ON TRACK

MOVING NO-TILL AND PRECISION AGRICULTURE TO THE NEXT LEVEL

Controlled Traffic Farming Alberta Project review

Getting into CTF

Producer profiles

Into the Future

CONTROLLED TRAFFIC FARMING Alberta

www.controlledtrafficfarming.org

Key Resources

Controlled Traffic Farming Alberta:
Information on Alberta project and links to many international sites.
www.controlledtrafficfarming.org
Peter Gamache, Project Leader
ctfa.alberta@gmail.com
or 780-720-4346

New in 2013 NACC Controlled Traffic Farming Manual - 80 page manual updating the Tramline Farming Systems manual.
http://nacc.com.au/pages/4838/sustainable-farming

Australian Controlled Traffic Farming Association:
http://www.actfa.net/index.html

Controlled Traffic Farming Europe:
www.controlledtrafficfarming.com

Precision Agriculture:
http://www.precisionagriculture.com.au/index.php

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Editor: Bruce Barker, HayWire Creative

Contributing Writers:
Bruce Barker; Donna Fleury

CTFA Contributing Writers:
Peter Gamache; Roger Andreiuk; Dennis Day

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"We are not sure if controlled traffic farming is the next major advancement in cropping in western Canada. What we do know is that the promise it holds in reducing risk and inputs while maintaining or increasing yield is a goal worth pursing."

–Craig Shaw, co-operator, Durango Farms, Lacombe, Alberta.

Controlled Traffic Farming Alberta (CTFA) is a farmer-led initiative aimed at evaluating controlled traffic farming systems in Alberta. The group is interested in taking no-till and precision agriculture to the next level.

The Vision

Our vision is to help farmers successfully adopt controlled traffic farming systems that improve soils, increase production per unit of input, decrease cost per unit of production, and increase net returns.

Our Mission

Our mission is to evaluate and assess controlled traffic farming systems under Alberta conditions, and provide farmers and agronomists with high quality, unbiased information so that they can make informed decisions about adopting controlled traffic farming.

Controlled Traffic Farming Alberta

Controlled Traffic Farming Alberta (CTFA) is a three-year project initiated in 2010 to help western Canadian farmers assess the potential of controlled traffic farming (CTF) under Alberta conditions. The objectives of CTFA are:

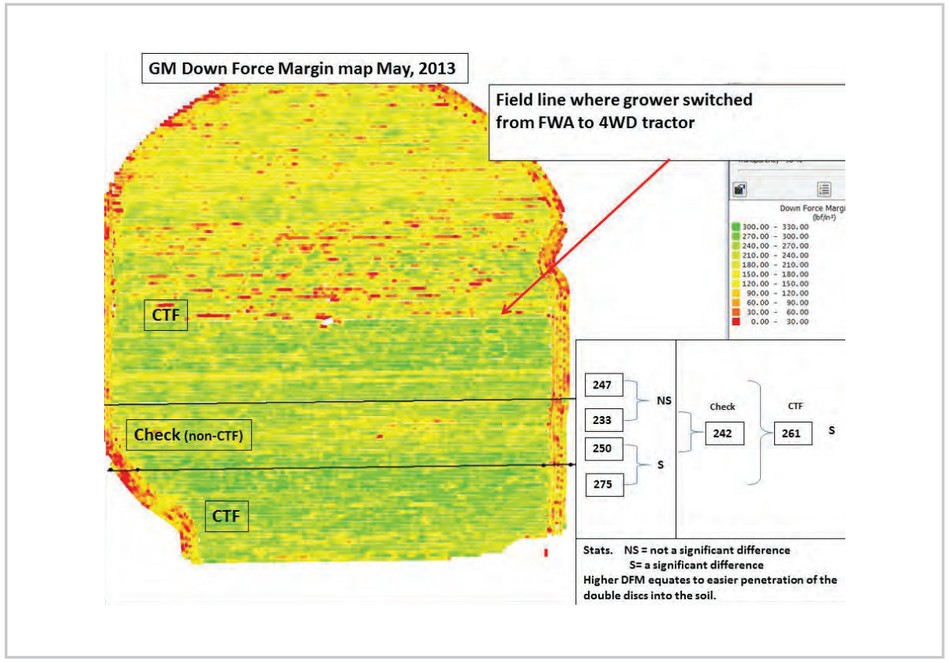
- Assess the agronomic and economic viability of CTF under a variety of climatic and soil conditions.
- Develop a resource base of farmers, agronomists, researchers and industry with CTF expertise to describe and advocate its evaluation and implementation.
- Increase awareness of CTF to 60 per cent of Alberta's commercial farmers.

Five farmer co-operators are involved in the project and use field-scale equipment on demonstration plots ranging from 140 acres to 480 acres. The check plot is the farmer's normal random traffic system, and CTF is the comparison.

Controlled Traffic

Controlled traffic farming is a crop production system in which the crop zone and traffic lanes are distinctly and permanently separated. In practice it means that all implements have a particular span or multiple of it and all wheel tracks are confined to specific traffic lanes.[1] Permanent wheel tracks (tramlines) are established in the field where all machinery travels year after year.

[1] No Tillage Seeding in Conservation Agriculture. 2nd Edition. Eds C.J. Baker and K.E. Saxton. FAO and CAB International, 2007.



Difference in ground force in CTF and conventional fields.

Above right: CTF may improve water infiltration.

Compaction can hinder root development.

Reducing soil compaction can improve soil structure.

Wheel tracks showing compaction at Morrin, Alberta.

CTF is an attempt to address the detrimental effects of compaction caused by the current tools used to travel on fields. The move to larger and heavier equipment, early season planting, field operations on wet soils, and random traffic in most cropping systems has increased compaction. Compaction may be a largely unrecognized problem in many Alberta fields, 'hidden' by random traffic. Little research on compaction exists in western Canada, contributing to a void in the understanding of how compaction may be impacting soil structure and yield.

