Cross Slot®

NO-TILLAGE SYSTEMS

A KEY TOOL FOR REGENERATIVE AGRICULTURE

>>>> www.CrossSlot.com

DVD ENCLOSED

Cross Slot®
NO-TILLAGE SYSTEMS

NO-TILLAGE 2.0
THE NEXT GENERATION

CONTENTS

FIELD BENEFITS OF CROSS SLOT SEEDING
*ONE-PASS **LOW-DISTURBANCE** CROP ESTABLISHMENT*

CROPS AND ROTATIONS

- Cross Slot drills seed all common agricultural crops and combinations.
- Yields—Extensive research and field experience has shown equal and improved yields compared with minimum and conventional tillage seeding.

NO-TILL SOILS

- Cross Slot drills seed precisely into almost all agricultural soils.
- Cross Slot drills readily adjust to variable moisture, density and friability.

SEEDING DEPTH SENSOR

- Each seeding opener down force is hydraulically controlled and independent of vertical travel.
- Required down-force for variable soil conditions is continuously monitored and automatically adjusted by an electronic sensor.

BANDED FERTILIZERS WITH SEEDING

- Fertilizer is banded adjacent to the seed through the same opener with no emergence reduction.
- All forms and combinations of fertilizer are possible: dry and liquid.

RESIDUE MANAGEMENT

- Heavy residue is no problem, either standing, chopped or lodged.
- No pre-seeding residue management is needed.
- Residue is returned over seed row with no 'tucking/hairpinning' problems in the seed slot.

True low-disturbance no-tillage starts at harvest

- *"Cross Slot no-tillage is all about a total system – "software" as well as "hardware".*

ECONOMIC BENEFITS OF CROSS SLOT SEEDING
COMPARED WITH TILLAGE AND MINIMUM-TILLAGE

DECREASED COSTS

- Seed rate is reduced by high germination and emergence.
- Fuel costs, labour and tractor time – save up to 60%.
- Capital costs are similar to tillage – operating costs are much less.
- Machinery replacement and maintenance are less frequent.

DECREASED SOIL DEGRADATION

- No compaction – minimal disturbance, flotation tyres.
- Low-disturbance drilling reduces moisture loss – otherwise every tillage pass can lose 12 mm (0.5 in).
- Reduced irrigation frequency from conserved moisture.
- Stones/flints are progressively buried – not brought to the surface.

ONE OPENER FOR ALL CONDITIONS

- Cross Slot drills operate in over 20 countries globally.
- The openers are all the same.
- No need to match opener configuration to local conditions.

INCREASED YIELDS

- Equal or better than tillage seeding.
- Excellent emergence and establishment.
- Banded fertilizer efficiency.
- Flexible cover-crops established and re-cropped.

INCREASED SOIL HEALTH

- Organic matter readily builds in first few years.
- Water infiltration – better porosity – less runoff.
- Biological variety and numbers improve.
- Soil trafficability – improved for machinery and livestock.

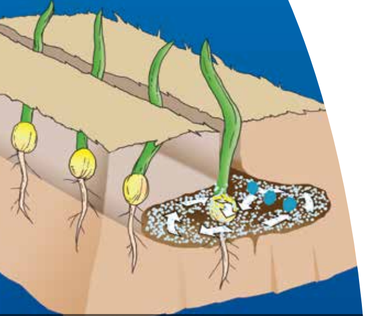
INCREASED SEEDING EFFICIENCY

- Routine seeding speed is 10–14 kmph.
- More hectares (acres) farmed with the same resources – more profit.
- More time available for crop management and lifestyle choices.

Harvest

Drill

Crop Management



Cross Slot: Seed, fertilizer, trapped moisture

Maize

SEED & FERTILIZER PLACEMENT

CROSS SLOT – A UNIQUE SEED SLOT

- Creates unique horizontal seed slots at precise, selected depths, whereas all other openers make vertical slots.
- Seed on one side, fertilizer placed simultaneously on opposite side.
- Residue folded back over the slots reduces moisture loss, provides seedling protection.
- Opener wheels maintain seed depth and firm closure.
- Self-closing of both slots ensures positive soil contact.
- Ultra-low soil disturbance conserves seed zone soil moisture.
- Positive closure of seed slot traps soil moisture vapor, ensuring rapid germination.

