

Cross Slot[®]

NO-TILLAGE SYSTEMS



A KEY TOOL FOR REGENERATIVE AGRICULTURE

>>>> www.CrossSlot.com



NO-TILLAGE 2.0 THE NEXT GENERATION

C O N T E N T S

Field Benefits of Cross Slot Seeding	1
Economic Benefits of Cross Slot Seeding	2
Seed & Fertilizer Placement	3
Fertilizer Banding	4
Seeding Depth Control	5
Residue Management	6
Second Generation No-Tillage	7
Cross Slot is a Valuable Tool	8-9
Securing Global Food Production	10
Cross Slot Applications	11
Cross Slot Special Applications	12-13
Cross Slot Drills	14-15
Cross Slot Toolbars	16
Further Reading & Information, Media Sites	
About Cross Slot, Contacts, DVD	

INSIDE
FRONT
COVER

INSIDE
BACK
COVER



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.



◆ "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 12mm (0.5in).
- ◆ 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.

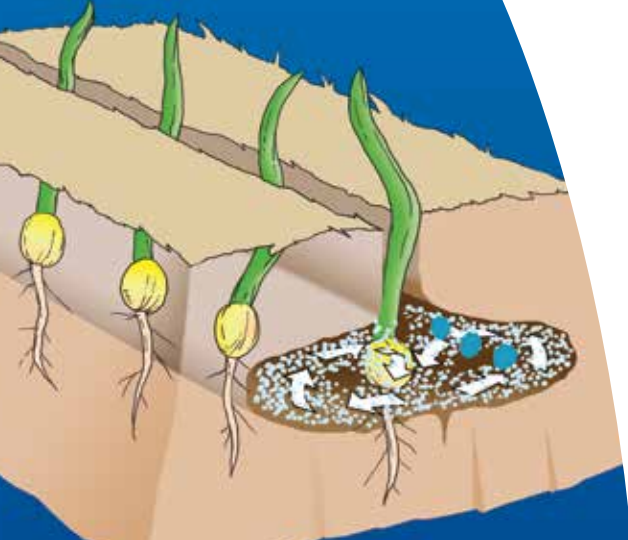
INCREASED SOIL HEALTH

- ◆ 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.





Cross Slot: Seed, fertilizer, trapped moisture



Cross Slot: separated fertilizer placement 2

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 opener



12m Cross Slot folding toolbar

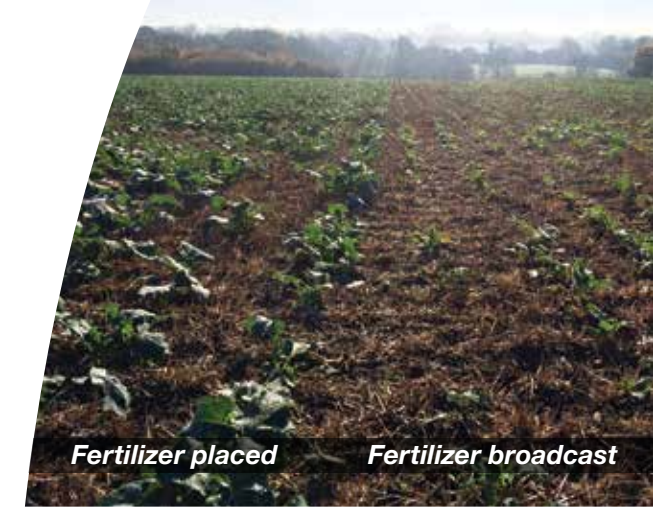


Lucerne

FERTILIZER BANDING

SIMULTANEOUS WITH SEEDING

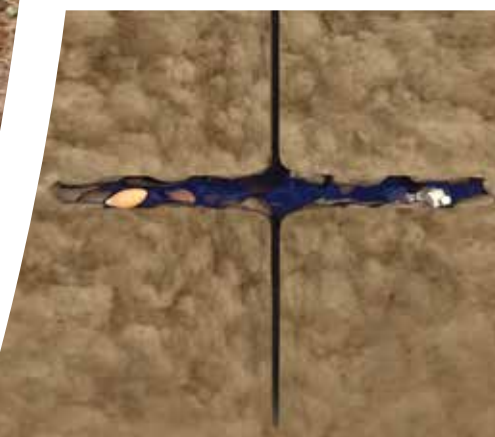
- ◆ Fertilizer banded with the same disc opener that sows the seeds (true one-pass).
- ◆ Dry, liquid, or combination fertilizer banded simultaneously with seeding.
- ◆ Fertilizer banded at seed depth or deeper.
- ◆ Separated from seed 1.5–5 cm (0.5–2 in).
- ◆ Fertilizer banding is unaffected by soil 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



