

# Making No-Till More Profitable On The Great Plains

A collection of valuable tips and insights from no-till and industry experts that could take your no-till operation to another level.

*DRYLAND*  
**NO-TILLER**  
"The No-Till Authority Since 1972"

**SEEDING SUCCESS.** Cronin Farms cuts 3,700 acres of wheat 18 inches below the head to leave at least a foot of stubble. Allowing the stubble to stand doesn't interfere with the planting of the next crop — in this case, winter wheat into spring wheat stubble.

# 8 Areas To Focus On For Higher Wheat Yields

Residue management, proper seeding rates, timely nitrogen applications and scouting for diseases are some of the keys to pushing no-till wheat yields to worthwhile levels.

By Dan Zinkand, Managing Editor

From the Pacific Northwest to the Great Plains to the Eastern Corn Belt, no-tillers John Aeschliman, Dan Forgey, Allen Dean and Romey Bardwell grow different varieties of dryland wheat in different soils in areas receiving vastly different amounts of rain.

But these long-term no-tillers generally agree on what it takes to push wheat yields to the economic maximum. Their systems focus on managing residue, harvest details, equipment performance, seeding rates, row spacing, top-notch tillering, pest control and crop rotations.

"I like wheat," says Forgey, who manages crop production on Cronin Farms in Gettysburg, S.D. Cronin Farms grows 3,700 acres of wheat — both winter and hard red spring wheat.

"I fully expect to make as much money on spring wheat as corn at the present price of corn, so long as we get the protein and yields up," he says.

In 2009, hard red spring wheat yields were good, Forgey says, averaging around 70 bushels per acre.

"If we have enough moisture, we can grow 80 to 90 bushels per acre with winter wheat and 70 bushels per acre with spring wheat. I know we are going to have failures when we don't have

enough moisture," Forgey says. "Our soil profile is full and so we are going to push our yields."

Average rainfall at Cronin Farms is 18.5 inches a year. In eastern Washington, Aeschliman farms three areas with varying amounts of rainfall: 12 to 14 inches; 15 to 18 inches; and 18 to 20 inches per year. Most of his rainfall arrives during the winter.

Dean Farms' average rainfall at Bryan, Ohio, is 36.1 inches a year, while Bardwell's farm in western Kentucky receives 51 inches annually.

While Forgey and Aeschliman treasure the moisture in springtime soils, Corn Belt wheat growers often feel they have too much moisture in the spring. That's the case for Dean, who farms about an hour west of Lake Erie.

Growing high-yielding wheat in northwest Ohio starts with selecting fields that are systematically tilled or have good internal drainage, he says. He grows soft red winter wheat, soybeans and cover crops.

Here's a look into eight aspects of these no-tillers' management programs that make wheat worth growing.

## 1. Residue Management

Managing residue with the combine lays the foundation for maximizing wheat yields, these no-tillers say.

Bardwell uses a John Deere rotary

combine with a 30-foot-wide head in corn prior to no-tilling wheat.

"We have a tendency to chop it up a bit fine in soybeans and wheat," the Hopkinsville, Ky., no-tiller says. "You really have to watch your spreader."

"In corn, we run that head higher. I try to leave 18 to 24 inches of corn stalks. You can still see the corn stalks in the wheat fields."

Bardwell has no-tilled all of his crops since 1999. He grows three crops in 2 years: corn, soft red winter wheat and double-crop soybeans. His wheat yields range from 80 to 90 bushels per acre, sometimes topping 100 bushels.

Bardwell says breaking down *Bt* corn stalks has become a problem, which affects seeding wheat.

"As farmers, we want the corn to stand up until the day we combine it; then we want it to disappear," he says.

To get stalks to decompose faster, some farmers in western Kentucky who planted hybrids with 111- to 116-day relative maturity are opting for 110- to 112-day hybrids, he says.

## 2. Wheat Harvest Details

Dean has been using a Shelbourne Reynolds stripper head for many years.

"This allows us to start taking wheat off earlier when moisture is around 18% to 19%," he says. "Wheat is air-dried in the grain bin to maintain higher test

PHOTO COURTESY OF CRONIN FARMS

weight and quality.”

Cronin Farms works “really hard” at residue management, Forgey says. They use a regular, straight grain head, but leave at least 1 foot of stubble, cutting stalks 18 inches below the head.

“We do not want to chop our straw fine,” he says. “We want to leave some length to it. We want to spread it out evenly so we get a slow breakdown.”

Using a stripper header to combine wheat and other small grains helps immensely with no-tilling the following crop, says Phil Needham of Needham Ag Technologies in Calhoun, Ky. He has worked with Bardwell, Forgey and other wheat growers in the United States, Canada and Europe on intensively managing high-yielding wheat.

Because a stripper header leaves most of the residue standing, just wheat and chaff and relatively little material must pass through the combine, Needham says.

“A stripper header can cause problems when you no-till crops into the tall stubble the following spring,” he says. “Stripped wheat traps and retains moisture, which can delay corn planting in areas which don’t double-crop.

“But in drier areas, using a stripper is very good and research from Colorado and other areas have shown higher yields result from better moisture retention.”

### 3. Seeding Tips

Needham believes it’s essential to no-till wheat with a disc drill or a disc air seeder instead of a hoe drill.

“We get much better seed placement and improved seeding depth consistency with a disc drill. They handle residue in no-till much better,” he says.