Cross Slot: separated fertilizer placement

Cross Slot opener

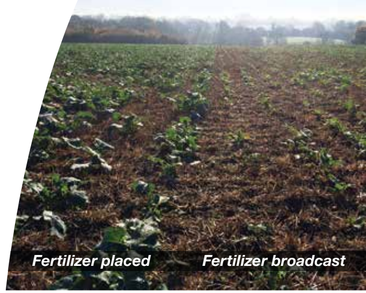
6m Cross Slot drill

Lucerne

FERTILIZER BANDING

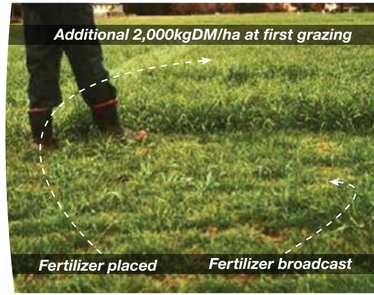
SIMULTANEOUS WITH SEEDING

- Fertilizer banded with the same disc opener that sows the seeds (true one-pass).
- Dry, liquid, or combination fertilizer banded simultaneously with seeding.
- Fertilizer banded at seed depth or deeper.
- Separated from seed 1.5–5 cm (0.5–2 in).
- Fertilizer banding is unaffected by soil moisture, form, residues or speed.
- Soil disturbance minimal and confined to sub-surface (non-inversion).
- True, one pass, low-disturbance, no-tillage seeding.



Fertilizer placed

Fertilizer broadcast



Additional 2,000kgDM/ha at first grazing

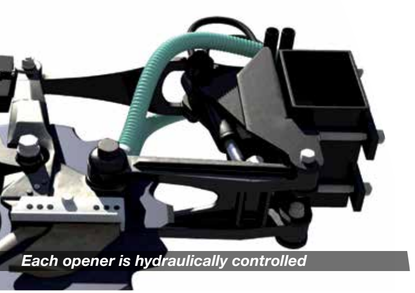
Fertilizer placed

Fertilizer broadcast

Seed & fertilizer placement...

...in one-pass

...diagonally offset if required



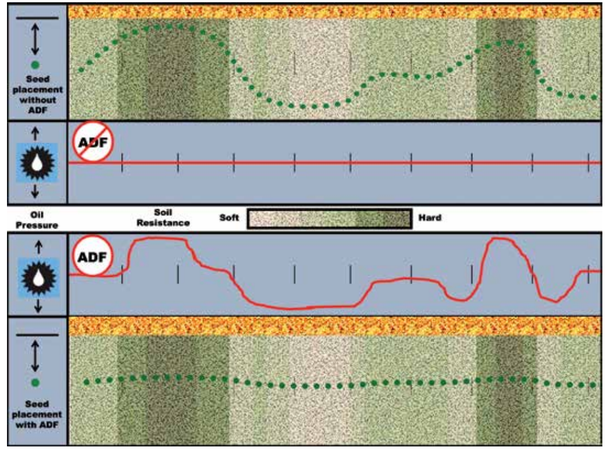
Each opener is hydraulically controlled

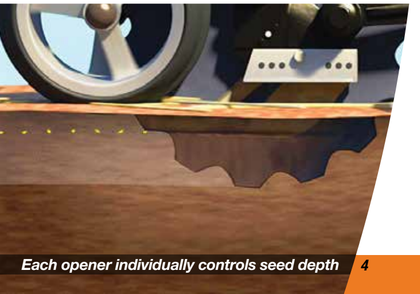
SEEDING DEPTH CONTROL

A VERY IMPORTANT PERFORMANCE REQUIREMENT

- Uniform, correct seeding depth is of utmost importance to crop stands and yields.
- Achieving uniform seeding depth in no-till fields is difficult because of variable surfaces and soil densities.
- Cross Slot drill engineers have superbly mastered this uniform depth requirement.
- Each opener is hydraulically controlled to provide the required down-force, up to 500 kg down-force per opener.
- Down-force is independent of vertical adjustments for soil surface variations.
- Depth control and minimal soil disturbance provides near maximum seed emergence.
- Seeding rates can be reduced due to improved emergence.
- Electronic sensors continuously monitor and re-adjust the down force required to maintain the set seed depth.
- Automatic down force (ADF) samples 10 times per second and adjusts 3 times per second.
- The result is very even seeding depth and crop emergence.