The popular belief is that freeze-thaw cycles break up subsurface compaction, although there is little research to support this. In-season wheel traffic can have a detrimental compaction effect on growing crops, too. A one pass direct seeding system covers about 50 per cent of the field each year. It is also estimated that 80 per cent of the damage caused by compaction is created on the first pass over the field. Controlled traffic farming has the potential to eliminate the effects of wheel compaction, and can provide a number of benefits to Prairie farmers.

Many potential benefits

In Australia and parts of Europe, farmers and researchers have been working with CTF for many years. Experience in Australia and Europe indicate the potential benefits western Canadian farmers might achieve with CTF.*

- Improve soil structure – reduce overall compaction,
- Increase water infiltration (up to 15%),
- Increase soil water storage,
- Increase moisture use efficiencies (up to 50%),
- Improve nutrient use efficiencies (up to 15%),
- Increase yields (10-15%),
- Reduce pesticide costs with targeted spraying,
- Reduce fuel consumption (up to 10%),
- Improve trafficability of equipment,
- Lower machinery investment, and
- Serve as a platform for applied research.

Controlled traffic farming improves soils and has been shown to enhance crop root development and root exploration of the soil profile.

Experience in Australia has shown that moisture management is improved when compaction is minimized. Moisture or rain events are much more easily absorbed into the soil profile and move to a lower depth away from losses from surface transpiration. Reducing soil compaction improves soil structure and allows plant roots to more easily expand in the soil for better access to moisture and nutrients.

Australian experience has shown that improved water and nutrient use efficiencies have provided CTF farmers average crops while conventional fields had negligible yields under low moisture conditions.

CTF farmers have documented evidence of moisture use efficiency three times the national average and nutrient use efficiency twice the national average in Australia. In Western Canada where lack of moisture is often the number one limiting factor in crop production, there is a compelling argument that a better understanding of CTF is required to see if similar benefits will occur.

With the adoption of GPS guidance and more recently of RTK repeatable sub-one-inch accuracy, controlled traffic farming now allows producers the possibility of incorporating a number of other disciplines into their farming operations such as interrow seeding and in-crop applications of fertilizer, fungicides and herbicides. By combining a number of these disciplines together in a farming system, there is the opportunity to farm with higher, more consistent yields while at the same time substantially reducing some of our operating costs of fuel, fertilizer and crop protection products.

*numbers in brackets are Australian figures.

Moving to Controlled Traffic Farming

Implementing a CTF system requires careful planning and may require some machinery modification so all load-bearing wheels follow the permanent tramlines. While this is the ideal end-goal, farmers can gradually move to CTF as resources allow and equipment upgrades are completed. Two principles guide CTF: matching equipment widths so that all machines can run on the permanent wheel tracks, and matching the wheel gauge width to all machines. Tim Neale at Precision Agriculture in Queensland, Australia provided many of the following recommendations to CTFA in 2010.

1. Choose imperial or metric

Generally, North American farmers work in Imperial measurements for equipment widths. Sticking with one system is better since 9 m is not 30-feet; a 30-foot header is 9.14 m, and a 40-foot header is 12.2 m, so Imperial may be easier to work with.

2. Get out the tape measure

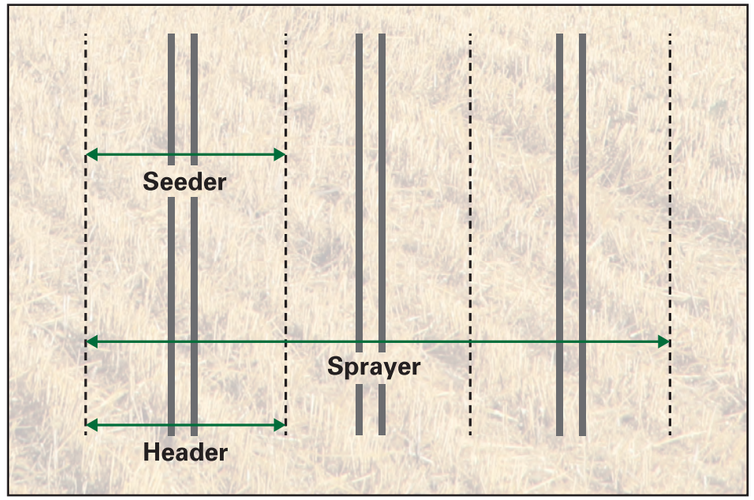
Little consistency exists in actual working widths among machinery manufacturers. Commonly, 30-foot headers are a few inches less, and other equipment such as drills or sprayers may not be the stated width. Match actual working widths so that you don't have a combine header leaving a few rows of crop or a sprayer overlapping passes. For interrow seeding where the drill will shift from year to year, also consider the additional width of this shift for the drill.

3. Decide on operating width

Often, the deciding factor is how well a combine can spread crop residue, as residue will build up over the years if not spread completely across the header width. The combine is one of the heaviest machines, and is also the hardest to modify for working width or wheel gauge. The combine can also have the widest wheel gauge and widest tires/tracks. Wheel gauge measured centre-to-centre on the load bearing tires is usually around 120 inches. Generally, farmers choose either a 30-foot or 40-foot combine header width.