Using a hoe drill to seed wheat in narrow rows often results in poorer seeding depth consistency. That’s partly a result of dirt being thrown back on rows that have been seeded, so there is generally no yield advantage to narrow rows with these drills, Needham says.

Bardwell uses a 30-foot-wide John Deere 1990 CCS no-till air drill, which has 7.5-inch row spacings.

“We’ve been on 7.5-inch row spacings for years,” he says. “We no-till wheat at a 15-degree angle to corn,



PHOTO COURTESY OF: PHIL NEEDHAM

**STREAMING NITROGEN.** Using streamer bars instead of broadcasting nitrogen enables no-tillers to reduce the amount of nitrogen tied up in residue. Streamer bars also deliver the nitrogen accurately and evenly.

using narrow gauge wheels on the drill.

“We are trying to get a more consistent seed placement by using the narrow gauge wheels as the drill goes through corn stalks.”

Cronin Farms seeds with a 43-foot-wide John Deere 1895 drill.

“When seeding wheat into soybean stubble, we wait to seed until conditions are right to avoid hairpinning when the straw is tough,” Forgey says.

Some growers no-tilling wheat into high-yielding corn residue use RTK guidance systems to index the corn rows between the wheat rows, Needham says.

**“We do not want to chop our straw fine. We want to spread it out evenly so we get a slow breakdown...”**

“This avoids the openers running directly down the corn rows and improves stand consistency,” he says.

Drills must be able to cut through residue and into the soil to place wheat at a uniform depth.

“It takes a good no-till drill with sharp blades in good condition to accomplish this,” Needham says. “You can’t use a worn-out drill and produce high-yielding, no-till wheat.”

Many no-till drills need additional weight to cut through residue and hard soil, Needham adds.

“A John Deere box drill with 7.5-inch row spacing has about 350 pounds per row unit,” he says. “This drill needs an additional 50 to 100 pounds of ballast per unit. If the drill has 24 openers, you frequently need to add 1,200 to 2,400 pounds to the drill to help it penetrate hard soil and heavy residue.”

There’s a flip side to residue management when producing high-yielding wheat, Aeschliman says. He has grown soft white winter wheat that has produced up to 200 bushels per acre. Some growers say no-tilling corn into that much residue won’t work.

“We are running row cleaners and Yetter residue managers on our air drill,” Aeschliman says. “Until people see it, they don’t believe it.”

### 4. Seeding Populations

Needham says it’s important for wheat growers to determine their seeding population by the square yard.

But settling on a population involves a number of factors, including planting date, tillering characteristics of a variety, seeding depth and moisture received in an area.

“Seeding rate is kind of an art,” says Forgey, adding he spoke to a group of wheat growers who complained about having all straw and low yields. Either their seeding rates were too high or the nitrogen timing was wrong, he says.

“A lot of people overseed,” Forgey says. “You always seed by population and you want to consider tillering.”

But he cautions that it’s hard to make a blanket statement about seed-



**NO TIRE TRACKS.** When no-tiller Allen Dean sprays wheat, tramlines on 90-foot spacings protect the crop from wheel damage, eliminating the threat of diseases infecting stunted, weak plants. Dean can spray wheat at any growth stage.

ing rates for all wheat production in North America. For Cronin Farms, the later the planting date for winter wheat, the higher the population. For hard red spring wheat, the seeding rate declines the later the season gets.

“But you want to start low with seeding rates for winter and spring wheat,” Forgey says.

Cronin Farms starts seeding winter wheat around Sept. 1 at 1.1 million seeds per acre, ending up at 1.5 million around Oct. 1.

With hard red spring wheat, they start at 1.6 million kernels, using a higher rate to compensate for seedling mortality early in the season due to cold soils. The rate will drop down to 1.5 million further into spring.

## 5. Row Spacing

Needham believes in planting wheat in narrow rows, especially if you’re intensively managing it for high yields.

“I’ve got a lot of replicated wheat trials over the years to back that up,” he says. “We are seeing yield advantages drilling wheat in 6- or 7-inch rows versus 10-inch row spacings.

“The narrower the rows, the better the yield, and this applies across the United States and Canada.”

## 6. Managing Tillering

Wheat growers have come a long way in North America in the past 20 years at managing tillering, which affects whether a plant produces high yields or more straw, Needham says.

“Tillering is highly affected by nitrogen,” he says. “The number of tillers per

plant and per square yard, along with the number of heads, is highly influenced by nitrogen rate, timing, planting date and variety.”

For example, if a variety that tends to produce lots of tillers is planted early, the worse thing to do is to apply all the nitrogen early because it will produce an excessive amount of tillers.

On the other hand, if a variety that produces fewer tillers is planted late, applying nitrogen early can stimulate tillers, Needham says. The optimum number of tillers and heads depends on the region and variety.

“In the Ohio River Valley, it’s about 600 heads per square yard at harvest,” Needham says. “That’s a pretty good rule of thumb, for wheat growers all the way west into Kansas and North Dakota and South Dakota.

**“Seeding rate is kind of an art. A lot of people overseed...”**

“But in the drier areas of Montana, Saskatchewan and Manitoba, you don’t need 600 heads per square yard. You don’t have the moisture to support 600. And if you get 600 heads, you will have a lot of straw and not much grain.

“We like to have 650 very strong tillers per square yard,” Dean says. “If we are short on tillers, the first application of 28% nitrogen in early spring will have a higher percentage of the total number of pounds of nitrogen to be applied, aiding in new, strong tillers.”

