

HORIZON

GUIDE TO

STRIP-TILLAGE





STRIP-TILLAGE BENEFITS

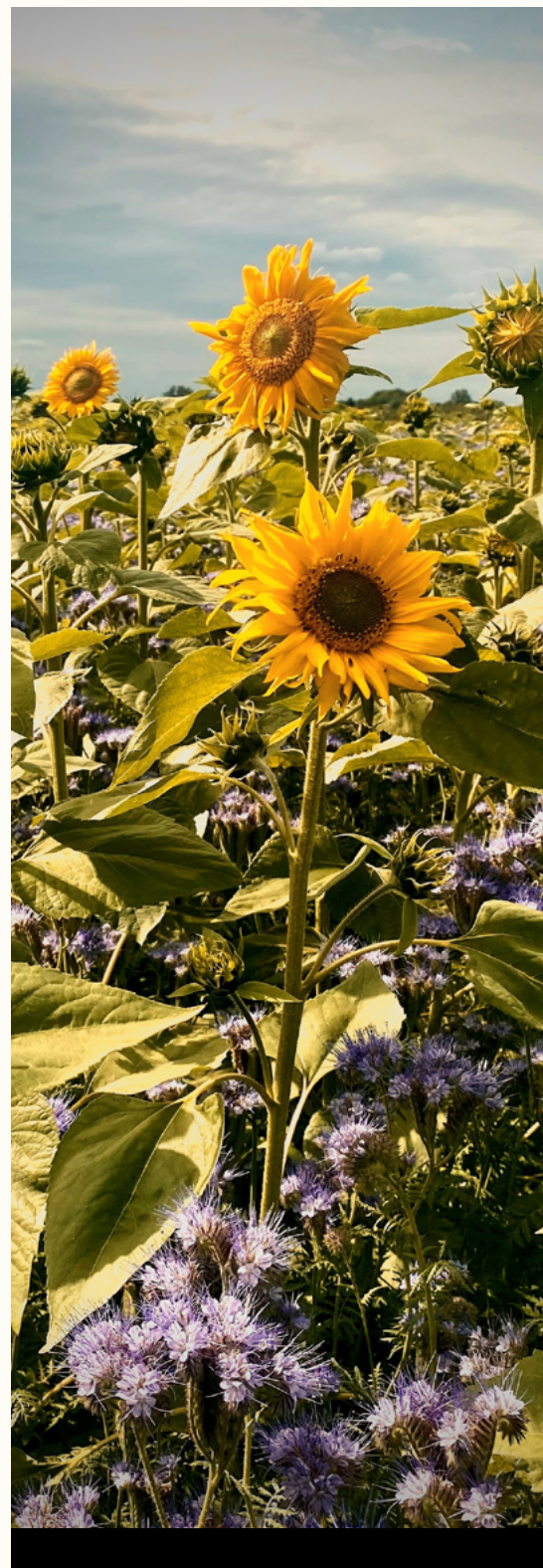
- Only disturbing the soil in the seeding zone dramatically improves soil health and allows harvest machinery to travel without causing damage to the soil.
- In-row fertiliser placement (liquid, granular or slurry) reduces the need for fertiliser applications whilst also reducing the weed burden between the crop rows.
- Conditioning the soil in and below the seeding zone creates the perfect growing environment for the plant, which will ultimately ensure the optimal level of yield.
- Passes with the SPX during the autumn and spring allow air into the soil, to aid the drying and warming process, which are essential for row crops on heavier soil types.
- Fewer passes equate to reduced cultivation time and cost.

WHY CHOOSE THE SPX?

- ✓ The mounted toolbar is directly attached to the tractor's 3-point linkage.
- ✓ The parallel linkage offers 260mm of travel to ensure that the working depth is consistently maintained.
- ✓ Pneumatically controlled row cleaners with CleanSweep technology can be adjusted in-cab for quick and accurate adjustment.
- ✓ The positioning, widths and angles of the deflector discs can be easily adjusted offering multiple berm building options.
- ✓ The pneumatic consolidation system with optional in-cab adjustment offers different wheel options for different soil types.