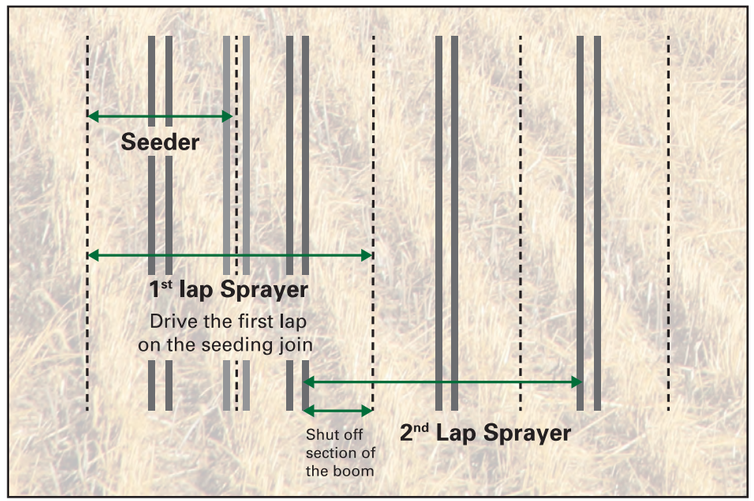
4. Matching operating widths

The easiest ratio to work with is 3:1, which provides easier matching of passes at the field edges. For larger air drills, a 2:1 ratio is a better option, but this ratio will have an overlap at the field edge. Another option proposed for larger air drills is to match the header in multiples of the sprayer 3:1 and the seeder to the sprayer 2:1. For example, 40-foot header, 120-foot sprayer and 60-foot seeder. The seeder will run on wheel tracks every second run. Sectional control will be required on the air drill and sprayer to avoid double seeding and application.



The 3:1 ratio is the easiest machinery width ratio to use.

Ratio	Header width	Drill width	Sprayer width
3:1	30 feet	30 feet	90 feet
	40 feet	40 feet	120 feet
2:1	40 feet	40 feet	80 feet
3:2:1	30 feet	60 feet	90 feet
	40 feet	80 feet	120 feet
3:1 plus 2:1	40 feet	60 feet	120 feet



The 2:1 ratio works well for wider air drills.

Wheel extensions for a 120-inch gauge.

Grain catcher on a grain cart.

Wheel rutting may become an issue.

The combine header width often dictates tramline widths.

RTK guidance is critical for CTF.

Combine auger extension.

5. Modify wheel gauge widths to run on tramlines

Measure the actual wheel gauge from centre-to-centre on each piece of equipment and decide on which will be the easiest to modify. Only load-bearing wheels need to run on the tramlines, as transport wheels such as those on air drills do not carry as much weight.

With the combine wheel gauge as the basis for the tramlines, usually 120 inches, other machinery including air carts, tractors, swathers, sprayers and grain carts may require wheel extensions. Generally, the need to modify wheel gauge varies among manufacturer and equipment types. Various after market options are available, but in some cases, on-site fabrication may be necessary.

6. Modify implement working widths

The need to modify working widths will vary. Air drills and boom sprayers are more easily made smaller by removing openers or clamping off nozzles. Combine headers and swathers are not easily modified, so are used as the basis for the operational width.

For grain carts, the combine unloading auger may need to be lengthened or an extension/grain catcher added to the grain cart. An alternative is to move the grain cart off the tramline during unloading, or unload at the headlands.

7. Decide tramline type

In the CTF Alberta project, most of the cooperators have left the wheel tracks in the sprayer tramline unseeded. Steve Larocque has successfully experimented with doubling up the seeding rate on the seed rows adjacent to the wheel track so that maturity is similar to the other seedrows. Australian research has shown that the overall yield increase of the crop growing adjacent to the bare tramlines more than compensate for missing one or two rows of crop. However, many growers have found that bare wheel tracks can lead to erosion and weed control problems.

Three commonly used tramline tracks used in Australia are unseeded, fuzzy and seeded wheel tracks. Fuzzy wheel tracks are made by broadcasting and rolling seed into the wheel track with one of the air cart wheels. While fuzzy tracks may help prevent soil erosion, crop maturity may be delayed in the tracks. In western Australia, most farmers are seeding wheel tracks to cereals and leaving them unseeded in broadleaf crops.

8. Wheel track maintenance

Rutting of wheel tracks and crowning of soil between wheel tracks has been a challenge for some of the CTF Alberta cooperators. Rutting is mainly due to wet soil conditions during field operations. To avoid long term wheel track problems, field design should use the most efficient direction for field operations and water movement. To combat wheel track rutting, Australian farmers have used a combination of wheel track renovators, shrouded spraying of weeds in wheel tracks, and avoiding field operations during wet conditions.

9. Guidance systems

An accurate GPS guidance system that is compatible across all machines is critical to CTF so that equipment is able to return to the permanent wheel tracks every time. Global Navigation Satellite System (GnSS) Real-Time Kinematic (RTK) 2-cm guidance is the recommended option. The Alberta cooperators use RTK guidance.

10. Plan for efficiencies

Examine ways to improve efficiencies on the farm. This can often be the longest discussion:

a. Use trackman program to show coverage with random traffic

Contact Tim Neale of Precision Agriculture in Australia for the Trackman program: tim@precisionagriculture.com.au

- Zero till about 40-60 per cent of field
- Conventional/minimum till > 85 per cent

b. Develop a five- to 10-year plan

- Think ahead to what you want to do in the future.
- What acreage do you want to be farming in 5 years?
- What are the time critical activities (how much needs to be achieved in a set timeframe)?

c. Plan and plan

- Field/farm layout,
- Topographic maps,
- Location of roads on ridges/removal of grain,
- Roads to improve truck “flow” through the farm, which minimizes trucks turning in the field,
- Length of runs based on header width, box capacity, av. yield, etc.,
- Water, drainage, erosion to minimize concentration and waterlogging, and
- Agronomic improvements to match new soil conditions.

Steve Larocque

Beyond Agronomy,
Morrin AB

Current CTF System

Tractor: Steiger 4WD on 120-inch wheel gauge

Drill: Conserva Pak 30-foot drill with 1.5-inch GEN sideband openers and offset hitch

Air Cart: Concord 120-inch wheel gauge

Sprayer: Melroe SP 60-foot sprayer 120-inch wheel gauge

Combine: JD 9750 combine with 30-foot header and fine cut chopper

Fertilizer banding: FAST 8100 nitrogen toolbar, 60-foot on 120-inch wheel gauge

RTK GPS

Steve Larocque moved to CTF to help combat soil compaction on his farm.