Fertilizer placed Fertilizer broadcast



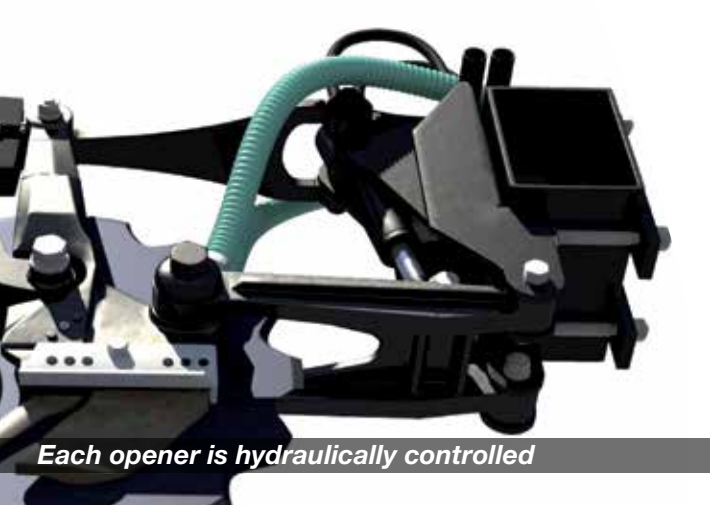
Seed & fertilizer placement...



...in one-pass



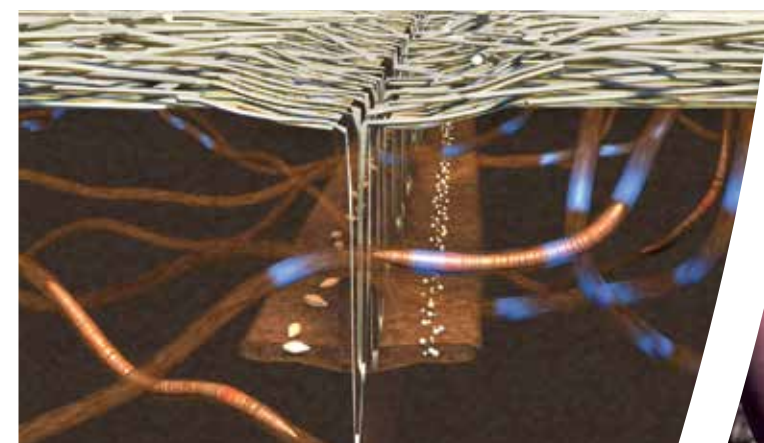
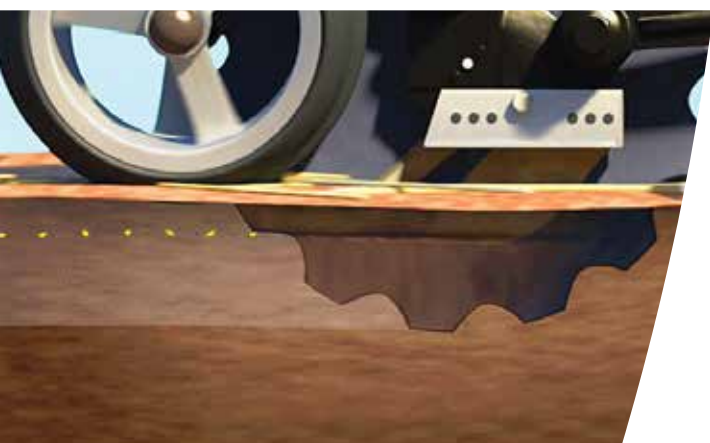
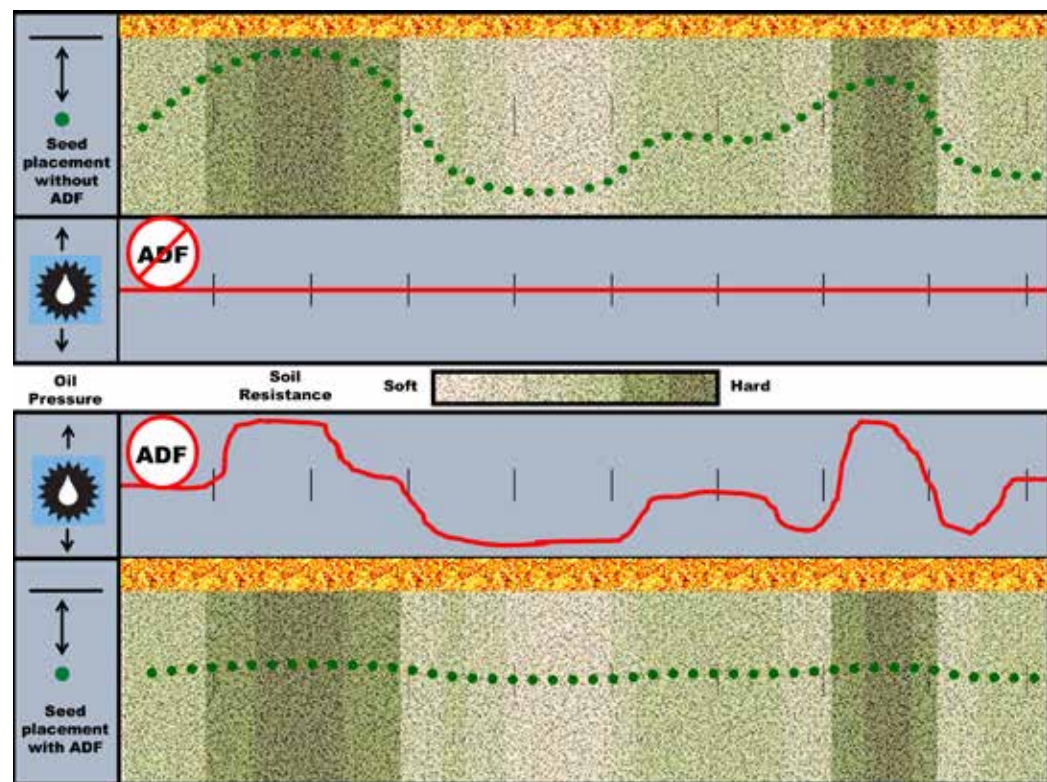
...diagonally offset if required 3