Dean uses Chafer stream jet bars with both applications of 28% nitrogen to reduce leaf burn, provide even application and reduce drift.

“If we are over 650 tillers per square yard, a lower percentage is used in the first application, allowing for the weaker tillers to die off,” Dean says. “The second application is sprayed sometime between growth stages 6 to 9 on the Feekes scale, with the total number of pounds of actual nitrogen applied being 100 to 110 pounds.”

Dean adds that the two spring applications reduce the risk of losing nitrogen to large rainfall events, which occur sometime in his region.

“In drier areas, it’s all about turning moisture into yield. By getting your stand too thick, you don’t achieve that,” Needham says.

With 18.5 inches of rain per year, Cronin Farms is in one of those drier areas. Forgey aims for 500 to 525 heads per square yard.

“For every spring wheat seed planted, I will end up with 1.7 plants,” he says. “For every winter wheat seed planted, I will get 2.5 plants.

“Your tillering is affected with the timing of nitrogen fertilizer. The more nitrogen that’s applied early, the more tillering you will have. If you plant too thick and have one seed with three tillers, you could have 750 tillers.”

Growing high-yielding no-till wheat requires good stands. Bardwell says no-tillers need to apply more nitrogen than conventional wheat growers.

“You need 10% more seed and you need 10% more nitrogen,” Bardwell says. “That’s probably a good rule of thumb. But that varies depending on when you are seeding.

“Because we were wet last fall, we have to push the wheat harder, with more and earlier applications of nitrogen. We split our applications in February and March, depending on the height and growth stage.”

Bardwell uses 28% for his first application of nitrogen and 32% for the second, using streamer bars so he doesn’t get a burn on the wheat.

## 7. Managing Pests

As wheat fields approach flowering, Bardwell applies fungicide to protect the wheat head from head scab, powdery mildew and leaf rust.

“We apply a half rate of fungicide early and then watch the wheat and apply another fungicide at heading for scab,” Bardwell says. “We watch and count aphids, which carry barley yellow dwarf disease.”

“It’s our feeling that a fungicide must be out front before disease is present,” Dean says. “Fungicides are a great risk-reducing tool and are needed most

years in our area.”

Forgey says it’s essential to scout all season for diseases and insects.

“You want to start scouting for tan spot at about the third or fourth leaf,” he says. “If you’ve got disease on the leaf, you put on a fungicide with the herbicide.”

Tan spot can be more of a problem in winter wheat because of the degree of old stubble you plant into, Forgey says. But he only uses fungicides after detecting disease.

When Dean sprays, tramlines help protect his wheat. His 30-foot-wide John Deere 1850 air seeder with 7.5-inch row spacing and 1900 commodity cart, is set up with an Air Tram tramline system. He places skip rows every 90 feet for the sprayer to follow.

“We think this is a must for wheat growers because it allows us to spray wheat fields at any growth stage,” Dean says. “Tramlines will aid the sprayer operator avoid skips and overlaps of chemical and fertilizer. They will prevent the wheat plant from being damaged by sprayer wheel tracks, reducing disease pressure from stunted and weak plants.”

## 8. Crop Rotations

For Aeschliman and Forgey, crop rotations are crucial to managing disease, pests and weeds. A “stacked rotation” of continuous corn allows Aeschliman to dramatically increase wheat yields and reduce disease.

He’s grown some 200-bushel-per-acre winter wheat after 7 years of continuous corn, he says. When Aeschliman saw his yield monitor registering 225 bushels per acre, he couldn’t believe it.

But the Natural Resources Conservation Service came out and verified a yield in a test area of 168 bushels per acre. The field averaged 203 bushels per acre.

Several experts attribute these gargantuan yields to many years of continuous corn eliminating wheat pathogens, huge amounts of organic matter and cool summer nights.

“The rotation with at least 3 years of continuous corn is the trick,” Aeschliman says. “However, out in the Palouse area of the Northwest, virtually no one has had any luck growing

corn, mainly due to frost and rotational issues.”

Aeschliman has an advantage because he doesn’t battle corn rootworms and diseases common in the Corn Belt.

For Forgey, diverse crop rotations are essential to managing weeds, pests and disease.

“There’s no way I would want to grow just wheat or corn or soybeans,” he says. “Cover crops are a nice fit following wheat. It helps build soil health.”

In 2009, Cronin Farms grew 18 crops, including forage and cover crops, on 8,950 acres 100% no-tilled since 1992. The top crops were hard red spring and winter wheat, corn, sunflowers, soybeans, field peas and lentils.

One crop rotation is spring wheat, followed by winter wheat, cover crops, corn and sunflowers or soybeans.

No-till has allowed the farm to diversify its crop production away from the days when it relied heavily on wheat. About 30 years ago, wheat accounted for 80% to 90% of the acreage on the farm. Since switching entirely to no-till, overall yields on the farm have increased 25%, Forgey says.

“It’s just amazing how we can grow other crops with no-till,” Forgey says. “The moisture no-till conserves makes it possible to produce corn, soybeans and other crops.”

When Aeschliman raises continuous corn, it removes the wheat pathogens since there is no host. As a result, there’s no grass or volunteer wheat to act as a green bridge.

“Pathogens are smart little suckers,” Aeschliman says. “When wheat germinates, the pathogens infect the new seedling from the host plant.