The deeply cracking soils at the farm.

By leaving stubble taller, Larocque can better manage crop residue.

The rear wheel gauge on the air cart was extended to match the tramlines.

In 2010, Steve Larocque and his brother-in-law Mitch Currie converted their 640 acre no-till family farm at Morrin, Alberta to CTF. Larocque grows a mix of cereals, oilseeds and pulse crops on clay to heavy clay soils.

As a Nuffield Scholar, Larocque became interested in CTF as he traveled around the world looking at precision farming systems. He was able to visit over 30 CTF farms in Australia and several farms in the United Kingdom and New Zealand who used tram lines to minimize wheel track damage. Larocque saw the benefits of tram lines in very dry climates like Australia and very wet climates like the UK and New Zealand.

CTF provided a means to reduce the impact of extreme weather events and virtually drought and flood proof his farm. In the spring of 2010 they modified all of the equipment to run on 30-foot widths with 10-foot axle spacing. Four years later they haven't looked back and the system is performing well beyond expectations.

One highlight in 2012 was being able to seed on his heaviest clay soil for two days while the neighbors sat still or found lighter ground to seed following two and one half inches of rain. The soils are unbelievably mellow in the top three inches and flows around the openers like butter. The hard packed tramlines, which are not seeded, are holding up very well and supporting traffic in tough conditions.

Implementing CTF

Larocque started with existing equipment, and chose a 3:1 ratio centered on his 30-foot combine header. Larocque has made some equipment changes and improvements over the past three years. Most of the changes were made upfront with minor modifications expected in the future. His biggest initial expense was $16,000 for installing RTK guidance.

The header was his deciding factor in setting up the system, as the ability of the combines to spread straw over the 30-foot header width was the limiting factor in CTF for Larocque. The combine wheel stance was 120 inches, so other equipment was modified to match this wheel gauge. The Steiger tractor had dual wheels on 11-foot, 6-inch centers. The inside duals were taken off, 7.5 inches were cut off of each spacer, and then put back in for stability. The stance ended up on 10-foot three-inch spacing, a compromise Larocque could live with.

The Brandt SB 4000 suspended boom, pull-type sprayer wheel gauge was naturally on 120-inch centers, so the only modification to the sprayer was to cut 10 feet off the 100-foot boom to bring it down to 90 feet wide.

Their drill was a 40-foot, 5-section Concorde. To bring it down to 30 feet, they removed a section from each end. The drill was originally set up as a single shoot system, so they bought different distributors to allow double shoot seeding. The 230-bushel air cart required axle extensions on to the back wheels to bring them to 10-foot centers.

An offset hitch has been installed on the drill to allow seeding between the stubble rows. In 2010 the offset was placed three inches to the right, three inches to the left of centre in 2011 and pulled from the centre in 2012.

Assuming the combine header was 30 feet wide, Larocque found the cutter bar width to be only 29 feet, eight inches. However, the air drill was only 29 feet wide from shank to shank, which turned out to be a positive. Seeding on 12-inch centers and interrow seeding meant that moving the offset hitch six inches each year resulting in two inches of room on one side of the header and three inches on the other. The increased efficiency has improved operating time and virtually eliminated seed and fertilizer overlap. With residue management one of the biggest issues, in 2013 he moved to a new 9750 John Deere combine with a fine cut chopper that spreads the residue more evenly across the 30-foot header width. The previous Gleaner combines tended to place most of the residue load in the middle 10 feet, causing chaff loading, increases in volunteers, and delayed emergence and maturity. He has also upgraded to a Melroe SP 60-foot sprayer.

To improve harvest efficiency and residue management, Larocque is also leaving tall stubble at harvest. By leaving cereal stubble at 16 or 18 inches high instead of six to eight inches, he can increase speed from two to 4.2 mph, which translates into an increase of $4000 per hour in harvest efficiencies. An added advantage is the following pea crop is much easier to harvest, even in situations like 2012 where severe hail damaged the pea crop extensively.

Going Forward – Future System Modifications

After four cropping seasons using CTF, Larocque continues to tweak the system. One of the biggest issues continues to be elevated soil between the tramlines. To reduce the effect of the crown that is building up he had to tweak the drill quite a bit. He is planning to move to a Conserva Pak drill to have more precision control over seeding depth. He is going to stay with a 30-foot seeding system, although the ultimate goal is 60 feet for efficiency. Larocque has also added a 60-foot nitrogen toolbar that allows for sidedressing of nitrogen in crop. The toolbar uses a set of coulters that inject liquid nitrogen on the go at rates up to 80 to 100 lbs./N/acre at speeds of 14 to 16 mph.

Jamie Christie

Arn Brae Farms,
Trochu AB

Current CTF System

Tractor: John Deere 9530T track - 120-inch wheel gauge

Drill: SeedMaster 80-foot independent hoe drill, 10-inch row spacing - 120-inch wheel gauge

Sprayer: John Deere 4730 120-foot SP sprayer – 120-inch wheel gauge

Combine: S690 John Deere with 40-foot header, dual wheels with reduced pressure on inside dual

RTK GPS

Jamie Christie built his CTF system to suit his own needs.

Working with a 40-foot header as the base unit increased cropping efficiencies.

Christie has seen some gulling issues along tramlines.

One challenge of the 40-foot system is having to move off the tramline to unload.

Jamie Christie is a fourth generation farmer and farms 4,200 acres with his father at Trochu, Alberta. Christie started converting to CTF in 2011 on 120 acres, with plans to move the whole farm to CTF in 2014. Christie grows mostly canola and barley in rotation on clay to heavy clay soils.