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What is strip-tillage?

In recent years, there has been a notable movement towards using less tillage to produce crops with less soil movement and leaving more residue on the soil surface. Strip-tillage combines the benefits of conventional tillage with the conservation-friendly advantages of no-till farming. The low disturbance, targeted tillage approach, consists of only cultivating a narrow band of soil in which the crop is to be planted, leaving lanes of uncultivated soil and residue on either side of the tilled strips over approximately two-thirds of the field surface.

Leaving undisturbed residue between the tilled planting strips is an excellent way to reduce risks of erosion, improve soil structure, enhance soil health and provide more stable footing for farm equipment.

Strip-tillage applications

Strip-tillage works only in 15cm to 30cm wide strips where the next crop is to be planted. The remaining area is left undisturbed so that cover crop or previous crop residues remain on the surface to protect the soil from water and wind erosion and minimise weed growth. The tilled strips correspond to the planter row widths of the next crop.

The Horizon SPX design allows the row units to be configured at any desired row spacing above 400mm.

Spacing can easily be altered to allow the same SPX to be utilised for seedbed preparation ahead of a variety of row crops such as maize, sugar beet, broccoli, sweetcorn, soya, sunflower and oilseed rape.

Growing of organic cereals on 50 cm spacing with pasture lays in between the rows is a sustainable and beneficial practice. It can help to improve soil health, reduce weed pressure, and increase biodiversity. It is important to monitor the soil fertility, weed pressure, and livestock grazing pressure to ensure that the system is sustainable.

Advantages of strip-tillage

Trial results from the United States Department of Agriculture using rye as a winter cover crop provide a clear picture of the advantages of strip-tillage; 20% of the rain on the conventionally tilled plots became direct surface runoff, compared with only 12% from the strip-tillage plots. The sediment carried in the runoff from strip-tillage plots was reduced by 87%, compared to the conventionally tilled plots.

Strip-tillage is also advantageous if you are in a cold, wet environment, it is possible to see approximately a two degree difference during the spring compared to conventional tillage. The temperatures were measured from mid-April through to late May.

Maize is very sensitive to soil temperature, and this variance can make a difference not only when the farmer can start planting, but also final yield.

The advantage of strip-tillage is efficiency – lower costs of production while maintaining good yields.



Why consider strip-tillage?

- **Fuel savings** – reduced primary and secondary tillage passes.
- **Fertiliser savings** – banding the fertiliser in the strip can reduce rates by 30%.
- **Fertiliser placement advantage** – banding nutrients where the seed needs it.
- **Reduce soil erosion** – most of the soil remains covered with crop residue throughout the year.
- **Alleviate soil compaction** – able to operate at 40cm depth if required.
- **Weed control** – cover crop residues can suppress weed control in between the strips.
- **Maintain levels of soil OM** – less soil movement and therefore less mineralisation occurring.
- **Less soil organic carbon released into the atmosphere** – less soil movement.
- **Warms the soil faster** – residue is moved off the strip so the soil warms faster.
- **Better travelling conditions** – unworked ground between the strips support heavy machines and reduce compaction.
- **Improved water retention** – fewer cultivation passes results in the soil surface between the strips being covered with crop residue.
- **Yields similar to conventional cultivation**

Spring and Autumn strip-tillage

For soils with a clay content over 20%, the SPX should be used in the autumn to utilise the natural process of soil breakdown from frosts and the wetting and drying process for all other soil types it is possible to leave strip-tillage until the spring.

There are benefits and drawbacks of both autumn and spring strip-tillage. In many cases, the decision is soil type dependent, spring strip-tillage, works more reliably on lighter-textured soils (e.g. sandy loams) than heavier-textured soils (e.g. clays and clay loams), whereas autumn strip-tillage is a better fit.

Fields with long slopes that are vulnerable to water erosion (e.g. silt loams) may be best suited to spring strip-tillage.