Automatic down force control unit in tractor cab

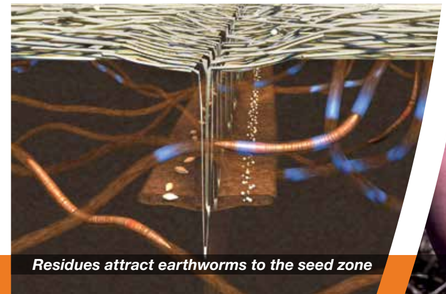




Each opener individually controls seed depth

Drilling conditions can be challenging!

Drilling linseed into rye cover crop (after crimper-roller)



Residues attract earthworms to the seed zone

RESIDUE MANAGEMENT

CROSS SLOT SEEDS IT ALL

- Pre-seeding plant residue management is usually not required.
- Manages any form, type or quantity of residues with only a depth adjustment.
- Residues are replaced over the horizontal shelves by the depth wheels.
- No residue enters the seed zone which avoids 'hairpinning' – seed is placed to one side of the vertical slot.
- Existing field residues are retained without redistribution.
- Residue reduces rainfall impact and runoff (erosion), reduces evaporation (more soil water) and provides organic matter (soil carbon).
- Residues attract earthworms to the slot zone and provide food for micro-organisms.
- Grain crops produce several tonnes of residue per hectare worth $$$$$$ in nutrients, moisture and yield gains.
- Don't waste it – use Cross Slot!

Seeding peas into heavy grass residue

Peas emerging through heavy residue

Extensive early root growth & earthworm activity

Excellent crop stand

Uniform crop emergence

SECOND GENERATION NO-TILLAGE

IS A SYSTEM WITH...

- More diverse crop rotations.
- Greater use of cover crops.
- Greater bio-diversity.
- Greater emphasis on soil micro- and macro-organisms.
- Greater utilisation/retention of surface residues.
- Different emphasis on creating the "right" seed environment.
- Greater emphasis on the seed micro-environment versus the field macro-environment.
- Greater emphasis on decreased soil disturbance (ultra-low-disturbance (ULD) no-tillage).

Cross Slot seeded winter wheat root growth

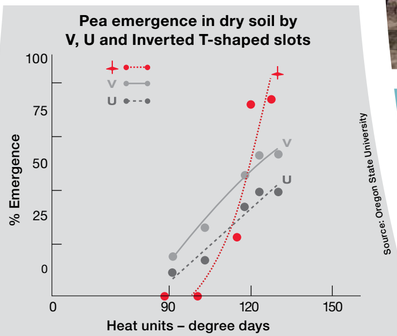
Drilling into sprayed cover crop

Pea root extension in heavy soil

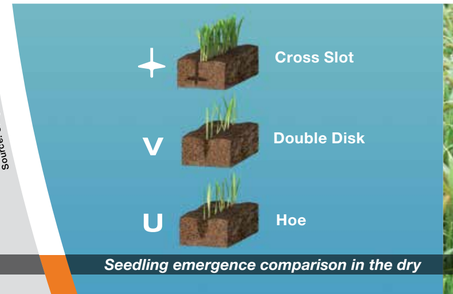
Conditions can be tough at seeding and emergence

Emergence

Good soil structure for plant growth



Emergence comparison graph



Seedling emergence comparison in the dry

Resulting crop

CROSS SLOT IS A VALUABLE TOOL

FOR PROVIDING FLEXIBILITY & RELIABILITY IN ALL DRILLING SITUATIONS

- Cross Slot demonstrates its flexibility and ability to seed directly into heavy residue.
- Spraying is the only preparation required before seeding.
- The principles of cover cropping and low-disturbance no-tillage seeding apply globally.
- The photos show the same concept in operation in North Dakota, USA (left) and Kent, England (right).
- Cross Slot owners share knowledge and experience through many mediums including an annual conference tour and social media.

Spray cover crop

Drill

In-field discussion at annual Cross Slot Conference Tour

Emergence

SECURING GLOBAL FOOD PRODUCTION

- Around the world, leading farmers have recognised soil degradation caused by continuous tillage.
- They have joined the movement to regenerate arable soils by eliminating tillage and utilizing crop residues to feed soil microbes and earthworms.
- Their results have demonstrated the ability of Cross Slot's low-disturbance openers to regenerate soils and the long-term yield and sustainability benefits that result.
- This is not new. Some farmers have over 20 years of experience using the Cross Slot System.
- One of the major symptoms of soil degradation is loss of soil carbon.
- Decades of tillage have mined the soil of its carbon (organic matter).
- Cross Slot provides the opportunity to rebuild soil carbon and therefore make a significant contribution to arresting the increase in atmospheric CO_2.
- If you want to contribute to the global effort to make food production truly sustainable, join us!
- At the same time you will be making your farm truly sustainable, both environmentally and economically.