After travelling to Australia in 2010, he came back to Alberta and decided to try CTF, but developed his own strategy for his farm rather than just implementing the Australian formula. He decided that rather than trying to make inferences from someone else's data in another location, he had the ability to prove it on his own farm and find out whether CTF would or wouldn't work under his conditions. He focused on looking past the CTF formula and developing solutions for his own problems.

One of the benefits Christie is seeing with CTF is increased yield without increased inputs. However, he sees CTF as more about trying to mitigate risk and maintain yield stability in adverse conditions over the longer term. His goal is to maintain and improve quality agronomics and lower the cost of production across the operation as CTF is implemented across more acres. CTF provides the foundation for increasing yield potential, pushing straw management and intensifying management.

Implementing CTF

Christie decided at the outset that since he planned to farm for several years, he would start with an equipment base that had the most viability over the long term. Therefore, he started with the largest practical width he could, including a John Deere S690 combine with a 40-foot header and 120-foot sprayer on 120-inch wheel gauge in 2011. He also did some tractor modifications on both his 8320 and 9630 John Deere tractors, using a kit to space out the undercarriage to 128 inches instead of 120 inches. The costs were $1800 for one tractor and $10,000 for the other plus 20 hours of labor for each installation.

He started CTF with his existing SeedMaster 60-foot independent hoe drill with 7.5-inch paired rows on a 120-inch wheel gauge. He uses the GPS to offset for interrow seeding. In the first couple of years there was minor rutting in the tramlines. Recently, Christie hasn't had too many problems with rutting except for one low area.

Christie has dual wheels with reduced pressure on the inside dual on his John Deere S690 combine. He has also upgraded the chopper on the combine to manage residue up to the 40-foot header width, but he emphasizes it has to be managed, it can't just be set up at the beginning. He adjusts the spreader three or four times a day, depending on conditions. All of the adjustments can be made from the cab. One other challenge is the standard grain carts and the 40-foot combine system. He needs to move off the tramline to unload the grain carts, keeping the left tire in the right tramline.

Going Forward – Future System Modifications

There are still a few cons to CTF that Christie continues to try to mitigate and find solutions that work on his farm as he implements CTF on more acres. Under his soil conditions, he is seeing some rutting issues along tramlines. By going to 80 feet on the drill or a 2:1 unit, he will reduce the number of passes at seeding from 66 passes to 33 passes on a quarter section and expects to gain precision and flexibility. Although there will still be an impact when the ground is wet, there will only be half as many tramlines being impacted in this higher damage timeframe. He plans to seed unfertilized tramlines to help reduce rutting problems and erosion and still have the visual indication of a tramline.

Christie has moved to a John Deere 9530T track tractor and a tow between aircart with tracks. He hopes this will create a light enough footprint so there are no gullwing effects and to reduce the current rutting problems in the tramlines. Initially, the traffic was 19 per cent through the growing season and 24 per cent at harvest because of dual wheels. The final goal is to reduce the traffic footprint to 7 percent throughout the season and 12.5 per cent at harvest.

Addressing Oil and Gas Footprint in CTF

Christie has three potential oil wells going in on a field. He has explained his CTF goals to the land agent and what he is trying to do with the land. They have been willing to discuss and to try and accommodate Christie's goals as they proceed. Christie is working with them to place wells in one row to make it easier to go around, and to place lease roads and right of ways on an existing tramline to reduce the traffic footprint.

Garry MacLagan

Grantully Farms Ltd,
Rolling Hills AB

Current CTF System

Tractor: Buhler-Versatile 2160 FWA on 120-inch wheel gauge; Versatile 800 4WD single wheels on 120-inch wheel gauge

Drill: Flex-Coil 6000 seeder, 30-foot, with single-shoot Barton openers on 7.5-inch row spacing

Air Cart: 2340, with front bogey-wheels removed to make a 120-inch pivoting axle. Rear axle already 120-inch wheel gauge.

Planter: JD7000, 20-foot, 8-row with lots of custom upgrades plus Precision Planting vacuum and SeedSense monitor.

Strip-Till: Converted JD7000 with Yetter Maverick Hi-Residue units; 8-Row, 20 feet

Sprayer: Farm-King 90-foot PT; 120-inch wheel gauge very narrow tires; planning for wider ones.

Swather: Westward 9352, 30-foot on 120-inch wheel gauge

Combine: Cat Lexion 450 with 20-foot headers – 127-inch wheel gauge with a removable 80 bu grain tank extension for 24 lbs./bu. sunflowers.

Trimble FMX with RTK base-station

Garry MacLagan hopes to take his no-till farm to the next level with CTF.

Wheel extensions on the Versatile tractor.

MacLagan's 3:1 CTF system

Row crops help to manage crop residue in the rotation.

Garry MacLagan farms under irrigation in the light Brown soil zone at Rolling Hills Alberta. He has been in a no-till system for the past 18 years under irrigation. All of the land is irrigated except for the corners. MacLagan grows both field crops (including spring and winter wheat, hybrid canola, edible beans and fababeans) and row crops including corn and sunflowers.

After attending an Advanced Agronomy Workshop in 2009 and listening to Robert Ruwoldt from Australia talk about no-till farming and CTF, MacLagan thought CTF might be the next step to try in his operation. MacLagan's goal for implementing CTF was to reduce compaction, improve yields, reduce costs and improve efficiency of operation. He also wanted to see if he might be able to cut back on fertilizers through variable rate applications.

MacLagan is seeing additional improvements in the soil since moving to CTF. The soil is more friable and takes moisture better. He has noticed improved moisture-holding capacity and lower irrigation requirements on corn, fababeans and wheat. So far yields have been similar and he is still working on further reducing fertilizer inputs. CTF has made setting up replicated variety or fertility trials very easy. MacLagan isn't sure whether the advantages he is seeing so far are from CTF or because he has been in no-till for such a long time. However, he thinks the combination of no-till and CTF is making a difference and he plans to continue with this combination on his farm.