“Because the pathogens live in the host — volunteer wheat or grass — it’s necessary to do a burndown in the fall to make it more difficult for the pathogen to overwinter.”

That assumes it rains in the fall soon enough to get a green-up before it’s too late to spray. If not, he must wait until spring and spray as soon as possible before seeding.

“You want the volunteer wheat or grass dead — yellow and dead, dead, dead,” Aeschliman says. “The disease



PHOTO COURTESY OF PHIL NEEDHAM

**PINPOINT PLACEMENT.** Some growers no-tilling wheat into corn residue use RTK guidance to index the old corn rows between wheat rows. This prevents corn residue from interfering with disc openers and improves wheat stands.

comes from the dying plant if it’s still green and it attacks that new wheat or corn seedling.

“The weeds and volunteer wheat must be dead for 2 to 3 weeks. With no-till, you can’t afford to screw it up. It’s a simple thing like that, killing the green bridge, that’s essential.

## No-Till Results

There are pluses and minuses with no-till wheat, Bardwell says. The ground holds up better than in conventional tillage. You can spray sooner because no-till soils will carry the sprayer for earlier applications that pay off in higher yields. No-till saves money, labor and horsepower.

“The biggest savings in no-till for me is reduced erosion,” Bardwell says. “We almost don’t have erosion anymore. We are mostly 0% to 2% and 3% to 6% slopes. We do have a little bit of 6% to 12% slopes.

“We have long slopes. That’s where you get sheet erosion, but no-tilling has basically done away with sheet erosion. You don’t get the runoff because you have a mulch on top that keeps water from running off.”

But no-tilling wheat requires more management than conventional-tillage systems.

“Some years, disease pressure and getting a good stand are real problems,” Bardwell adds. “We’ve got scab, we’ve got barley yellow dwarf disease and the more we no-till, the more likely we are to have disease in our wheat. No-tilling wheat is a continual learning process.”



# Setting Up No-Till Drills, Air Seeders For Success

Taking a hard look at your equipment and seeding practices can lead to better emergence and higher yields, says ag consultant Phil Needham.

By John Dobberstein, Managing Editor

When No-Tillers have problems maximizing yields, the cause can often be traced back to the start of the growing season, when no-till drills and air seeders started making their passes.

Equipment setup, ballast requirements, disc blade conditions, down pressure and planting speed are critical considerations sometimes overlooked, says ag consultant Phil Needham of Calhoun, Ky.

Below are several tips Needham shared during last January's National No-Tillage Conference that could help no-tillers boost the performance of their no-drills and air seeders.

**Watch Your Weight.** To achieve consistent emergence and high yields, it's important to get all seeds to the same depth — preferably pressed into moisture — and to close the slot, Needham says.

If a no-tiller is facing higher levels of residue — for example, when seeding double-crop soybeans into wheat stubble — moisture may be deeper because the wheat has probably drawn some of the moisture out of the upper soil profile, Needham says.

“So you seed deeper to penetrate through the residue and to put the soybeans consistently into moisture,” he says.

Seeding deeper might require adding some weight to the drill or air-seeder, especially when the ground is hard or the residue is tough, but Needham often finds his customers aren't taking this action.

“For every mile per hour you increase forward speed over 5 mph, it takes another 10% additional down force — and that's cumulative — to keep your opener in the ground,” he says.

**Monitor Speed.** Machine speed can have a major impact on seeding performance, but Needham says he frequently runs into no-tillers wanting to go faster than necessary, rather than making satisfactory stands the goal.

On flat, dry fields with mellow soil and low residue levels, speeds higher than 5 mph might be acceptable, he says. But in fields

where wheat or soybeans are being no-tilled into corn stalks, the residue and crown roots may cause row units to bounce.

“Some guys tell me they want to run 8 mph or 9 mph with a single-disc seeder or a double-disc opener,” Needham says. “In most examples, 5 mph to 6 mph is as fast as you need to run with most seeding equipment.”

**Spread Residue.** Frustrations in spring planting can take root during the previous harvest if no-tillers don't spread crop residue evenly, Needham says. The lack of a chaff spreader or a poor performing straw chopper can leave heavy bands of residue behind that are hard for disc blades to cut through.

“You'll find the chaff is a lot more difficult to cut through, even with firm ground underneath — especially wheat chaff. Soybean residue isn't much better,” Needham says. “You can spend as much money as you can afford on a piece of seeding equipment, but often the previous crop's residue is the weak link.”

Chaff spreaders are an essential part of a no-till system, Needham says, adding that today's combine technology is much improved at spreading chaff and straw as a uniform mixture.

A conference attendee asked Needham if no-tillers should plant shallower or deeper if residue is distributed unevenly across a field.

“If that's representing 20% of the field, you're going to have to seed the whole field deeper to achieve consistent seeding depth,” Needham says. “If you seeded everything normally, you'll probably be too shallow within the 20%.”

**Better Blades.** There are pros and cons to using larger or smaller disc blades. New disc blades can run anywhere from 14 to 18 to 22½ inches in diameter.

Smaller disc blades have been found to cut residue better, as a result of less down-pressure and the larger cutting angle, when compared to a larger blade.

“If you try to cut through a thick piece of cardboard, the more you open the scissors, the easier it's going to be to cut through it,” Needham says. “If you try that with the scissors closed, at a lower angle, you're going to have a harder time.”