Cover crop management for strip-tillage

Combining strip-tillage and cover crops offers various benefits including minimal soil erosion, maintaining soil moisture and weed suppression. When growing cover crops, the management of removing them needs to be considered:

If you have frost-sensitive species such as buckwheat, phacelia or mustard, you may find that a number of hard frosts will do a good job of destroying the crop. However, more robust, winter-hardy species such as radish, vetch and cereals will need specific attention. Options for destruction include mechanical, animal, chemical or a combination of them:

Chemical Termination

In most situations, using a herbicide e.g. glyphosate will help deliver an effective and integrated opportunity. A herbicide will enable the efficient removal of both sown and weed species and is particularly beneficial for addressing grass weeds at the same time.

Mechanical Termination

Flailing offers an effective method of removing big bulky crops, with woody stems that cannot be easily grazed. However, this is an intensive process, requiring high levels of diesel and labour, and additional wheelings.

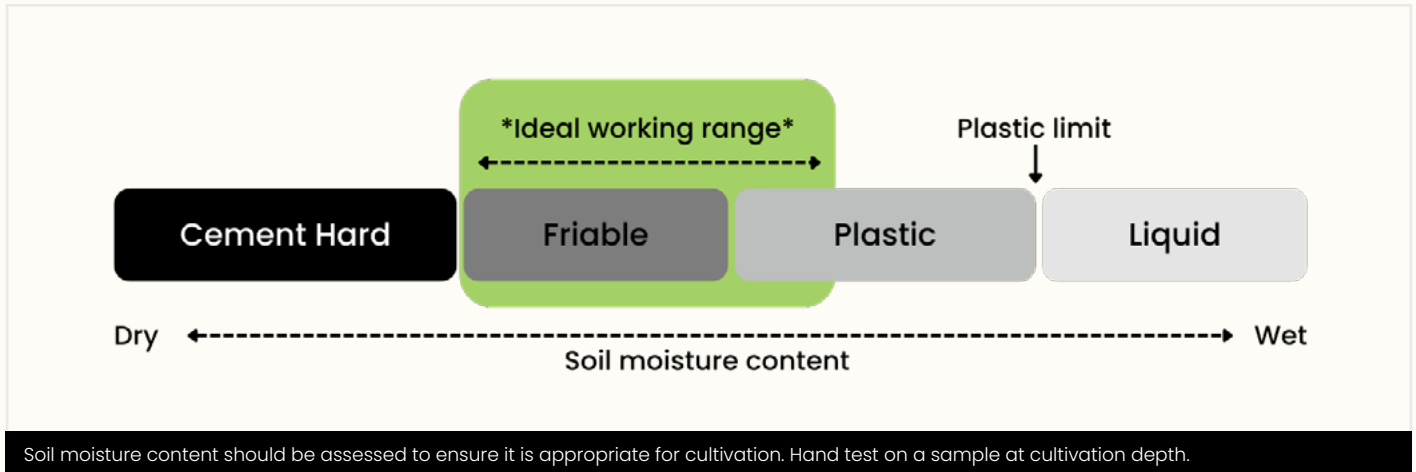
Rolling or crimping can be used in conjunction with hard frosts to enhance cover crop removal. When crops are flattened, their stems break at the growing point, exposing crops to freezing temperatures, causing them to die. The use of a crimper roller provides a more aggressive action to crush the crop and achieve effective destruction.

Animal Termination

Grazing can be a successful means of converting green cover biomass into meat and more readily available nutrients. However, farmers should consider soil types and ground conditions. Light to medium soils will carry stock well although you should not leave them on for a prolonged period, where the animal are walking on bare soil and poaching can happen. Then the crop should re-grow for 10 to 14 days, before spraying off.

Strip-tillage operating conditions

Like any form of primary or secondary cultivation machinery, a strip-tillage should only be operated in the right soil conditions and operators need to check the field's soil consistency. Soil consistency is the strength with which soil materials are held together and the consistency will change with the amount of water present. The diagram below shows the different soil consistencies.