Implementing CTF

MacLagan started CTF using his existing equipment and chose a 3:1 ratio centered around his a 30-foot Flex-Coil air drill to seed field crops. The air seeder is a single-shoot machine with Barton openers on 7.5-inch row spacing, so fertilizer is applied first, either in the fall, or as early as possible in spring, followed by seeding. MacLagan feels that with this two-pass seeding system CTF will be of even more benefit because the air carts are very heavy. He has also started strip tilling in 2009, which allows him to apply any amount of nutrients in varying rates down to six to eight inches deep and directly below the seed and away from weeds. For row crops, he currently uses a 20-foot, 8-row planter for seeding sunflowers and corn.

MacLagan has a 90-foot pull-type Farm-King sprayer, which works well in the field crops, but in row crops he had to block it off to 80 feet to match the 20-foot wide row crop drill. He is seeing an advantage to CTF with spray operations and the ability to get into the field much sooner after a heavy rain than he could in the past. He would like to move to 120-foot sprayer but the rolling land may be too big of a challenge.

One of the reasons MacLagan grows row crops was to handle the high residue produced on his irrigation farm. In the first 12 years of no-till he did bale most of the residue off the field, but he stopped doing that about six years ago. By utilizing row crops, he can use paired residue managers and/or cutting discs to get through any amount of residue. MacLagan also has to be careful with his crop rotations, trying to alternate between higher (wheat, corn) and lower residue crops (edible beans, sunflowers). Seeding into wheat or corn stubble can still be challenging, depending on what crop is being seeded.

Because one of the most compacting pieces of equipment on the farm is a grain-cart, MacLagan was fairly determined not to use one. This does restrict his combining throughput to a certain extent and has also meant that he had to limit the width of the header to 20-feet. To accommodate high-yielding crops such as confection sunflowers, he built a removable extension to the grain tank on the Cat Lexion combine, which allows him to unload at field edges. The extension is not used for wheat or some other crops.

Going Forward – Future System Modifications

MacLagan is planning to move to a 30-foot 12-row planter to match the air seeder, which should provide a fairly large reduction to the amount of soil tracked. He plans to add two rows to each side of his planter this winter to extend the planter to 30 feet. He is concerned about the deepening tramlines and thinks they may prove to be a problem in the future, hence the desire to replace the narrow tires on the sprayer. He does have a ditch-filler that is used to occasionally fill centre-pivot wheel-tracks and is an option to repair the tramlines, by building a toolbar to hold two old ditch-fillers 120-inches apart. Another solution may be to divert all the chaff from the chaff spreader into the tramlines.

Guidance is still a challenge and MacLagan switched to a Trimble FMX with base-station system that was installed before the 2013 harvest. He found the differences between the Outback system seeded area and the Trimble system at harvest to be quite startling. MacLagan thinks the new system seems to be more accurate and will continue to try to improve the guidance system issues. Once he can accurately plant using auto-steer on the four inch strips made by the Strip-Tiller, he'll be happy! The Outback system could not do this, so the planter was manually steered.

Craig Shaw

Durango Farms,
Lacombe AB

Current CTF System

Tractor: Fendt 927 FWA on 120-inch wheel gauge

Tractor: John Deere 8360 RT track machine; 120-inch wheel gauge

Drill: Salford 522 30-foot double disk drill; 10-inch row spacing

Air Cart: Flexicoil 4350

Fertilizer banding: Salford RTS 30-foot coulter machine; 120-inch wheel gauge

Sprayer: 120-foot Case 3310 SP; 120-inch wheel gauge

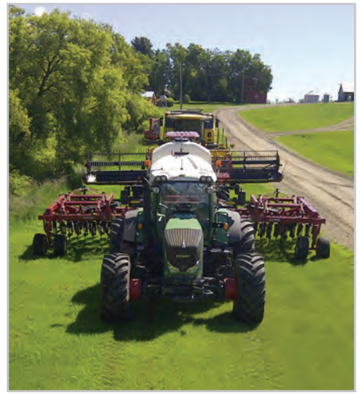
Swather: Macdon 9352 30-foot; 120-inch wheel gauge

Combine: New Holland CR9080 Rotary 30-foot header; 120-inch wheel gauge

Grain cart: Brent 760

RTK GPS: Base station on-farm Trimble

Craig Shaw is resolving underlying soil issues to reboot his CTF system.



The CTF system was built on the 30-foot combine header width.

Rutting has been an issue.

Tile drainage is being installed to improve moisture management.

Craig Shaw started implementing a CTF system on 160 acres of his farm at Lacombe, Alberta in 2010. He grows a mix of cereals, oilseed and pulse crops on sandy loam to heavy clay soils. Shaw has made a substantial investment to implement CTF on a larger scale on his farm.

Risk management and addressing moisture management are two key reasons Shaw decided to consider CTF. Managing too dry and too wet conditions, and providing a better environment for plants to grow were priorities. Shaw also saw some opportunity for improving efficiency and optimizing equipment utilization with CTF. He also is expecting to see benefits by reducing compaction on the fields.

After three years of trialing CTF, Shaw is still a strong supporter but has come to realize that under his short, cool growing environment and recent wet conditions CTF may have more challenges than in some other areas. During the last three years he has experienced unusually wet conditions and has had severe hail damage in two of three seasons, adding several challenges to his system. Shaw has decided to install tile drainage on his farm as a way to address the extremely wet soil conditions, and once that is in place will continue to move forward with implementing CTF across his farm and realizing the benefits he expects.