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.



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!





Uniform crop emergence



SECOND GENERATION NO-TILLAGE

IS A SYSTEM WITH...

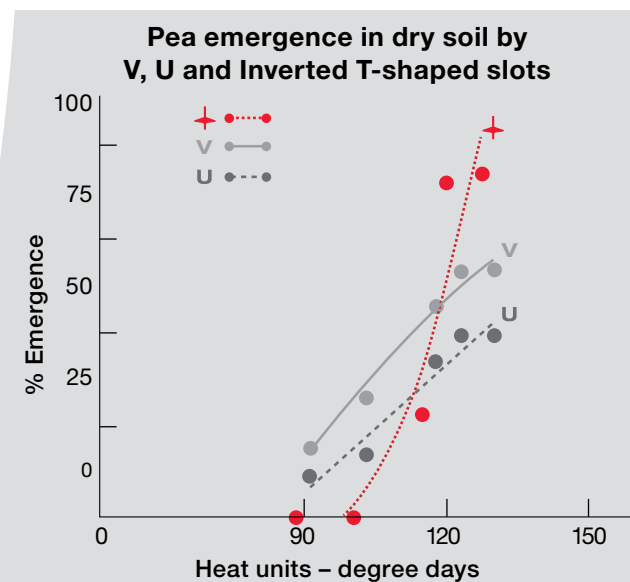
- ◆ More diverse crop rotations.
- ◆ Greater use of cover crops.
- ◆ Greater bio-diversity.
- ◆ Greater emphasis on soil micro- and macro-organisms.
- ◆ Greater utilisation/retention of surface residues.
- ◆ Different emphasis on creating the "right" seed environment.
- ◆ Greater emphasis on the seed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



