

# Prospects For Sub Soiling (Deep Ripping) Compacted Land with Minimal Surface Disturbance

**Agronomic Demonstration prepared by:**

Pattison Agriculture Limited

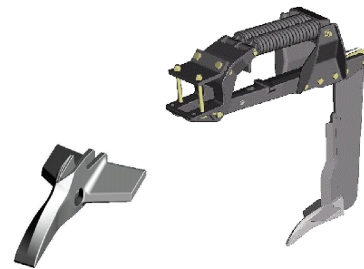
Intelligence Solutions Department

Pattison Agriculture Intelligence Solutions Department has prepared and analyzed the effects of deep ripping land in attempt to demonstrate the benefits of this type of tillage in Saskatchewan. In this agronomic demonstration you will see data that is specific to one region for the crop year 2023.

Questions about this article are to be addressed to the IS Department.

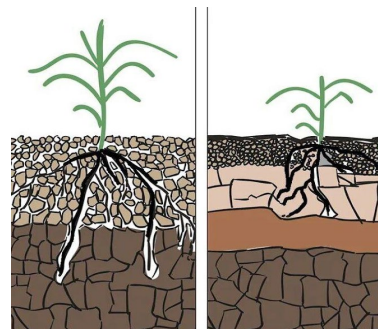
# Agronomic Trial

## Pattison Agronomic Demonstration

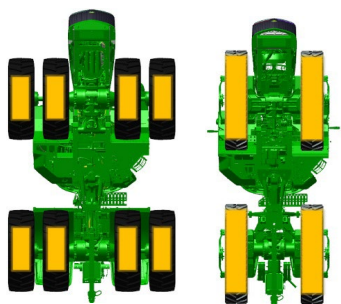


### Deep Ripping for Soil Compaction

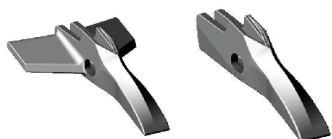
Mechanized agriculture and livestock grazing are common sources of compaction resulting in increased soil density, as well as reduced available space for water, air, and root infiltration. During a period of drought, compacted areas within a field may have significantly lower production due to plant root limitations to break through the compacted soil to be able to access moisture during the growing season (**Figure 1**).



**Figure 1.** The Fredrick Nature Notes: Soil compaction", May 2022



**Figure 2.** Machine compaction comparison.



**Figure 3.** Winged points (left), wingless points (right).

Deep Ripping (**Figure 4**) is ideally completed in the fall as winter freeze up allows time for the surface disturbance to settle out and worked soil promotes deeper freezing, which increases the effects of the “freeze-thaw” cycle which naturally reduces soil compaction (*Soil Science of America*, 2014).

In the following Agronomic Demonstrations, you will find several in-season observations and the results of the Fall 2022 Deep Ripping.

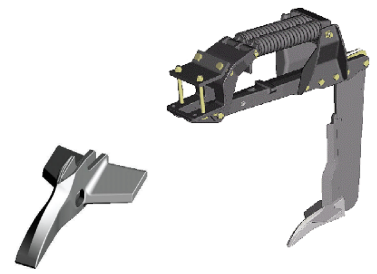
Please consult with your agronomist/advisor to ensure this practice is right for your land.



**Figure 4.** Field operation and field finish of a Deep Ripping application. .

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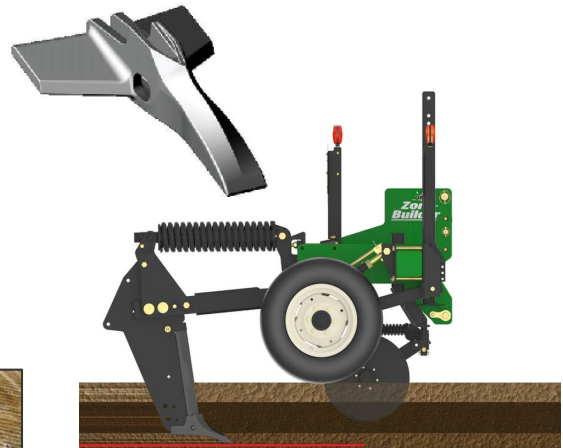