Implementing CTF

Shaw started with existing equipment on his farm and chose a 3:1 ratio centered around his 30-foot combine header, 30-foot seeders and 90-foot sprayer. For seeding, he has a 30-foot Salford 522 double disk drill on 10-inch rows and has added a second 30-foot Salford RTS vertical tillage unit to use for banding ahead of seeding. This unit will also replace the heavy harrow, which doesn't work well on a tramline system. He has exchanged a tow behind Flexi-Coil air seed tank for a tow between unit that eliminates the castor wheel issue and creates fewer issues with skew on side hills. Shaw has added a track tractor that has been a welcome addition and believes it to be the best choice as pulling power in a CTF system. In his wet conditions, tracks provide the traction he needs without having to go to wide wheel widths. The tramlines have become extremely hard and were a benefit during wet conditions at spraying and harvesting. The tramline kit has worked well and Shaw is a firm believer of sprayer tram rows. With crop dividers on the sprayer, he has been able to minimize crop tramping during late season sprayer operations. He moved to a 120-foot sprayer in 2013.

Shaw's goal with equipment was to plan for five years ahead and work towards building a system that would be most efficient. One of the frustrations of building the system was getting all of the equipment to match up. For example, a manufacturer may say a piece of equipment is 30-feet in width, but the working width may be less, such as his drill that was actually 29.6-feet. Measuring and matching equipment is a continual learning process and may impact some systems more than others. Although the changes he has made in equipment have come at some cost, Shaw feels he has added more flexibility while standardizing the operations.

For harvest, Shaw uses a New Holland CR9080 Rotary combine with a 30-foot header, which did a good job with both chaff and straw spreading under good conditions, but not under damp conditions and tougher grain. He also had other challenges including lodging and hail damage, which compounded residue management problems. The farm is in a high hail incidence area, and he has to bring in outside silage equipment to remove hailed-crop residue, which caused some damage to his CTF system.

The current high water table has created a number of problems in many of the fields with erosion and rutting. In the fall of 2013, Shaw did a major overhaul to the CTF site, including re-establishing tramlines to 29´ 6˝ from 29´10˝. He also used this opportunity to apply liquid hog manure, do some deep ripping of wet areas and put down drainage tile in some of the wet areas of the field. All of these activities have put him basically back to square one on the CTF field.

Going Forward – Future System Modifications

To address some guidance issues, Shaw has moved away from a Cellular RTK to his own on-farm base station. This has been simple, straight forward and very reliable, and payback will happen quickly without the need for cell plan and usage charges. He is still trying to solve some GPS and guidance issues with trying to standardize monitors and equipment systems.

Shaw is installing tile drainage to get rid of moisture and to improve the situation both from the ability of staying on tramlines and from an aspect of getting into the field in a more timely fashion. It will also allow him to bring his best land back into useful production. Although Shaw believes that CTF has benefits under the correct environment and under the right soil conditions, he has had to take a step back to try to resolve some operational issues on his farm before he can successfully expect to see the benefits of CTF on the farm.

James Jackson

Jackson Farms,
Dapp AB

Current CTF System

Tractor: JD 8360 RT and JD 8430 – 20-inch tracks - 120-inch wheel gauge and JD 9330 4WD on single wheels - 120-inch wheel gauge

Drill: JD 1895 30-foot air seeder and JD 1890 60-foot seeder, with 10-inch spacing on 120-inch gauge

Fertilizer banding: JD 1830 60-foot hoe drill, Atom Jet paired row openers with 10-inch spacing on 120-inch gauge

Sprayer: JD 4940 120-foot on 120-inch gauge

Combine: JD S680 with 30-foot headers – harvest straight cut

Grain cart: Unverferth 1550 with tires on 120-inch gauge

Harrow: McFarlane 60-foot on 120-inch gauge

RTK cellular GPS

James Jackson (left) discusses the benefits of CTF.

The 30-foot combine header was the basis for the CTF system.

Equipment was set up on a 120-inch wheel guage.

The equipment was set up on a modified 3:1 ratio.

James Jackson farms at Dapp, Alberta and started with CTF in 2011. He grows CPS wheat, canola and peas in rotation on sandy clay loam soils. Jackson had made a significant investment into guidance systems and thought that CTF was the next level to gain some payback on that equipment. He is progressively moving the entire farm to CTF and is amazed at how quickly they are getting used to the CFT concept.

An initial CTF benefit observed is better efficiency and utilization of equipment and technology such as variable rate fertilizer and interrow seeding. Interrow seeding provides for better emergence and seedling protection and is also opening the possibility for interrow fertilizing during the growing season. Moving from field to field is simplified with multiple machines, and he also sees advantages of tramlines for fuel savings and reducing soil compaction.

There are CTF benefits that have begun to show up that would likely be overlooked in a random managed field. For example, Jackson has noticed that at harvest, the 30-foot header can follow the exact pattern of the 30-foot seeder and the performance of the drill becomes very obvious. CTF brings all of the equipment together. Jackson is finding that CFT makes on farm research much easier. Jackson can more easily collect data with CTF to confirm economic benefits of new products and services. He likes to do replicated trials over three to five years to take account of weather variability from year to year and other factors.

Implementing CTF

Jackson started with his existing equipment and selected a 3:1 ratio based on his 30-foot combine header. He also has both a 30-foot and 60-foot disk seeder and has moved to a 120-foot sprayer. In 2013 he seeded 6,000 acres with the 60-foot seeder, and was able to seed at 6.5 mph with the traction gained by driving on the tramlines. He has moved both seeders to 10-inch spacing and has two of three carts set up for CTF. The other cart will be ready to go a for 2014. Jackson usually bands fertilizer in the fall, and in 2013 added a 60-foot JD 1830 hoe drill with Atom Jet paired row openers on 10-inch spacing, which will also be used for seeding.

Jackson straight cuts over 95 per cent of his acres and has stayed with 30-foot headers on the combines. The 30-foot headers keep the system quick and nimble, allowing him to easily move from field to field and to accommodate some irregular fields.