For general cultivation with a strip-tillage, the ideal working range is 'friable' to slightly 'plastic' and for subsoiling 'cemented/hard' to slightly 'friable'. When soil reaches the 'plastic' limit (at this stage soil can be rolled and moulded into a worm without cracking or crumbling) it is unable to reform after compression from machinery or cultivation and so compaction or panning can result.

Cropping systems for strip-tillage

A strip-tillage machine is able to operate in a wide range of field conditions and cropping systems, for example, continual strip tillage is widely practised across the world in situations where continuous row crops are grown, e.g. maize on maize, or soybeans and maize rotation. In this system, it is best to move the strips annually to minimise soil compaction between the rows.

When considering strip-tillage into a grass ley, it can be expected that two passes will be required to achieve a satisfactory berm to plant into, as the matt of grass roots in the topsoil restrict the soil lift and a fine tilth to be formed. In this situation, it is recommended that the second pass is done with the shank working at a shallower depth than the first pass.



The Horizon SPX is comfortable working in cereal stubble where the straw has been either chopped or baled. If the straw has been chopped, it is recommended to use the row cleaners to clear away the crop residue to leave a clean strip.

Nutrition

Strip-tillage offers an advantageous placement of fertiliser in the root zone.

Horizon's SPX has nutrient application options, including dry and liquid products. This allows the farmer to choose the product or combination of products that work best for their operation and nutrient goals.

When installing or freshening strips in the spring, it's possible to apply nutrients that can take the place of starters or other soil-applied fertiliser products. Phosphorus and potassium can be band-applied during the strip-tillage operation, banding phosphorus and potassium allow for a rate reduction of approximately one-third compared with broadcast applications.

Proper placement of fertiliser at the right depth and rate is very important so you don't get seed burn, however, applying nutrients directly into the seeding zone puts nutrients in the optimal location for crop roots to access and fully utilise them. This cuts down on waste and runoff of surface-applied fertilisers.

The diagram (right) shows:

Fertiliser 1 is banded at 15cm depth behind the leg – reflecting where fertiliser is released shallower to provide some starter fertiliser effect but is not directly in the starter zone.

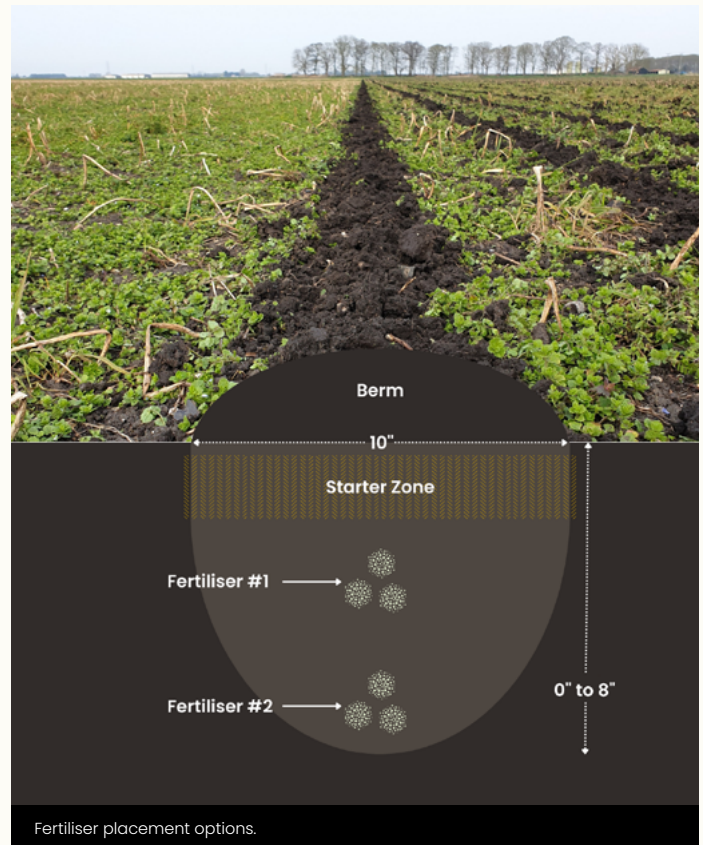
Fertiliser 2 is banded at 20cm depth behind the leg– reflecting where fertiliser is placed deeper to avoid seed burn, but at the expense of the starter fertiliser effect.