The greater the angle achieved by a smaller disc blade, the better the cutting effect will be.”

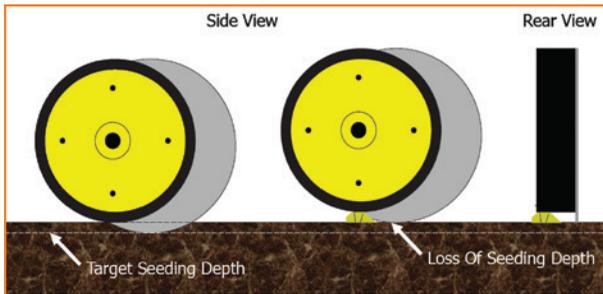
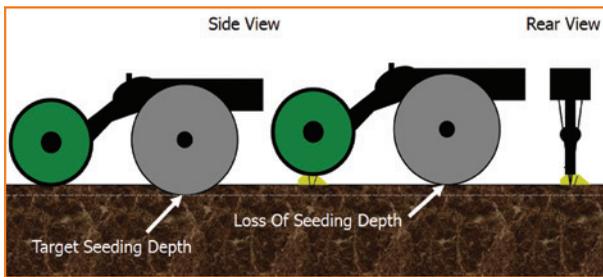
Regardless of brand or whether it's a double- or single-disc blade, no-tillers who don't have consistently sharp blades will have a hard time cutting through hard soil or heavy or damp residue, Needham says.

“A lot of guys are measuring disc blades and they're saying, ‘Oh yeah, it's 17½ inches in diameter. I shouldn't change it until 17 or 16½.’ But if you lose that edge, it's not going to cut even if the diameter is OK,” Needham says.

That leaves to question whether no-tillers should be more diligent about sharpening disc blades or simply replacing them. Needham issued a word of caution about sharpening: If the



THINK AHEAD. No-tillers need to use sharp disc blades, seed with adequate down pressure and maximize seed populations to increase yields, says Calhoun, Ky., ag consultant Phil Needham.



**DON'T SPEED.** No-tillers who plant too fast risk having row units bounce over trash and crown roots, making it difficult to obtain consistent seeding depth and uniform emergence, says ag consultant Phil Needham.

blade edge becomes hot during the work, it could lose its tensile strength and get dull fast when put back in the soil.

Some no-tillers listening to Needham's presentation said they put new blades on every year instead.

"The blades are surface hardened. Once you grind through that, they look good until you get to the field and they melt in a hurry," one no-tiller said. "I'm convinced that new blades pay for themselves over and over."

"I don't even really wait for them to get dull."

Another no-tiller asked if all disc blades were created equal in terms of quality.

"Absolutely not," Needham says. "There were some blades floating around last year in Kansas for \$20. A few guys bought them and they didn't make it through the season. They were losing their edge and even bending over. Find the good blades. They're worth the money."

**Use In-Row Phosphorus.** Needham says no-tillers can boost yields with in-row phosphorus applications when conditions are right, such as later-planted wheat no-tilled into cool, balanced soils.

"It needs to be in the row, not broadcast, and in contact with the seed," he says. "And don't dribble liquid fertilizer on top of the soil. That wouldn't be much better than broadcasting it. Phosphorus doesn't move very much."

Another suggestion is to put the liquid-fertilizer tanks on the tractor rather than the drill or air seeder.

"When your tanks are full, you've got a lot of weight per opener and it probably performs very well," Needham says. "As your tanks empty on your fertilizer and seed hoppers, often times they're light and you've got a dynamic weight change."

"Especially on the John Deere CCS, relative to when the hopper is full and when the hopper is empty. The challenge with the CCS is that all the weight is on the middle section. They're not able to transfer the weight out to the wings and that makes it worse." ❁

## No-Till Wheat Planted In Narrow Rows Can Boost Yields

Calhoun, Ky., ag consultant Phil Needham says he's seen growing evidence that seeding wheat in 7½-inch rows can yield more than wheat in 10- or 15-inch rows.

"No-tilling wheat or soybeans in 10-inch rows, offset from either side of the old corn row, could be an advantage for no-tillers struggling with corn stalks," Needham says. "But there's plenty of research that suggests 7½-inch rows produce higher yields."

"I've heard guys using 10-inch spacing say there's more weight per opener, but I'd rather guys do 7½-inch rows and add weight. You can achieve the same amount of down force per opener with weights."

Needham showed data from a 2010 replicated winter-wheat trial in Kentucky conducted by Miles Opti-Crop Research (where Needham worked for 17 years), which was sponsored by the Kentucky Small Grain Growers Assn. The trial analyzed wheat yields by row spacing, seeding rate and nitrogen rate.

Wheat was planted at 150, 200, 250 and 300 seeds per square yard in both 7½- and 15-inch rows, and spring nitrogen was split applied at the rates of 100 and 120 pounds of actual nitrogen.

In plots with 250 seeds per square yard, plots with 15-inch rows and 100 and 120 pounds of applied nitrogen, respectively, made 84 and 88 bushels. At a 7½-inch spacing, with the same two nitrogen treatments, the yields went up to 93 and 99 bushels, respectively.

"Nitrogen is your primary mechanism to adjust tiller numbers up or down at the early application time, so we apply higher rates of nitrogen to fields with lower tiller densities," he says. "And you need to understand where your seed populations need to be for maximum yield."