Pea root extension in heavy soil



Good soil structure for plant growth



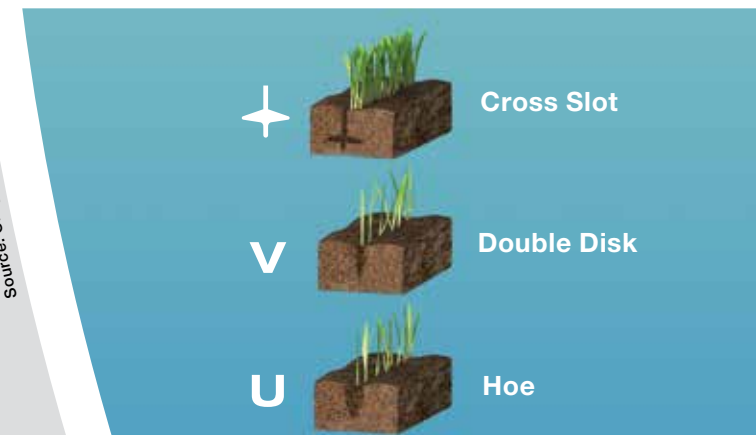
Emergence comparison graph



Cross Slot seeded winter wheat root growth



Conditions can be tough at seeding and emergence



Seedling emergence comparison in the dry



Drilling into sprayed cover crop



Emergence



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 CO₂.
- ◆ 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

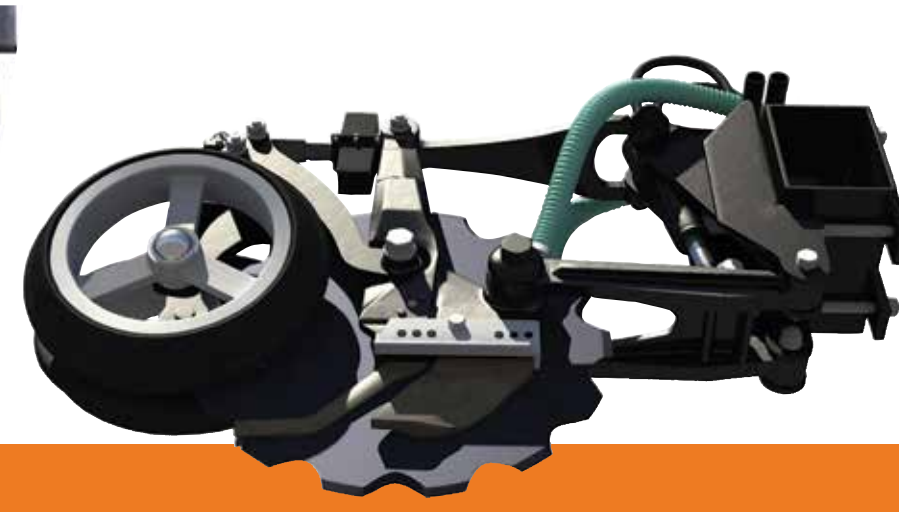
UNIQUE CAPABILITIES

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

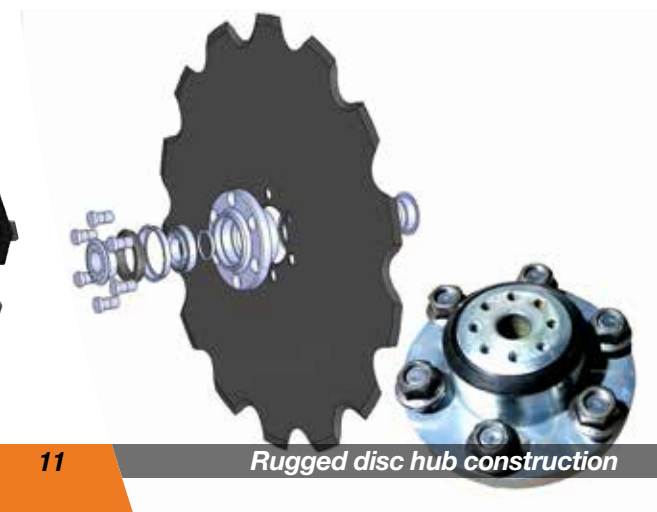
- ◆ Soils with rocks always provide a drilling challenge for ruggedness and seeding.
- ◆ Seeding into rocky ground requires very durable machinery.
- ◆ The Cross Slot single disc opener hydraulic design safely lifts each opener up and over the rocks without damage, and immediately returns to seeding.
- ◆ 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



6m Cross Slot folding drill



CROSS SLOT DRILLS THE COMPLETE NO-TILL SOLUTION

FEATURES AND BENEFITS

CROSS SLOT MK IV OPENERS WITH...