Note: Safe rates for placement will depend on the fertiliser product being used.

Slurry injection with strip-tillage

The Horizon SPX can also be configured to apply liquid slurry via the back of the shank, injecting slurry into strips allows more efficient use of it.

Research and practical experience suggest the top of the slurry deposit should be between 10 and 12cm from the top of the soil surface. At a 10cm placement depth, it may be better for overall maize yield, but there's more chance of salt injury to young roots, especially on sandy soils, and if the slurry is applied at higher rates such as 30m³ / ha.



Timing

As discussed strip-tillage can be done in the autumn or spring for a spring crop, the decision on when to strip-tillage will be down to the field's soil type:

- **More than 20% clay content = Autumn strip-tillage**

Generally, an elevated strip with larger aggregates is desirable in the autumn. Such a strip is less vulnerable to erosion, and frost weathering over winter helps break it down to a uniform, slightly raised seedbed come spring.

It is important that the autumn strip does not become a depression over winter, therefore the rear packer wheels fitted to the SPX are lifted out of operation. In some cases, farmers will perform autumn strip-tillage followed by a light spring pass to "freshen" the strips ahead of planting.

A finer, more level seedbed is the goal for spring strip-tillage, where usually one pass will be sufficient to achieve a good seed bed in front of the planter.

Strip-tillage for organic cereals

A new concept in strip-tillage is drilling cereals with a strip-tillage machine, the optional Horizon double seed outlet point in combination with a narrowing row spacing, provides an ideal one-pass system.

The weed control benefits and targeted banded fertiliser applications of strip-tillage work particularly well for organically grown crops, banding is more economical than broadcasting fertiliser across the soil surface. Due to the challenges created by herbicide restrictions on organic crops, having a cover crop such as clover or a relay crop in between the rows provides benefits to weed control management, and in the instance of relay cropping more financial profit as well.

Refreshing the strip

Some farmers will perform two passes of strip tillage. The first pass is done in the autumn and the second in the spring. The spring pass is often light as the soil “lifting” has already been done in the autumn pass, the second pass is to achieve a seed bed in front of the planter. Operators may choose to either run a point-and-wing combination or replace the shank with a spring-tine unit, known as Vibrotines on the SPX.



Selecting the right cover crops for strip-tillage

Cover crop seed options include legumes to fix nitrogen, small grains and brassicas to recycle nutrients, improve soil structure, build organic matter and help break pest cycles. Remember, a diverse cover crop mix will allow different goals to be achieved at the same time.

Planting clover or beans in the row is also possible with the SPX, this allows for nitrogen to be fixed in the following crops rooting zone.

Selecting the right cover crops depends on the goals, such as:

- **Increase soil health**
- **Improve soil organic matter**
- **Reduce soil erosion**
- **Reduced nutrient leaching**
- **Improved weed control**
- **Moisture retention**
- **Improve soil structure**
- **Enhance nutrient cycling.**

Benefits when using cover crops in a strip-tillage rotation



Cover crops are an important part of weed management programs in strip-tillage cropping systems because of their weed-suppressive abilities, and therefore less use of herbicides.

The most common method of weed suppression by an actively growing cover crop includes competition for limited plant growth resources that result in reduced weed growth.

Alternatively, cover crop mulches suppress weeds by reducing weed seedling emergence through allelopathic effects or physical effects of shading.

Overcoming the challenges of cover crops in strip-tillage.

Like any crop, growing cover crops can have its challenges, although it is usually the following crop that suffers rather than the cover itself. The greatest challenge with growing a cover crop is for the cover to either dry the soil out in the spring or prevent the top layer of soil from drying out enough to allow the strip-tillage to work correctly.

Working back from your target drilling date by a minimum of six weeks will ensure that the herbicide has adequate time to break down the cover crop canopy. This will then help to create the best medium to plant the following crop into, unless you are drilling into the "green" where the cover crop is left growing when planting and then terminated.