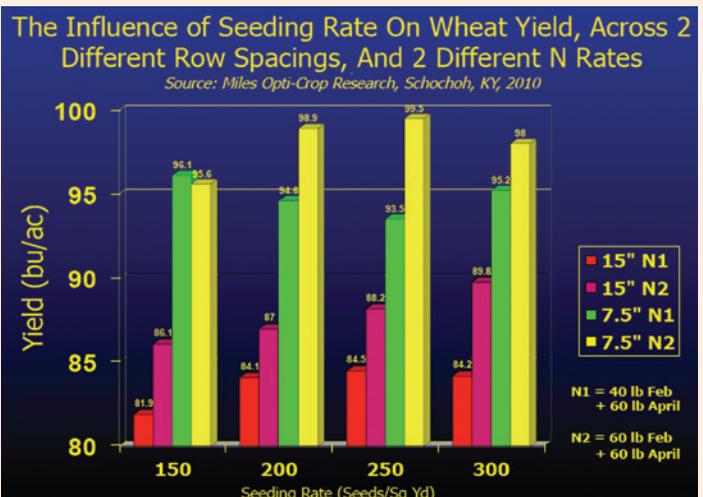
In a 2010 study by Needam Ag Technologies and Great Plains Mfg. conducted in Jewell, Kan., Great Plains provided two drills set at 7½- and 10-inch spacings.

All plots were treated the same with regards to seed population per acre and fertilizer practices, plus a fungicide was applied.

In this trial, the researchers found only a 2-bushel-per-acre yield advantage for 7½-inch rows, when averaged across four replications. But with \$7 wheat, this is still \$14 per acre, more than enough to pay for the additional drill cost, plus wear and tear, Needham says.

"I don't think I've ever done a row-spacing trial where the wider rows have outyielded the narrows. The narrows have always resulted in equal or high yields," he says. "If you get dry areas where the single-limiting factor is moisture, then they're probably going to be equal."

"For residue flow, and cost reasons, most guys find 6- to 7½ inch spacing is the best compromise for no-till."



**NARROW ROWS RULE.** This study shows that winter wheat seeded in 7½-inch rows, with split applications of nitrogen, consistently outyields wheat in 15-inch rows.

A man wearing a blue and white plaid short-sleeved shirt and a dark baseball cap with a logo is kneeling in a field of golden wheat. He is looking down at a small amount of wheat he is holding in his hands. The background shows a vast, flat landscape under a clear sky.

**DOUBLE-DUTY WHEAT.** No-tiller Tom Pauly counts on wheat as a cash crop and also relies on it to provide the residue that will supply nutrients in the soil to power double-crop corn and soybeans, and grain sorghum on his south-central Kansas farm.

# No-Till, Residue Opens New Doors

In the heart of wheat country, continuous no-till delivers crop flexibility and productivity for Kansas grower Tom Pauly.

By Mark Parker

**T**om Pauly pulls a pair of pliers from the holster on his hip, kneels down and scratches through a thick thatch of crop residue. And he smiles.

There's moist soil beneath the aftermath of past soybean, wheat and corn crops — enough to get the seed corn he's getting ready to plant up and growing.

It's been a dry year, with about 4 inches of rain from November to June around Conway Springs, Kan., where Pauly grows dryland hard red winter wheat, corn, soybeans and grain sorghum in a no-till system he initiated 12 years ago.

Average annual rainfall for Sumner County, traditionally the state's leading wheat producer, is about 33 inches.

"The problem is that a lot of that comes in 5-inch spurts," he says. "If we can catch that rain and store it, that's absolutely huge for us. Wheat is a dry-weather crop, but to consistently grow corn and soybeans, we need residue to capture moisture. Residue is the crop that feeds my cash crops.

"For a no-tiller, it's all-important — building organic matter to bring back the life in the soil that was killed with tillage, and conserving moisture. It opens up new possibilities."

### No-Till Changes Picture

Pauly's 2,000-acre farm has been 100% continuous no-till for the past 6 years. He began with no-till wheat on more reliable bottom ground for 2 years and moved to upland fields, as he proved to himself that the no-till system would also work there.

"I felt confident it would work in the bottoms, but I wasn't so sure about the upland," he says. "I had a lot of challenges — especially with



**GETTING IT RIGHT.** Tom Pauly spends a lot of time assessing planter performance and trying various equipment add-ons to find out what works best on his farm.

equipment — but no-till showed a lot of promise despite all the mistakes I made. And it became clear that it was just a better way to farm."

When Pauly began transitioning to no-till in 1998, his goal was to save tractor-seat time and grow continuous

with residue, Pauly says.

Wheat residue is what powers his summer crops. In an area where the prospects for June-planted corn would be iffy at best, he has a proven yield on double-crop corn of 100 bushels per acre.

**"The field that's been in no-till 3 years longer will consistently produce about 10 bushels per acre more wheat..."**

wheat. But there was more to it.

Wheat, all grown for seed, remains a cornerstone of the operation. But today's typical 4-year rotation is wheat followed by double-crop soybeans or corn; corn or grain sorghum; full-season soybeans; and then back to winter wheat and another double-crop.

Pauly is disappointed if corn doesn't make 125 bushels per acre; soybeans 35 bushels; or wheat 50. In a good year, those numbers can be replaced by 180, 70 and 70, respectively, he says.

