil erosion. Excellent soil tilth means proper pore and soil aggregate size and distribution in the seed zone and improved seed-to-soil contact for faster germination and more uniform crop emergence.

A good seed bed is important because plant roots require water and oxygen from the soil pore space. The right soil-air-water balance helps limit plant stress during drought periods and enables the plant to fully explore the soil profile for nutrients. Plants are able to use water efficiently and grow strong roots for good anchorage. ■

CASE IH AGRICULTURE

GREAT SEED BEDS REQUIRED FOR GREAT ROOTBEDS.

By Dr. Rob Zemenchik, Case IH Crop Production Marketing Manager

High yields require having enough productive plants to utilize available resources. And productive plants require a well-prepared seed bed. Plants that emerge uniformly and progress at the same rate of development throughout the growing season, also known as "photocopy plants," deliver improved yield potential.

Uneven emergence introduces inefficiencies and added competition within the stand. Larger, early emerging plants obtain a greater proportion of available resources (light, water, nutrients) than smaller, later-emerging plants (See Figure 1). However, the smaller plants will produce less grain from the resources used than the additional grain from the larger plants. If stands limit such behavior, yield potential is increased, ultimately improving the field's profitability.

Maximizing yield potential starts right behind the combine. Many top producers today set their sights on achieving level output behind their fall tillage pass. If successful, the spring tillage requirement is reduced so earlier planting dates can be accommodated. The output from fall tillage is more level and uniform, and tougher residues associated with growing Bt hybrids are also sized and mixed for more rapid nutrient cycling (See Figure 2).

Case IH has discovered that by reducing both clod and valley sizes out the back of a tillage pass in the fall to **6 inches or less in prairie soils and 4.5 inches or less in forest soils**, growers dramatically reduce the risk of emergence problems in the spring.

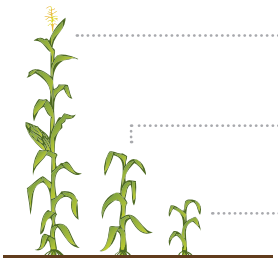
In more than five years of extensive field research, Case IH found that up to 10 percent of seeds planted failed to emerge or develop a full ear at harvest because of cloddy, uneven output.

This research was done in five states at seven locations, using a randomized complete block design, and included more than 2 million hand-collected data points (See Figure 3). Using advanced data mining techniques, the Case IH team learned that by better managing residue, soil fracture and, most importantly, the size of holes and clods left behind, yield potential could be significantly improved. Large holes collect water, and in combination with large clods, they increase the variability of soil temperatures and emerging plants in the field. This makes accurate seed placement at planting impossible in spite of freeze-thaw cycles and subsequent field passes in the spring.

This research showed that as many as 3,000 plants per acre, or up to 10 percent of the net effective stand, could be lost due to poor seed bed conditions. Most of those lost plants were recovered, simply by focusing on delivering level output, both clod and valley-free, following primary tillage. The financial reward for preparing an optimum seed bed is significant. For example, with 1,000 acres of corn priced at $4.50 per bushel, keeping all clods and valleys to 6-inches or less and achieving a smooth seed bed translated to a $75,600 income advantage with yields of 7 bu. per acre per 1,000 effective plants at harvest. Case IH research demonstrated a 6.6% yield recovery when creating a level seed bed following primary tillage.

figure 1

Identifying Late Emerging Plants



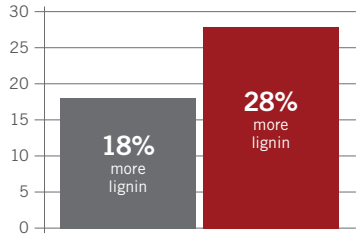
Full Potential – Plants at the same growth stage, where they should be.

Partial Potential – Plants one to two leaves behind are actually half "weed." They do not add to productivity, and they take nutrients from 100% plants.

No Potential or Weeds – Any plants that are three or more leaves behind.

figure 2

Stem Lignin Content

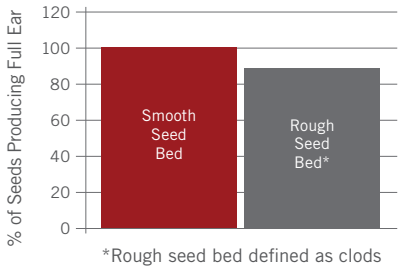


Two Bt hybrids compared to their non-Bt isolines

Source: Poerschmann J. et al., 2005 Aug. 9 *Journal of Environmental Quality* 34:1508-1518.

figure 3

Net Effective Stand %



*Rough seed bed defined as clods and holes larger than 6 inches

Source: Case IH field research in 5 states, 7 locations over 5 years.

CONSIDERATIONS FOR OPTIMAL SEED BED CONDITIONS

By Tim Nix, Case IH Tillage Marketing & Sales Manager

Cold, wet, cloddy soil is all too frequent in spring. A secondary tillage pass may take extra time, but it can be of great benefit to help level and warm the seed bed. It is recommended that wherever the soil surface is too rough to permit optimum planter speeds or accurate planting at a uniform depth.

