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A new era for direct seeding

New converts, new research will mean continued growth for direct seeding

The soil management system that revolutionized Prairie cropping systems is coming of age.

For more than 15 years direct seeding has dominated crop production discussions. Few cropping topics have had such a high profile on farm meeting agendas. Purists moved it to near-mythical status. They spoke passionately and reverently about it changing their lives and their industry.

The early glamour years may be fading, but many believe the biggest impact for direct seeding is yet to come. Continuous tough cropping economics, combined with the public's persistent push for environmentally sustainable farming systems, has many supporters believing that direct seeding will appeal to a new generation of farmers. And the potential for continual improvements will keep the converted in the fold.

"In terms of fuel and labour costs, research shows direct seeding can save money," says veteran researcher Lawrence Papworth, an engineer at Alberta Agriculture, Food and Rural Development's (AAFRD) AgTech Centre in Lethbridge. "If done properly, it can increase yield and be part of a long-term plan for sustainability, but producers have to know how to make it work for them."

The secret of really successful direct seeding systems is in the details of management, says Papworth. This is an entirely personal management system, with options that fit each farming operation like a finely tailored suit.

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Look no further than this past year's drought. In case after case, producers who had the best handle on their soil moisture management weathered the tough climatic conditions better than others, he says.

"Knowing your individual needs as a farmer will help in the design of a productive direct seeding system," Papworth says. "It's just a matter of paying attention to the details."

Matching soil type to equipment

"It's true some soils are better suited to direct seeding systems," says Papworth. "But it's also true that some of the soils that may not be best suited to such systems will end up benefiting more."

That's why producers shouldn't rule out the switch to direct seeding because of soil type.

Loamy soils are best for direct seeding, while sandy or heavy soils may not be. But, because direct seeding is a cropping system that maintains crop residue and conserves moisture, it's the sandier, heavier soils that can benefit the most.

"It's all a matter of choosing the right equipment," says Papworth. "Knowing your soil type and choosing equipment that's right for the soil type is the difference between a productive direct seeding system and one that isn't."

For example, an air seeder is better suited to wet soil areas. Air seeders don't pack soil directly over the seed, but in wet soil, the seed is likely to germinate regardless of whether soil has been packed around it.

A new seeding system that has been tested by AgTech Centre engineers could be used in dry soil; a burr packer runs behind the opener and packs soil around the seed, says Papworth. It may also be a good choice for beginning users because it can be added to an older cultivator, which makes it cheaper than a whole new piece of equipment. This is a good example of how research and technology development is helping to change the face of direct seeding.

Single shoot or double shoot?

The decision to single shoot or double shoot will affect several other decisions a producer must make – from choice of equipment to choice of fertilizer. Likewise, certain conditions, such as soil type, will come into play when deciding whether to single or double shoot.

"Single shoot systems are usually preferred by small operators or those who are just getting into direct seeding, but such systems limit the amount of nitrogen that can be applied because high application rates stop seed germination," says Papworth. "Double shoot systems are more complicated to set up, which makes them more suitable for a producer who already has some direct seeding experience under his belt."

On the upside though, double shoot systems can save time and money because the seed and fertilizer are placed at the same time, which means only one pass on each field. Less fuel is used and the equipment is subject to less wear and tear.

"Generally we've found double shoot systems are best suited to large operations that cover a lot of acres or have certain soil types," says Papworth. "For example, in light, loamy soil, the soil flows well around openers, making it suitable for double shoot systems."

Crop rotations are key

In direct seeding systems, crop rotations are even more important because of concerns about crop residue spreading disease.

Research by other institutions, such as Agriculture and Agri-Food Canada's Lethbridge Research Centre, has demonstrated the connection between crop residue and the

spread of disease. That's why, in a direct seeding system where more crop residue remains on the field, carefully planned crop rotations are so important.

"Choosing a suitable crop rotation should help reduce the disease threat and make volunteer weed problems easier to handle," says Papworth.

Seeding winter wheat into spring wheat makes it almost impossible to kill volunteer plants, so this rotation would not be suitable in a direct seeding system, he says. Such a rotation would also be more susceptible to disease threats, because disease can carry over from one cereal crop to another.

A more suitable crop rotation for direct seeding would be to go from a cereal to an oilseed. In that case, volunteer crops would be easier to handle and disease is less likely to be carried over.

Choosing, using the right fertilizer

Deciding which fertilizer to use is another important decision, and not just for beginning direct seeders.

"Our research has shown that, in terms of performance, one fertilizer isn't better than another," says Papworth. "What does make one fertilizer better than another is how well it's suited to a direct seeding system and whether it matches an individual producer's needs. It's important, from the beginning, to evaluate what those needs are. For farmers who have been direct seeding, but for whom productivity has remained lower than expected, it may be time to re-evaluate and change fertilizers."