Unlocking yield potential can be attributed to better soil health and moisture utilization, but it all begins

"That's part of the flexibility," Pauly says. "Before no-till, there's no way I would have planted corn in June, but no-till makes it work."

Pauly knows residue boosts yields. A few years back, he burned part of his wheat stubble because wet conditions had put him behind. The result? Five to 10 fewer bushels per acre on the subsequent wheat crop compared to non-burned ground.

### Managing Residue With The Combine

Pauly believes maximizing the benefits of residue in no-till operations begins with the combine.



**SCRATCHING THE SURFACE.** Thanks to thick, uniform residue cover, Tom Pauly has the soil moisture necessary to no-till corn in spite of extremely dry weather conditions. “Residue is the crop that feeds my cash crops,” he says.

For Pauly, it starts with what does and doesn't go on the machine's front. For wheat harvest, he uses a 32-foot Shelbourne Reynolds stripper header on his John Deere 9670 combine.

“The stripper keeps the straw long so it doesn't break down as fast as chopped straw, and it will retain more moisture,” Pauly says. “It's much easier to plant through because it's still attached to the ground and you just cut right through it.”

“And with more uniform residue coverage across the field, you have a more consistent growing environment for the next crop. And you get a more uniform stand with your corn, soybeans or grain sorghum.”

The stripper system also allows him

to run at about 8 mph and saves a significant amount of fuel compared to traditional headers.

For no-tilling corn, soybeans and grain sorghum into residue, Pauly relies on a 16-row John Deere 1770 planter that looks a little different than it did when he bought it.

“I love modifying equipment,” he says. “I don't trade often because I spend a lot of time trying to get everything just perfect for my operation. When I get something the way I want it, I want to keep it.”

The planter has Dawn row cleaners, Keeton seed firmers and May Wes spoked closing wheels.

“Most add-ons are used to address problems,” he says, “and those situa-

tions change. I use my row cleaners less and less every year now because I'm getting better residue distribution.

“Most of the time, they don't even touch the ground unless there's something big in the way, like a gopher hill or a root ball.”

## A Fertilizer Cushion

Pauly's planter has a liquid fertilizer system with a CDS-John Blue manifold to distribute nutrients from a nurse-tank pulled behind the planter or drill. For starter fertilizer, chelated zinc is added to the commercial N-P-K blend for all crops.

“The fertilizer is placed behind the row units, and about 2 inches to the side of the row,” Pauly explains. “Our soil-test levels are good. We keep them high enough so if we get some tie-up in the residue, we'll still have adequate nutrients. And then what's tied up will be available to the crops that follow.”

“No-till gives you a fertilizer cushion. Although you need a little extra fertilizer those first couple of years, you constantly have residue breaking down and adding to your fertility as you build your soils.”

Adjustable air bags on the planter provide adequate down pressure when dry conditions make getting corn seed 2 to 2¾ inches into the soil a challenge.

“I don't do any variable-rate seeding,” he notes. “Most of my fields are very uniform and, within each field, I don't see a lot of variation. While it isn't at the top of my priority list right now, I think it's a good concept.”

Wheat seed goes into the ground with a 30-foot John Deere 1890 single-disc no-till drill with Keeton seed firmers and Martin 20-point crumbler wheels. Liquid fertilizer is applied with a system Pauly made that utilizes a Finn fertilizer applicator.

“One of the most important things with the drill is not to skimp on opener blades,” he notes. “Those things get dull and they hairpin, and the seed boot starts dragging so you're wearing that out, too.”

“It's just a lot better to replace the blades so you're always doing a good, clean job.”

## No-Tilling Is About 'Attitude'

As much as Tom Pauly enjoys working with farm machinery, the key to successful no-tilling is more a matter of attitude, he says.

“No-till isn't as much about equipment modifications or herbicides or varieties as it is about commitment,” says the Conway Springs, Kan., no-tiller. “You have to decide that it's the best choice — not only for you and your family, but also for future generations.”

“Your mind has to be right to no-till, but once you make that commitment, the rest will come. That's what leads to the equipment modifications and the cover crops and all the other management decisions you make.”

He adds, “My dad had a saying: ‘Can't never done nothing.’ It was his way of telling us that we needed to figure out a way to make something work. Well, that's the way it is with no-till.”

One of his most-appreciated drill add-ons is a hydraulic lift system.

“That makes the drill so much easier to work on,” Pauly says.

Designed and built with input from friends and neighbors, the lift consists of three 4-foot-by-4-inch hydraulic cylinders placed vertically so that they push toward the ground. Powered by tractor hydraulics, the lift raises the drill to about 3 feet off the ground, allowing Pauly to use a roll-around stool for easier maintenance.

A Miller MD1000 self-propelled sprayer with a 90-foot boom and auto-boom shut-off handles herbicide, pesticide and fungicide applications.

Foliar diseases, particularly leaf and stripe rust, can significantly limit hard red winter wheat yields in Pauly’s area, so a fungicide such as Tilt or Quilt is sprayed on when potential yield and crop value make it an economical practice.

In his herbicide program, Pauly’s goal is to limit glyphosate use to one application per crop because he’s concerned about potential residual effects.

To eliminate a glyphosate application, he uses a pre-emergence application of Authority First on soybeans and Lexar on corn. A dicamba herbicide and 2,4-D are used for broadleaf control whenever practical.

The sprayer also sees considerable topdressing duty, since most of the fertilizer for wheat is provided in-season, according to need and yield potential.