### Deep Ripping for Soil Compaction

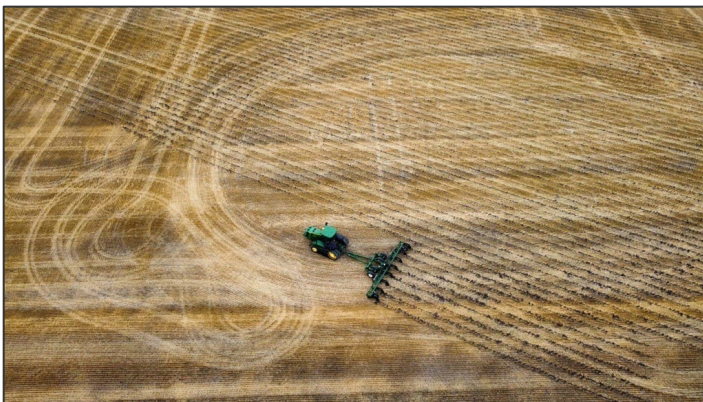
Deep ripping agronomic demonstrations were completed on September 15<sup>th</sup>, 2022 on two fields noted as “Grandmas” and “Thomas”, using a 9560RT & Unverferth 122 Zone Builder – 8 Shank x 60” Spacing, Spring-cushioned reset shank + winglets on opener (**Figure 5**). In addition to completing passes across entire fields; saline areas were ripped, and observations taken. In the spring of 2023, canola, chickpeas, lentils, and wheat were sown into the ripped ground.

The demonstration area suffered a drought for the 2023 growing season, with limited rainfall totaling less than 3in. Lack of moisture as well as a soil texture of Loamy-Sand → Sandy-Loam resulted in limited potential for an above average yielding crop. The soil texture is highlighted in **Figure 6**. The 30yr average annual precipitation in this region between May – August is 8.9 inches (*El Dorado Weather – Tugaste, 2023*).

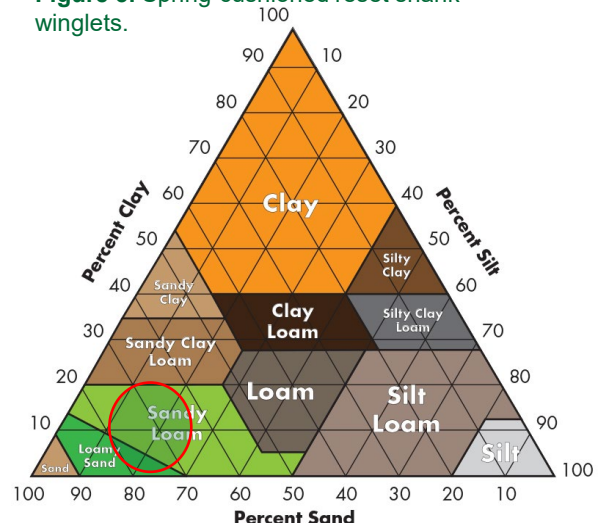
The fields were harvested, and the yield was further analyzed. “Thomas” was selected due to its history of cattle traffic increasing compaction over many years whereas “Grandmas” was selected due to its loamy soil type, prone to compaction and evidence of soil compaction in previous seeding trials.



**Figure 5.** Spring-cushioned reset shank + winglets.



**Figure 7.** Aerial photo of field finish, taken September 15, 2022.

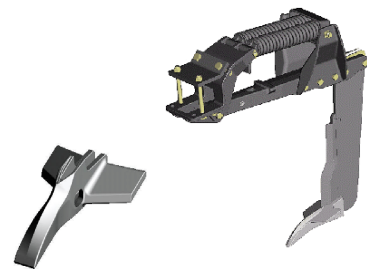


**Figure 6.** Soil texture triangle with highlighted demonstration area soil texture interpretation.



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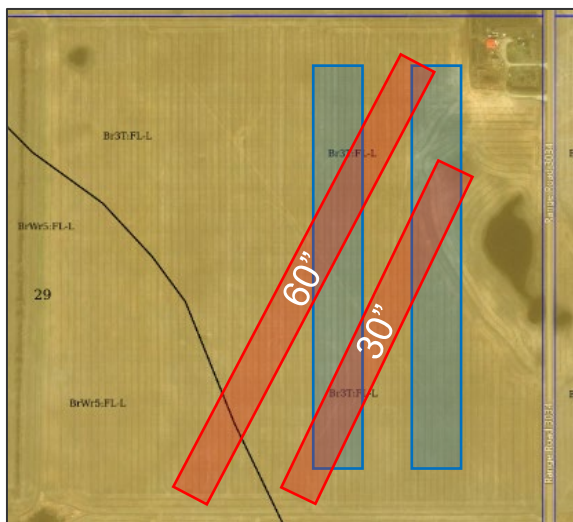
### Deep Ripping- “Grandmas” (NE 29)

#### Unverferth Zone-BUILDER SubSoiler 122 + 700 Caddy [Folding 8 Shank x 60”]

“Grandmas” (NE29) soil type is dominantly Bradwell Orthic Dark Brown with Weyburn Orthic Dark Brown on upper slopes. This Fine Sandy Loam soil has an Ag Capability rating of (3), meaning it has moderately severe limitations, restricting the range of crops or may require special conservation practices (SKSIS Working Group, 2018). Previously, this field had been used for air seeding demonstrations due to its compacted nature; notably showing an advantage for seeding tools that can fracture hardpan in a one pass application. These previous results inspired more work to be done to reverse the effects of mechanically created soil compaction.