The secondary tillage pass should be shallow (average depth not to exceed 3 inches) and should be performed within 24 to 48 hours of planting to minimize excessive moisture loss from the seed zone.

Secondary tillage options may include:

- ***Field cultivation*** *to provide uniform soil distribution for faster dry down, allowing earlier planting, faster germination and an extended growing season. Cultivation can provide a smooth, level field by evenly distributing soil and residue, breaking clods and killing weeds.*
- ***Vertical tillage*** *can be an effective approach to crop residue challenges, while providing uninhibited early seedling rooting and full-season water and nutrient uptake. Vertical tillage efficiently sizes and mixes residue and levels soil, ensuring greater productivity that comes from a smoother, more uniform seed bed.*
- ***Seed bed conditioners*** *are often pulled behind a primary tillage or vertical tillage tool to enhance its seed bed preparation performance without an added pass across the field. Conditioners reduce clod size and create a level seed bed of firm, fine soil covered by loose, coarse soil.*

Manage Traffic Patterns

The need to control traffic patterns to optimize seed bed conditions and reduce compaction extends throughout the growing season.

As in spring, caution needs to be taken to avoid ruts and ridging by making field passes in wet conditions. Maintaining optimum seed bed conditions also requires care when traveling through fields, especially in wet conditions, to prevent berms and ridging when making turns.

Compaction restricts water and root infiltration and makes soil vulnerable to drying out, ponding and erosion. Healthy soil acts like a sponge, allowing excess rain to infiltrate and letting roots absorb deep-down moisture during dry periods.

Staying off of wet fields isn't always possible, especially when weed pressure is high. Minimize the impact of compaction by using equipment that has a balanced footprint, such as Patriot® sprayers and Steiger® Quadtrac® and Rowtrac™ tractors. This equipment is designed to have even weight distribution, which means less rutting and soil compaction in wet conditions.

High Yields Start In Fall

Fall tillage lays a solid foundation for the next growing season. The main priorities are to manage residue and reduce compaction. Many tools can manage residue to provide a warmer, drier seed bed in spring. And, when soil conditions and early harvest allows, it is always beneficial to remove compaction layers.

Following are some tillage options. Determine the most appropriate based on field conditions and operational goals:

- ***Disk harrows*** *are a good choice for cutting and incorporating residue, as well as breaking up clods. This tool ensures soil is mixed thoroughly and chemicals are incorporated more effectively.*
- ***Disk rippers*** *are used to fracture compaction, size and mix heavy residue and level soil.*
- ***In-line rippers*** *address yield-limiting factors – such as compaction and cold, wet seed beds – while protecting Highly Erodible Land (HEL). This tool fractures compacted soil while leaving the surface residue virtually undisturbed. In that way, moisture is conserved but roots have the necessary pore space to grow and feed.*

Case IH equipment, like this Patriot 4430 sprayer, is designed to deliver even weight distribution, which means less rutting and soil compaction in wet conditions.

Combination primary tillage tools, like the Ecolo-Tiger 875, can manage crop residue, soil tilth and provide a level seed bed in a single pass.

TILLAGE EQUIPMENT DESIGN CONSIDERATIONS

Striking the right balance between soil tilth, crop residue and seed bed consistency is easier when using tillage and planting equipment that is agronomically designed. Case IH engineers know the importance of planting into the best possible seed bed to achieve early, even emergence that is key for increased profitability. Following are examples of equipment that can help prepare the optimum seed bed.

Case IH Tiger-Mate 200 field cultivators create a firm, level seedbed that provide uniform soil distribution for faster dry down. This allows earlier planting dates for an extended growing season with faster germination.

Case IH True-Tandem™ 340 and 370 disk harrows are high-performance seed bed preparation systems that help properly distribute residue, size clods and firm the seed zone to achieve the desired field finish.

The attachable Case IH Crumbler® seed bed finisher combines primary tillage tools or the Tiger-Mate 200 field cultivator with secondary tillage in one pass. It provides the final touch for thorough seed bed preparation by creating an excellent seed bed of firm, fine soil covered by loose, coarse soil.

Case IH Ecolo-Tiger® 875 disk rippers offer all-new redesigned, high-density Tiger Points that run just under hardpan compaction and deliver the proven Case IH lift-twist-roll soil action to eliminate soil compaction, but with less draft. This contributes to smoother fields and extended point life.

Case IH Early Riser® planters feature pulled gauge wheels that ride up and over obstacles, as opposed to forward-facing gauge wheels that hit and bounce over them. The result is uniformly correct seed depth and seed placement accuracy.

Case IH Ecolo-Til® 2500 disk rippers can be customized to leave the soil and residue visually undisturbed. They provide a soil/residue mixture that allows rain to soak down into the subsoil faster, decreasing erosion through improved porosity and drainage.

The Precision Disk™ family of air drills feature a parallel-link system, consisting of an upper and lower arm to ensure even depth placement across varying soil conditions. Patent-pending variable down-pressure springs apply the right amount of pressure on individual row units to ensure better penetration across varying residue and soil conditions.

FIND OUT MORE: Visit **www.CaseIH.com/Agronomic Design** to learn more about agronomic considerations.