Granular nitrogen fertilizer is fairly common and a lot of equipment manufacturers have set up their seeding equipment to use granular fertilizer. But, the downside is it's less concentrated than some of the other options, so producers have to handle a lot of it.

Anhydrous ammonia begins in liquid form in the fertilizer tank, but converts to a gas when applied. As a more concentrated fertilizer, producers can handle less of it and save money.

While most opener manufacturers have systems on the market that accommodate this fertilizer, a major disadvantage is that it's not as safe to work with.

Liquid nitrogen is the least concentrated, but it has other advantages, says Papworth. "It's easy to set up on a direct seeding double shoot system and still keep it separate from the seed. Seed and fertilizer placement is sometimes a concern in double shoot systems, but liquid fertilizer can eliminate that concern."

On the other hand, liquid fertilizer is more expensive per pound and producers must handle more volume.

"At the end of the day, fertilizer choice really depends on the individual producer's needs," says Papworth. "A producer with a fairly large operation using a double shoot system will probably lean towards anhydrous ammonia to save money. For a producer with a smaller operation who is using modified equipment rather than completely new machinery, liquid fertilizer may be the more appropriate choice."

The future of direct seeding

Direct seeding technology has come a long way in the past 15 years, and research will take it farther still.

Rapid progress in direct seeding will have some users convinced that's as far as the science will progress. Lawrence Papworth, an engineer at Alberta Agriculture, Food and Rural Development's AgTech Centre in Lethbridge, thinks differently.

"We want to continually help farmers fine-tune their systems," says Papworth. "That's why we did a row width and row spacing project. We want producers who have made the switch to get as much productivity out of their systems as they can."

Though AgTech engineers have already collected some row width and spacing data, they plan to continue their research next year as well.

"There were other variables built into our original width and spacing project – such as fertilizer placement," says Papworth. "Next year, we're going to scale back those other variables and focus completely on the row width and spacing that is the most productive for producers. This information would help producers add some finesse to their operations."

Future AgTech Centre research will also tackle residue management, because in no other system is crop residue more of an issue than in direct seeding.

"As producers start to buildup residue in their fields, they'll have to find ways to manage it," says Papworth. "In the next few years our research will explore management options with respect to residue management. Could a residue manager attachment that runs in front of the opener increase crop emergence and crop yield by clearing some of the residue away? Answers to that type of question will help producers increase their productivity."

It may be a desire to keep their industry environmentally sustainable that has led producers to make the switch to direct seeding, says Papworth. "But it's continued research that's ushering in a new era of direct seeding productivity, and that in turn will keep producers hooked."

Width matters

"We've done a row width project that showed row width can affect yield in a direct seeding system," says Papworth. "Changing the spread of the seed within a row is a way for a producer who already has some experience with direct seeding to add some finesse to the operation."

AgTech Centre engineers tested row widths of one, three and five inches. In most cases, increasing the row width led to an increase in yield. "The main reason for that is seedbed utilization," he says. "Using more of the seedbed means using more of the soil and more of the soil's nutrients."

But there are issues associated with too great a row width. In order to spread seed out, a producer will have to use a wider opener. With a wider opener, the seed needs to be placed deeper to keep the opener in the ground, and that's not ideal seed placement.

"The decision of row width should also be made with soil type in mind," says Papworth. "If you're planting into loamy soil, the seed depth isn't as critical, because the seed can germinate in a wider range of depths. That allows you to use a wider row. But, producers with a heavier soil may not want to go to a five inch width because the seed placement may be too deep for that type of soil."

The crop should also determine row width. For example, canola shouldn't be seeded too deeply, so canola producers should use a narrower row width.

Re-thinking row spacing

Changing the row spacing, that is, the distance between rows, is another way to make an operation even more productive. Recent research at the AgTech Centre has explored different row spacing – eight, 10 and 12 inches – to determine which brings the highest yields.

"We tested row spacing at the same time as we tested row width, because earlier research had shown a dramatic difference in yields depending on the spacing," says Papworth. "Our research found that a narrower row spacing brings higher yields and again this is because more of the seed bed is used."

In the case of row spacing though, it is possible to go too narrow. With narrower spacing, a producer may run into other problems, such as residue management.

"The higher yields that result from narrow spacing are going to leave heavier crop residue on the fields," says Papworth. "That could be a problem for direct seeding the next time. A producer would need equipment that will work with heavier crop residue."

That's why some producers are choosing a 12-inch spacing even though having a narrower one may result in higher yields, he says.

The future is now

The past 15 years have seen a tremendous increase in the amount of knowledge available about direct seeding, Papworth believes, and that's only going to grow in coming years.

"We have the knowledge now to help beginners get into direct seeding and our ongoing research will help experienced direct seeders improve their operations even further," he says. "Now that we know as much as we do about creating successful direct seeding systems, there's no reason that all producers can't do this.

"In the future, as inputs get more expensive and as the trend towards conservation practices grows, even more farmers will make the switch. And when they do, there will be a system that's exactly right for them."

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