This field had been ripped in the spring of 2022 (**Blue area**) prior to the Durum Crop as well as in the fall of 2022 (**Red area**) before the chickpea’s sown in the spring of 2023 (**Figure 8**). The 2022 Durum crop experienced severe drought but left adequate stubble to demonstrate the minimal surface disturbance the Unverferth Zone Builder leaves (**Figure 9**).

Spring ripping dried out the soil and didn’t have as significant effects compared to fall ripping. However, an increase in the rooting ability of the chickpea crop was noted where the 2022 spring deep ripping was conducted, as well as a positive impact on the yield.



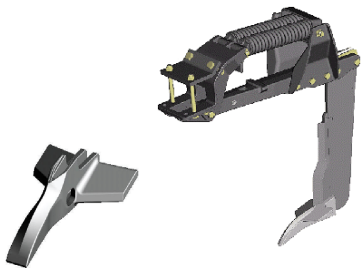
**Figure 8.** Field demonstration areas, spring of 2022 ripping (blue), fall of 2022 ripping (red).



**Figure 9.** Field finish of Unverferth Zone Builder.

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### Deep Ripping- “Grandmas” (NE 29)

Unverferth Zone-Builder SubSoiler 122 + 700 Caddy [Folding 8 Shank x 60”]


The Results of Grandmas (NE 29) deep ripping demonstration displayed an average of a ~115% advantage for the area deep ripped compared to the untreated check. There was a 117% yield advantage to ripping on 30” spacing, and a 113% yield advantage of ripping on 60” spacing. Throughout the season there was a slight difference in the crop; showing more vegetative index in the deep ripped area.

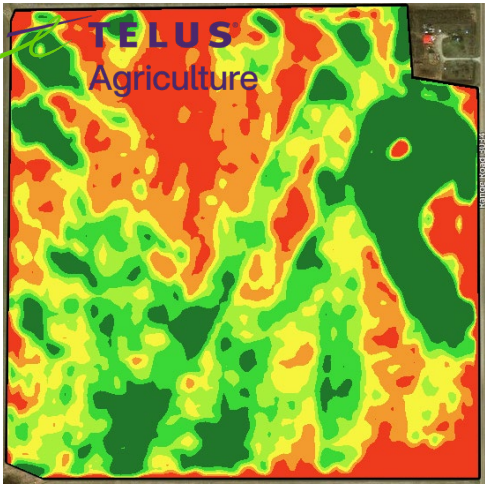
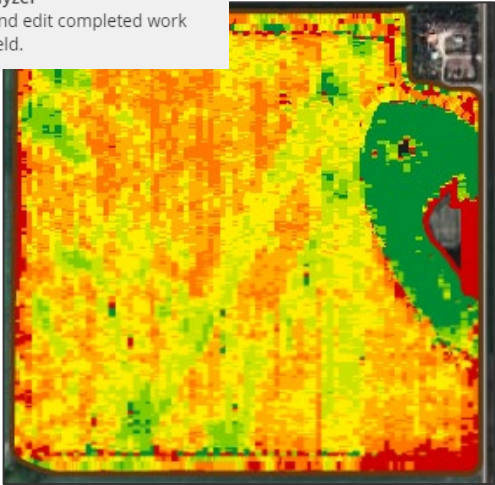
During Harvest, a John Deere S670 combine with a 635FD AWS header was used to collect data, which was then analyzed using **Field Analyzer** in John Deere Operations Center. This yield data is displayed in **Table 1**, where a clear advantage in the ripped treatment can be seen. **Figure 10** displays the yield map from Operations Center (left), as well as in season NDVI imagery provided by TELUS Agriculture (right), which was taken July 31, 2023.

In previous seasons, this field has shown an advantage for treatments to amend soil compaction. For the 2024 crop (Canola) most of this field will be deep ripped, leaving a smaller area for the untreated check.

**Table 1.** Yield (bu/ac) of demonstration areas compared to check.

Treatment	Yield (Average Bu/acre)	Difference
Ripping 30”	34.4	<b>+4.9</b> <b>(+117%)</b>
Check	29.5	
Ripping 60”	33.3	<b>+3.9</b> <b>(+113%)</b>
Check	29.4	

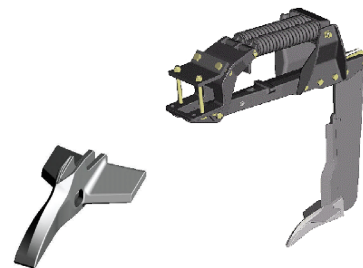
 **Field Analyzer**  
Analyze and edit completed work  
field by field.



**Figure 10.** Field analyzer in John Deere Operations Center displaying the yield map (left), and in season NDVI imagery provided by TELUS Agriculture (left) taken on July 31, 2023.