Barley


Wheat


Cover/forage crop

CROSS SLOT APPLICATIONS

UNIQUE CAPABILITIES

COMBINABLE CROPS, COVER CROPS, FORAGE CROPS, PASTURE

COMBINABLE CROPS

- Cross Slot has seeded most combinable crops in a range of conditions world-wide.
- The consistent seed environment results in even germination and emergence.
- Separate fertilizer placement (liquid or dry) enhances early establishment and plant growth to compensate for the lack of early mineralisation that results from soil disturbance.
- Superior soil strength resulting from improved soil structure results in less vehicle damage at harvest.

COVER CROPS

- Cover crops are a useful management tool.
- Cross Slot drills have seeded cover crops for many years.
- It is important to get them seeded as early as possible.
- Early seeded cover crops can be grazed.

FORAGE CROPS

- Forage crops (brassicas, specialty grasses) are readily seeded by Cross Slot.
- Forage crops provide the ability to increase available dry matter for animal feed.
- Seasonal forage crops can be used for summer feed when other grasses have died off.

PASTURE

- Pasture renovation is a unique application for the ultra-low soil disturbance Cross Slot opener. Leaving the field surface undisturbed following seeding provides the option to maintain current species while others emerge and grow for enhanced grazing.
- Pasture can be sprayed and directly seeded with cover crops or combinable crops (peas are a good option).


Maize


Peas


New pasture


Excellent contour following


Seeding uneven, muddy ground


Opener action – rise & fall 45cm (18")

CROSS SLOT SPECIAL APPLICATIONS

UNIQUE CAPABILITIES

UNEVEN SURFACES

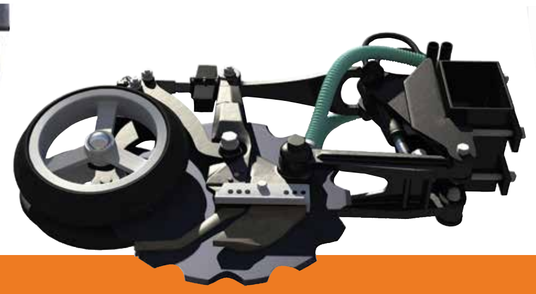
- Each opener independently maintains its set seed depth over dips and ridges.
- Uniform seeding depth is required for even emergence.
- Cross Slot hydraulic down force and parallel linkages provide a full 45cm (18") of vertical motion without losing full surface contact.
- Openers with spring-loaded down force have uneven seed depth and emergence – shallow in dips and deeper on ridges – resulting in less yield than with Cross Slot openers.

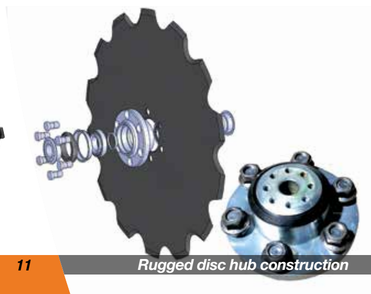
CHALLENGING CONDITIONS

- Soils with rocks always provide a drilling challenge for ruggedness and seeding.
- Seeding into rocky ground requires very durable machinery.
- The Cross Slot single disc opener hydraulic design safely lifts each opener up and over the rocks without damage, and immediately returns to seeding.
- Unlike hoe and shank drills, Cross Slot does not pull rocks out of the ground.
- After several seedings, it forces the rocks below the surface to leave a clean, workable surface.


Forage crop successfully seeded into rocky ground


Repair/seed pugged ground in one pass




Rugged disc hub construction


4.5m Cross Slot drill

CROSS SLOT DRILLS
THE COMPLETE NO-TILL SOLUTION

FEATURES AND BENEFITS

CROSS SLOT MK IV OPENERS WITH…

- 560mm (22") central scalloped disc.
- Tungsten-carbide-tiled side blades.
- 75mm (3") press wheels (plain or ribbed).
- On-the-move opener pressure control.
- Vertical opener travel 45cm (18").