For maize specifically and when using a cereal cover such as rye and oats, the cover should be terminated when it's no more than 30cm high.

One-pass or two-pass system

A one-pass system is where the strip-tillage machine is coupled to a planter, and both passes are done at the same time. In theory, this concept is more efficient, but in reality works on a very limited soil type.

The reason why a two-pass strip-tillage system is the right choice is that after the initial pass with the strip-tillage, time is required for the soil surface to dry to allow the planter to run efficiently and smoothly, providing the best conditions for the crop to grow in.

In certain circumstances, a second pass with the strip-tillage machine may be required to provide the best soil conditions, which is not possible with a one-pass system.



Berm discs and Vibrotine kit (optional feature).

Trailed or mounted strip-tillage

A mounted strip-tillage like the SPX is attached to the tractor's 3-point linkage so that it can follow the GPS, which is essential for the following planter operation. A trailed machine would ideally need GPS guidance on the machine as well as the tractor to provide the accuracy required for planting row crops behind it.

In both a mounted and trailed scenario, the same guidance unit should be used for both the strip-tillage and planting operation, if not then the heading coordinates should be shared between the two.

SPX machine adjustments



1. Leg, 2. Point and wing, 3. Row cleaners, 4. Packing wheel, 5. Berm disc, 6. Opening disc, 7. Compression spring.



Point and wing.

Depth

The SPX can be operated to a depth of 40cm if required, however, in normal conditions, a depth of 15cm to 23cm is typical. A consideration when setting up the machine is that for every 5cm of depth, the draught force needed to pull the legs through the ground almost doubles, as well as increasing fuel consumption.

Tine

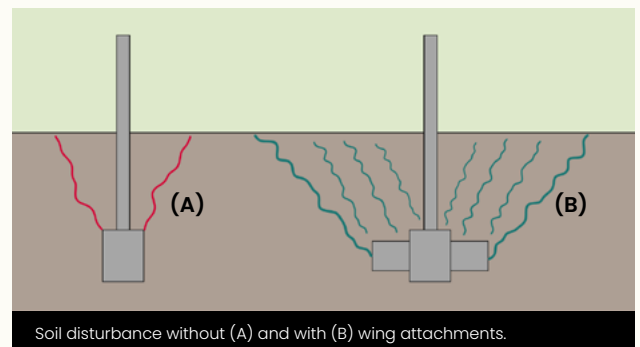
The tine assembly consists of the leg, shank, point and wing. Its purpose is to remove any compaction layers, move & fracture the soil, and place fertiliser accurately in the seeding zone (if fitted). Low and high disturbance points, along with medium (130mm) and wide (160mm) wings are available to manage soil movement and lift.

Points and wing options

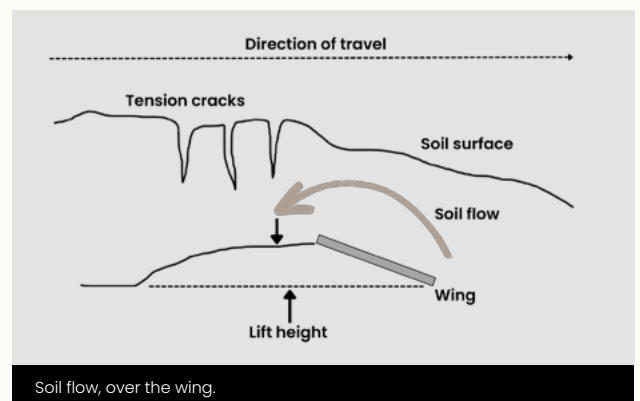
The SPX is able to be used with either low or high disturbance points and run with no wings, a 130mm wing or a 160mm wing to suit different applications.

The high disturbance point coupled with the 130mm wing is the factory standard specification, this gives good soil lift / disturbance from the point whilst the wings are cracking the soil profile (Figure 2). If less soil boiling up is required, then switching to the low disturbance point is an option.