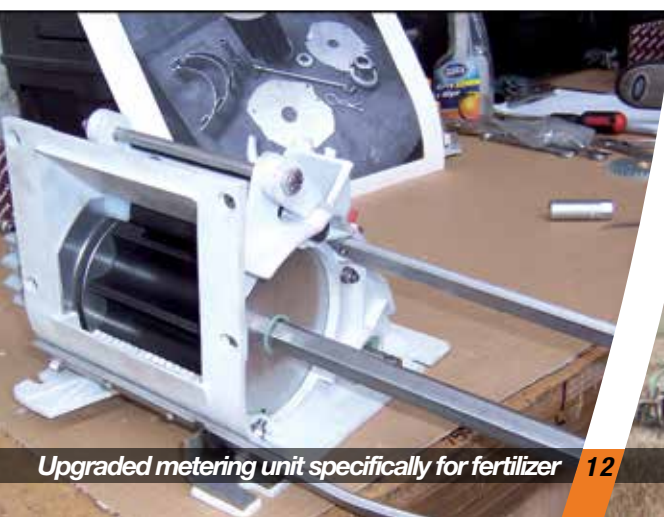
- ◆ 560mm (22") central scalloped disc.
- ◆ Tungsten-carbide-tiled side blades.
- ◆ 3" (plain or ribbed) or 4" ribbed press wheels.
- ◆ On-the-move opener pressure control.
- ◆ Vertical opener travel 45cm (18").

PLUS

- ◆ 6m and 9m 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
- ◆ Custom models available.
- ◆ Hydraulic brakes.
- ◆ 2,000, 2,500 and 4,000L hopper options.
- ◆ Automatic down force (ADF) control.
- ◆ Hydraulic metering drive.



Topcon VR controller



Upgraded metering unit specifically for fertilizer



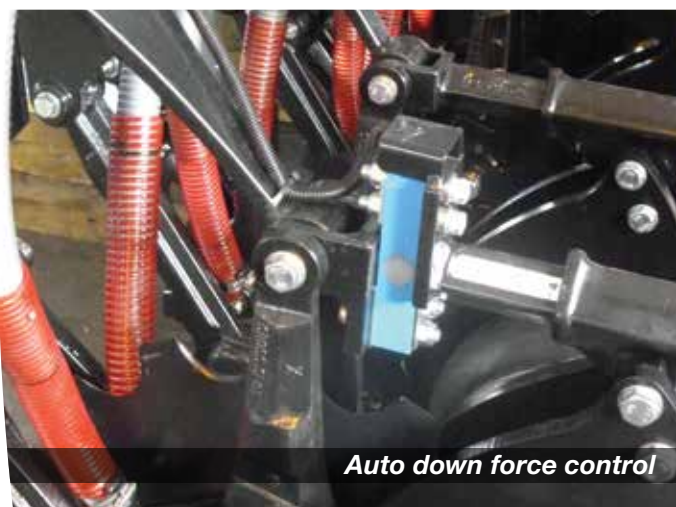
9m Cross Slot folding drill



Floatation tyres



Heat exchanger



Auto down force control



Hopper shut-off slide



Hydraulic metering drive



Hopper weigh scales



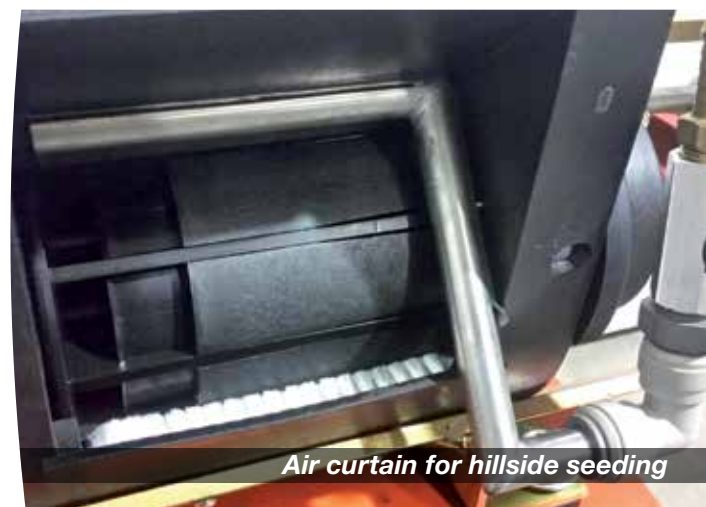
CROSS SLOT DRILLS FOR INTENSIVE AGRICULTURE

OPTIONS

- ◆ 150L 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....