PLUS

- 3, 4.5, 5 and 6m models standard.
- Floatation tyres.
- Kverneland Accord seed and dry fertilizer metering.
- Upgraded metering unit specifically for fertilizer.
- Kverneland Accord pneumatic product distribution.
- Topcon VR control or match client controller via ISOBUS.
- Liquid fertilizer capable
- 3m transport width (folding models).
- Custom models available.
- Hydraulic brakes.
- 1,250, 2,000 and 2,500L hopper options.
- Automatic down force (ADF) control.
- Hydraulic metering drive.

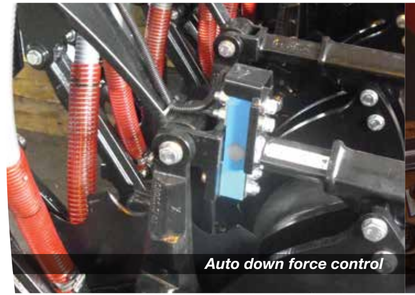

Topcon VR controller


Upgraded metering unit specifically for fertilizer


5m Cross Slot

Floatation tyres

Heat exchanger


Auto down force control


Hopper shut-off slide


Hydraulic metering drive


Hopper weigh scales

CROSS SLOT DRILLS
THE COMPLETE NO-TILL SOLUTION

OPTIONS

- 150 L granule hopper (one or two).
- Agtron blockage sensing (seed only or seed and fertilizer).
- Hopper weigh scales (seed and/or fertilizer).
- Road and work lights.
- 2 or 4 camera CCTV.
- Multiple load cell ADF sensing.
- Heat exchanger to warm intake air.
- Hopper shut-off slides.
- Alternative controller through ISO connection.
- Hiab crane for bulk bags.
- Rear towbar.
- Drawbar hitch options (Bull-Pull, K80 spoon, Pintel).
- Ball valves for wide rows.
- Air curtain for reliable seed metering on hillsides.
- And more….


Granule hopper


Air curtain for hillside seeding


Hiab crane for bulk bags

CCTV hopper monitoring

CROSS SLOT...

TARANAKI

Cross Slot since: **2008.** Farm Size: **410 ha.**
Farm Type: **Sheep/beef, dairy and arable.**
Topography: **40% flat, 40% rolling, 20% steep.**
Soil Types: **Volcanic ash based from Mt Egmont/Taranaki (dormant volcano), Egmont loam.**
Rainfall: **1,200mm ±200mm (50 yr avg)**.
Altitude: **20–125m ASL.**
Irrigation: **None.**
Labour: **3 full-time.**
Crops: **Summer turnips, forage brassica, maize, sorghum, plantain, chicory, annual ryegrass, ryegrass/clover, oats and ryecorn (forage).**
Livestock: **2,300 ewes, 360 steers, 230 dairy cows.**

OWNER COMMENTS

- The Cross Slot no-till system fits well with our diverse farming operation. Our crop rotation can have as little as 24 hours/year when there is ***not*** a crop or pasture in the ground.
- The ability to establish crops during very narrow windows of suitable soil/weather conditions.
- The ability to continuously crop while maintaining our fragile volcanic loam soils.
- Great moisture retention when establishing summer crops. No soil disturbance and great residue protection from our prevailing westerly winds.
- Accurate seed and fertiliser placement in any soil type, residue cover or soil condition. This system can push the boundaries, using less time and fuel and still produce exceptional yields.

WAIRARAPA

Cross Slot since: **1998.**
Farm Size: **335 ha (140 ha arable).**
Farm Type: **Dryland mixed arable and livestock.**
Topography: **Flat to rolling (some steeper hills).**
Soil Types: **Mixture of Kokotau silty clay loam 3d, Ahikouka silt loam 2a and Taratahi peat.**
Rainfall: **900 mm +500/–150 mm (50 year avg)**.
Altitude: **105m ASL.**
Irrigation: **None.**
Labour: **Owners plus 1 full-time.**
Crops: **Ryegrass (seed), red clover (seed), spring barley (feed) and peas (seed).**
Livestock: **1,500-2,400 ewe-hoggets, 3,000-6,000 lambs & 180-240 weaner heifers.**

OWNER COMMENTS

- It wasn't that easy making up our minds (to change to Cross Slot no-tillage) but in hindsight it was the best thing we ever did.
- It's just a totally sustainable package with so much more productivity.
- We probably grow twice the area of crop and finish more stock per hectare on the same farm.
- Soil health has vastly improved.
- Our two sons are farming on their own accounts now and Cross Slot no-tillage has played a big part in making that possible.