The deeper the SPX is working, then the higher the lift will need to be, consequently, increased lift should be by using the wider 160mm wings. While the addition of wings increases the draught force this is outweighed by increases in the amount of soil disturbance.



Soil disturbance without (A) and with (B) wing attachments.



Soil flow, over the wing.

Row cleaners

For the majority of row crops to germinate effectively, it is essential that the seed is planted into trash-free soil. The optional SPX row cleaners, utilise market-leading CleanSweep technology from Precision Planting to remove all surface trash from the seeding zone.

Each row is equipped with a pneumatic cylinder to control the row cleaner operation, with an in-cab control box. It is important that the row cleaners do not operate directly on the ground as this will create a tillage effect resulting in excessive soil movement. The required pressures used will depend upon the row cleaners and field conditions.

Berm building discs

The berm discs manage the strip width and structure, by containing the soil brought up from the point and wing. Toe, width and lateral adjustments can be made to find the optimal setup. The width, angle and positioning of the discs can be adjusted according to the season and field conditions. Strip widths from 150mm to 300mm and a berm height of between 0mm and 100mm are achievable.

In the spring, the deflector discs can be set in a parallel position, leaving the strips level with the unmoved ground. In the autumn, the discs can be set at an angle, leaving the cultivated strip higher than the unmoved ground, allowing the soil to settle over winter.

Available adjustments on the SPX

Toe-in

Allows the soil to flow easily out of the berm discs. This will create a shallow / lower strip.

Toe-out

Slows the soil from passing through the berm discs. This will create a wider / higher strip.

Width adjustment

A narrow berm disc setting will increase the residue flow between the row units. It will contain soil between the discs and produce a more pronounced strip. A wide disc setting will decrease residue flow between the row units. It will allow more soil to pass between the discs and produce a less pronounced strip.

Fore / aft adjustment

The Berm discs position can be adjusted forward and backwards to determine strip width and structure. Move the discs forward to increase the amount of escaping soil. Move the discs rearwards to reduce the amount of escaping soil. A higher strip will be built with the berm builders in a reward position.

Each berm disc arm is held in place by a compression spring. The spring has two functions:

1. **To allow the disc to ride over obstacles and to prevent component damage.**
2. **Enables the disc to cut into the soil and assist in building the strip structure.**

Packing wheel pressure

Each row is equipped with a pneumatic airbag to control the closing wheel pressure on the unit. The closing pressure can be controlled via the supplied box from the tractor cab, or manually with the fitted Schrader valves.

Note: If you strip-tillage in the spring in front of the planter, make sure an air pocket is not left in the seeding zone, the danger is the seed falls into this deep air pocket and /or does not have good seed-to-soil contact to germinate. To avoid this risk, make sure the rear packer wheels have enough pressure to push the lifted soil back down.

The packing wheels on the SPX can be mechanically locked in the raised position for the following reasons: Damp soil conditions, or the strips do not require any firming e.g. when stripping in the autumn on heavy land and frost weathering is required to help produce a tilth in the following spring, so the berm is intentionally left raised over winter.

Optional rear seeding elements

The SPX can be equipped with an integrated seeding unit, which allows for the placement of seed post tillage. The unit is equipped with a seed boot and disc to place the seed and a rear packing wheel.

The seeding unit is available in single or double-row disc configurations, both of which mount onto the rear packing arm of the SPX row instead of the packing wheels.

The unit has a choice of packing wheels available to firm the tilled strip prior to seed placement and for closure of the slot post drilling.

Working speed

The optimum forward speed for the SPX is 10–14 km/h, the faster the machine is operated at, the more soil will be brought to the surface to create a better tilth and minimise the number of passes required.



Berm disc angle adjustment.

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HORIZON AGRICULTURAL MACHINERY LTD

t: +44 (0) 1945 440 999 | e: info@horizonagriculture.com | w: horizonagriculture.com

Registered in England | Company Number: 5930757 | VAT Number: GB 894781854
Cliftons Bridge, Fishergate, Sutton St James, PE12 0EZ