With heavy crops and sometimes less than ideal harvesting conditions in north-central Alberta, residue can be a challenge even though he has kept the header at 30 feet. He has 60-foot McFarlane harrows that he can use after combining, which do a very good job, and keep to the tramlines. He found that going the same way as the combines travel seems to work in wheat, but on some of the canola fields this operation can cause trouble on fungicide spray tracks.

There have been some challenges with getting all of the equipment sized up properly and to get the tires lined up to prevent the tramlines from getting wider. Jackson has had some problems with rutting in low areas and soft areas and is considering bringing in a tramline renovator to fix problem areas. He is still having challenges with headland and field edge areas and is looking for ways to include curved tramlines in these areas to accommodate the 30-, 60- and 120-foot equipment and improve efficiency.

Going Forward – Future System Modifications

Jackson would like to improve interrow seeding and fertilizing of the CFT system. He plans to eventually go to narrower tires and tracks on carts and other equipment to narrow the footprint and improve the ability for interrow activities. Jackson believes that CTF and the tramlines are a good investment since ruts can be more easily repaired without having to work the whole field. Tramlines also improve the ability to get into the field for straight cutting, and one wet harvest season could see CTF pay for itself in one year.

To address some of the straw management challenges, Jackson is considering using growth regulators, and utilizing interrow seeding with tall stubble. He is also considering wide row canola as a way to help residue management.

Although Jackson likes the CFT system and sees some benefits, so far he hasn't seen any significant yield increase. Over the past three years, Jackson has dedicated two quarters of land to CTF with the CTF Alberta Project. He still expects to see a yield increase from CTF, but with his soil type he thinks it may take a bit longer, even five years or more. So although Jackson is transitioning most of the farm to CTF, he may allow some flexibility in the implementation. Once the system starts showing real yield increases, then Jackson will be willing to implement full CTF protocols across the farm.

CTF Alberta Research Results

Observations and Future Challenges

The three-year research project run by CTFA included an agronomic and economic analysis of the cooperating farms. This economic analysis conducted by Dennis Day, an independent consultant, focused on comparisons of the economic performance of CTF acres with non-CTF acres on individual farms.

The concept behind CTF recognizes that soils and their biological systems take time to repair after years of random traffic and soil compaction. Accordingly, it is reasonable to expect that it will take time for a farm business to achieve the economic benefits of increased yields and increased gross margins.

Four of the five farms had a check comparison to the CTF acres. Over the three years of the CTFA project, yield benefits were variable. The Dapp, Lacombe and Trochu sites had some years with increased yield on the CTF acres, but not always significant and not in every year. The Rolling Hills site did not have any yield benefits to CTF in the two years of the project, and the Morrin farm did not have a check comparison.

Investment analysis

Producers considering the adoption and implementation of CTF will want to know the economic consequences that an investment in CTF will generate over time. The focus tends to be on whether CTF contributes to increased yields, but the challenge is that the likelihood of achieving acceptable yield increases over time is uncertain. As well, there is the uncertainty of how long it might take for the soil conditions to respond to CTF on an individual farm so that increased yields are achieved. In this context, CTF is framed as an investment decision.

In the CTFA economics report on the CTFA website, Day presents the incremental capital investment required to implement CTF that could achieve the target rate of return of 15 per cent given the different combinations of prices and yield increases. The economics report provides detailed analysis that cannot be easily summarized without losing the context of the variables. Producers are encouraged to go the website to review the complete report.

System Benefits and the Long Game

Producers might also want to consider how the adoption and implementation of CTF affects the future of the whole farm business. Discussions with individual producer/co-operators over the past year revealed a number of qualitative factors that were considered in the decision-making process leading to the implementation of CTF.

- CTF was a means of achieving improved soil quality, which in turn would provide long-term production benefits to the farm business.
- Where compaction was felt to be a critical constraint to crop production, CTF was seen as a means of overcoming this constraint.
- CTF was seen as a means of gaining soil quality characteristics that would reduce the harmful effects of extreme climate conditions including drought and excessive rainfall.
- CTF was seen as a means of insuring the cropping operations had sufficient “windows” (of time) to effectively complete seeding and harvesting operations.
- CTF was seen as a framework that enabled managers to effectively balance precision and large-scale farming.
- CTF was seen as a means for implementing more precise on-farm research and agronomic trials.
- CTF was viewed as a platform for implementing split applications of fertilizer.

In summary these system benefits may have greatest value to those farm managers playing the long game.

After three years of research, Peter Gamache, project leader with CTFA was able to summarize successes, issues and future challenges for farmers in a CTF system.

Equipment

- Large 40-, 60- or 80-foot drills can work in CTF.
- You can move into CTF gradually. The most important piece to build on is the combine and combine header widths.
- Uniform spreading of straw and chaff across the full width of the header or swather cut is critical and challenging.
- It is possible but challenging to grow both row crops and grains in a CTF system.
- Interrow seeding is an integral part of a CTF system and relatively easy to do with RTK/GPS, although steeper slopes can be an issue because of drill skew.

Tramlines

- Hard packed tramlines have for the most part held up well and support traffic in tough conditions.
- Rutting of the tramlines will occur, especially in wet and/or low spots and you will eventually need to repair them.

New ideas and research

- CTF makes on-farm research far easier, extremely accurate and repeatable.
- Savings in fuel, field efficiencies, timing, benefits from on-farm research accuracy and new techniques may result in significant gains from adopting CTF.
- CTF is opening up a world of new possibilities such as in-crop banding of nutrients and more accurate, targeted pesticide applications.
- Soils do seem to be changing but it likely will take up to five years to see the changes.
- Heavy clay soils seem to be responding sooner than loam and sandy loam soils.

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Harvest time on a CTF farm in central Alberta.
Photo credit: Steve Larocque