MID CANTERBURY

Cross Slot since: **1995.**
Farm Size: **385 ha.**
Farm Type: **Irrigated mixed arable and livestock.**
Topography: **Flat.**
Soil Types: **Lismore & Eyre stony silt-loams. Medium-to-light free-draining soils.**
Rainfall: **638 mm ±240 mm (50 year avg)**.
Altitude: **80m ASL.**
Irrigation: **100% of farm.**
Labour: **Owners plus 3 full-time.**
Crops: **Wheat (feed, milling and seed), barley (seed), ryegrass (seed), clover (seed), process peas, Marrowfat peas, vegetable seeds, brassicas (forage), green-feed oats.**
Livestock: **500-1,000 weaner deer, 6,000-20,000 lambs (finishing).**

OWNER COMMENTS

- Cross Slot chosen for depth control, residue management and fertiliser placement.
- Cross Slot are specialised no-till people.
- After years of no-till we have less stones on the surface and have increased soil organic matter. This farm has changed so much!
- On average we are saving 40-60mm of water per year.
- We have gone from an average of 8 T/ha of feed grains up to 11-12 T/ha.

...WHAT USERS SAY

SOUTH CANTERBURY

Cross Slot since: **2004.**
Farm Size: **480 ha.**
Farm Type: **Dryland mixed arable and livestock.**
Topography: **Rolling (steep for arable).**
Soil Types: **Mainly Timaru and Claremont silt loams. Some Waimak silt loam. All on a deep tight clay base, no stones.**
Rainfall: **525 mm ±200 mm (50 year avg)**.
Altitude: **40–100m ASL.**
Irrigation: **None.**
Labour: **Owners plus 1 full-time.**
Crops: **Wheat (feed), Barley (feed), Winter Oilseed Rape, Ryegrass (seed), Peas (seed), Linseed, Pasture, Rape and Kale (forage).**
Livestock: **700 breeding ewes, 23 beef heifers, all lambs sold prime.**

OWNER COMMENTS

- We're on marginal land for cropping (contour).
- Want to minimise erosion and maximise production in a sustainable way.
- This is a single-pass system. The only pass we make is the one that counts.
- Chose Cross Slot because it was specifically designed for no-tillage.
- There are so many challenges that the drill has to cope with instantly in a one-pass system and Cross Slot is just brilliant at doing that because of its ability to control depth and pressure on-the-go.

FURTHER READING

No-Tillage Seeding in Conservation Agriculture – *2nd edition*

Authors: CJ Baker, KE Saxton, WR Ritchie, WCT Chamen, DC Reicosky, MFS Ribero, SE Justice and PR Hobbs

Published by: CAB International and Food And Agriculture Organisation of the United Nations (Rome, Italy) 2006

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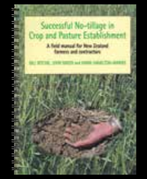
Download for free at www.fao.org/3/a-al298.pdf



FURTHER READING

Successful No-Tillage in Crop and Pasture Establishment

Authors: Bill Ritchie, John Baker, Mark Hamilton-Manns

Produced by: Monsanto New Zealand Limited 2000

ISBN 0-473-06685-8

OTHER INFORMATION

Check us out on-line at www.CrossSlot.com. You will find a comprehensive summary of the science behind Cross Slot together with photos, videos and user comments from around the world.

There is also a spread sheet to help you determine the cost-benefit of Cross Slot on your farm (from "No-Tillage System" tab go to "Cost-benefit analysis").

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CROSS SLOT NO-TILL TECHNOLOGY SELECTED AS BEST IN THE WORLD

Our company designs the world's most sophisticated no-tillage system.

The science and design that originated at Massey University, New Zealand, is embodied in all our Cross Slot machines and is internationally recognized.

We market them and support our users in the field through our Australasian distribution team, Carrfields Machinery Ltd (New Zealand) and Carrfields Machinery Pty (Australia).

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Cross Slot openers have seeded into this residue – spot the rows...

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REGENERATIVE AGRICULTURE IN ACTION

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CROSS SLOT – DELIVERING THE SOLUTION FOR NO-TILLAGE 2.0