In addition to nitrogen, phosphorus and potassium, the commercial liquid formulation includes sulfur.

**“A friend tells me we need to keep feeding our underground animals, and I think he’s right...”**

“This year, we put on about half of our wheat fertilizer in early March with the intention of putting the other half on in mid-April,” Pauly says. “In March, our crop prospects still looked pretty good. But when April came with no



**A ‘RESIDUE SALAD.’** Corn, wheat and soybean crops contribute to the residue cover Tom Pauly needs to improve soil health and save precious moisture. While his county averages 33 inches of rain per year, it comes in 5-inch spurts, he says.

rain, I skipped the second application.

“That’s the beauty of sidedressing. You put more fertilizer on if the crop can utilize it, and if it can’t, you don’t waste your money. We rely on crop condition more and more as an indicator of fertility needs.”

The same tramlines are used to apply fungicide when it’s needed.

The sprayer’s auto-height sensing booms, controlled by Raven Envivio Pro technology, allow Pauly to not only keep the boom height consistent across the field, but set them as low as 20 inches in windy conditions to minimize drift.

Pauly’s John Deere 9670 combine has an eight-row corn head and a 30-foot MacDon FlexDraper for soy-

bean and grain sorghum harvest.

Auto-steering is handled by a Trimble EZ-Guide 500, while a John Deere GreenStar system is used for yield monitoring.

“I use the yield-monitor information

primarily to compare varieties,” says Pauly, who is a Garst dealer in addition to growing seed-wheat varieties. “We have a lot of soybean and corn test plots, so the information is important.

“I also use it to take note of the good and bad spots in a given field so I can determine what happened there.”

### **Cover Crops: ‘The Next Frontier’**

Pauly has been experimenting with cover crops for residue-building and soil health. He’s still searching for the best options on his farm.

“I want to come as close to having something growing all the time as is practical,” he says. “I’ve tried some different cover crops and decided I like the mixes best.

“I don’t want a monoculture. I want more diversity to address different issues, and I think a mix gives you a much better shot at getting a good stand in different weather situations.

“A friend tells me we need to keep feeding our underground animals, and I think he’s right.”

Sunn hemp, spring oats and spring peas have been planted as cover crops. This spring, Pauly killed out a stand of oats, peas, canola and flax that had been planted right after corn harvest.

“It was a beautiful crop and I’m



**SEEDLINGS OF SUCCESS.** Soybean seedlings pop through the residue of past crops, clearly showing the intact nature of the preceding corn and wheat residue.

sure some of the neighbors thought I was insane for killing it, but it served its purpose of keeping the soil active, building residue and cycling nutrients,” he says. “It wasn’t a cash crop, but I believe it will add cash value to the crops that follow.”

The sunn hemp was double-cropped behind wheat as a residue and nitrogen builder, while the spring peas followed soybeans.

“Those single crops were OK. But the more I learn about it, the more important I think it is to provide some diversity in cover crops, just like we do with our cash crops,” Pauly says. “I think we have a ‘use it or lose it’ situa-

“Cover crops are the next frontier for no-tillers. I really think that cover crops are where our next big advances in no-till will be and, right now, we’re just beginning to scratch the surface.”

### Never Stop Learning

Pauly, a member of the South Central Kansas Residue Alliance, is constantly seeking answers, which he believes is critical for farmers considering a switch to continuous no-till.

“I see guys starting out who would save so much frustration if they would go to meetings, read articles and talk to somebody who’s done it,” he says. “Most guys start out by just

**“I measure no-till success by whether or not there’s more money in the bank. For us, the answer is ‘yes’...”**

tion with moisture and nutrients, and cover crops are the key.

“As we utilize cover crops more, I believe we’ll have more flexibility in our rotations.

eliminating tillage. Period. I know that’s what I did, and then I started learning all the other management adjustments I needed to make.

“Right now, I’m not so sure that

planting cover crops shouldn’t be one of the very first things you do. It would sure bring your soil around a lot quicker.”

No-till, Pauly says, gives him more farming choices than he had 12 years ago. Besides being able to expand and diversify into crops other than wheat, he has more flexibility on how he manages those crops.

“The conventional wisdom around here was that if you couldn’t plant corn really early, you were just wasting your time,” he says. “With the wheat residue that we no longer burn off or till under, we can save moisture. I feel I have a much wider planting window, even into June, for corn.

“It’s that residue effect. With healthier soil we can grow better crops, different crops with different rotations and we conserve moisture.”

### Age Improves No-Till Fields

Pauly expects greater productivity in the years to come as he fine-tunes his no-till strategies. He notes results from two adjacent 80-acre fields. One has been in continuous no-till for 9 years, the other for 6 years.

“They’ve both been productive, but the field that’s been in no-till 3 years longer will consistently produce about 10 bushels per acre more wheat,” he says. “They lay similar and their soil types are the same.

“I think the difference is that 3 extra years of no-till. I believe our soils are getting better all the time and, generally, yields have improved.”

Dollars and not bushels, however, are what Pauly uses for a success barometer.

“I don’t really measure no-till success in bushels per acre,” he says. “I measure it by whether or not there’s more money in the bank. For us, the answer is ‘yes.’ No-till is more profitable than the type of farming we were doing 12 years ago.

“No-till is what gets me up in the morning and, sometimes, it’s what keeps me up at night — asking myself, ‘What can I do to make this work even better?’ ”