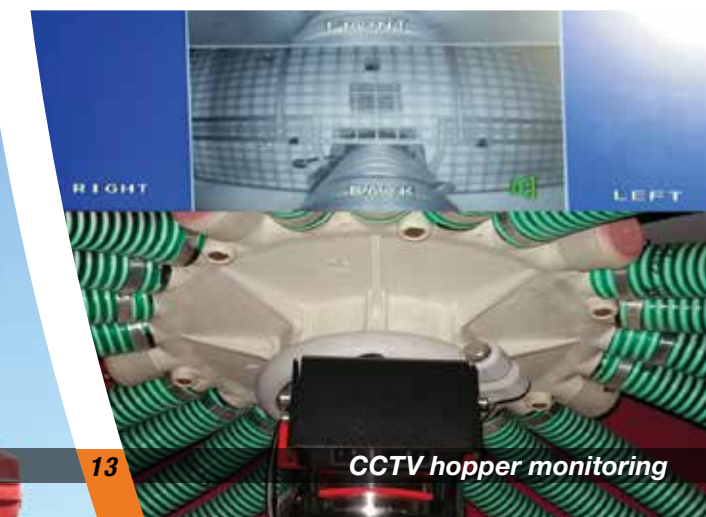
Granule hopper



Air curtain for hillside seeding



Hiab crane for bulk bags



CCTV hopper monitoring



Press wheel options



CROSS SLOT TOOLBARS FOR BROAD-ACRE AGRICULTURE

FEATURES AND BENEFITS

CROSS SLOT MK IV OPENERS WITH

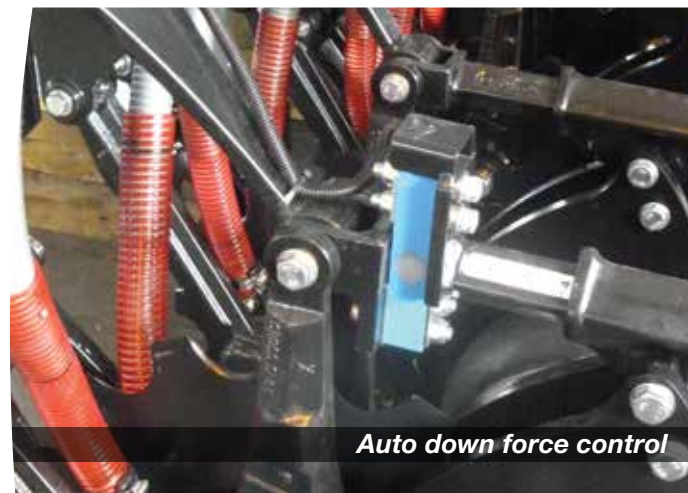
- ◆ 22" central scalloped disc.
- ◆ Tungsten-tiled side blade.
- ◆ 3" (plain or ribbed) or 4" ribbed press wheels.
- ◆ On-the-move opener pressure control.
- ◆ Vertical opener travel 400mm.

PLUS

- ◆ Compatible with most commodity carts (tow-between and tow-behind).
- ◆ Rugged folding frame.
- ◆ Liquid fertiliser capable.
- ◆ 12m and 14m (3-plex), and 18m (5-plex) models standard.
- ◆ Custom models available.
- ◆ Hydraulic brakes (optional).
- ◆ Automatic down force (ADF) control.



Floatation tyre(s) on toolbar



Auto down force control



Robust frames on Cross Slot toolbars (12m)



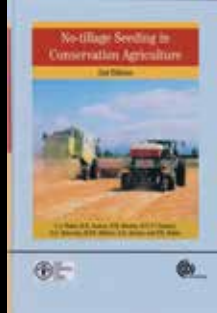
10.5m Cross Slot folding toolbar



14m Cross Slot folding toolbar



18m Cross Slot bi-folding (5-plex) toolbar



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

ISBN-10: 1-84593-116-5 (CABI), I ISBN: 92-5-105389-8 (FAO), SBN-13: 978-1-84593-116-2 (CABI)

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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www.Carrfieldsmachinery.co.nz
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JOIN US!

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

MANUFACTURING AND DISTRIBUTING GLOBALLY

REGENERATIVE AGRICULTURE IN ACTION