# Agronomic Trial

## Pattison Agronomic Demonstration



### Deep Ripping – “Thomas” (SE/SW 15)

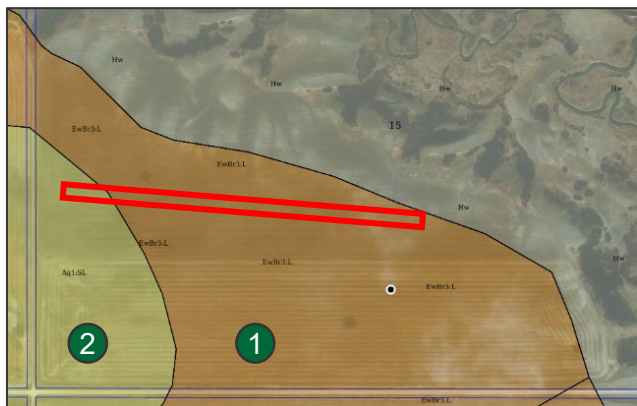
Unverferth Zone-Builder SubSoiler 122 + 700 Caddy [Folding 8 Shank x 60”]

“Thomas” (SE/SW 15) is dominantly an Elstow-Bradwell Dark Brown Chernozemic soil **Figure 11-(1)** with a Loam surface texture and an Ag Capability rating of 3 (as seen in field “Grandmas”). The south-west corner of this field is a lighter “Asquith” Dark Brown Chernozemic **Figure 11-(2)** - Sandy Loam texture that is more moisture limiting & has a lower Ag Capability Rating (SKSIS Working Group 2018). This Sandy Loam area previously received manure application in the fall of 2022, therefore, it has been removed from the analyzed trial area.

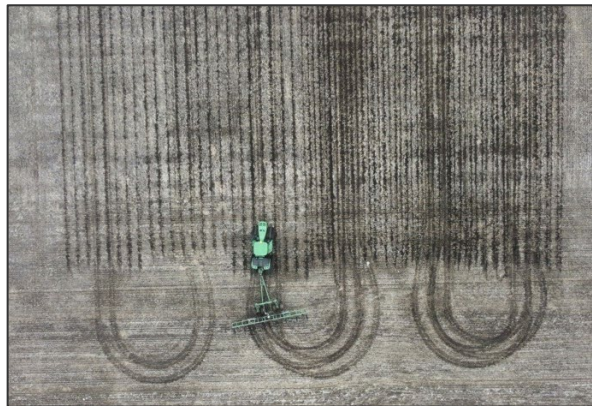
In 2022, this area experienced a severe drought. In season rainfall can be seen in **Table 2**. The lentil crop was below average and left inadequate residue for ground cover. The intention was to deep rip a wider area prior to freeze up. Given the elevated risk of soil erosion, only a small area was completed, which is highlighted in red in **Figure 11**. When operating in this field the Unverferth 122 Zone Builder the 9620RX showed minimal engine load, creating the assumption of minimal compaction in the area due to the machine response during the demonstration. **Figure 12** displays the field finish of the deep ripping operation.

**Table 2.** In season

Date	Rain
May 12	1/10”
May 24	4/10”
May 28	2/10”
June 1	1/10”
June 7	3/4”
June 15	1/10”
June 18	9/10”
July 18	2/10”
July 19	1/10”



**Figure 11.** Worked field area.



**Figure 12.** Aerial field finish.



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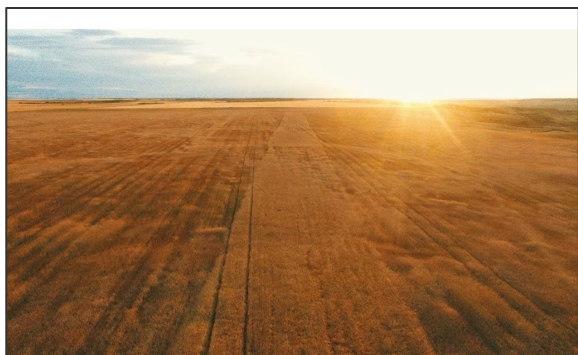
### Deep Ripping – “Thomas” (SE/SW 15)

Unverferth Zone-Builder SubSoiler 122 + 700 Caddy [Folding 8 Shank x 60”]

The Results of Thomas (SE/SW15) showed a positive yield response to the deep ripping operation. During the beginning of the season there was minimal difference between the untreated check and the area deep ripped. As the canola grew past the 4-5 leaf stage it became clear there was an advantage to this treatment. During harvest, a John Deere S790 combine with a RD40F header, and a Unverferth V1300 Cart was used to harvest the demonstration areas. A 40ft strip of the treated area was harvested, weighed, and documented, as well as the untreated check. The yield results displayed in **Table 3** show a +172% difference for the deep ripped treatment, compared to the untreated check.

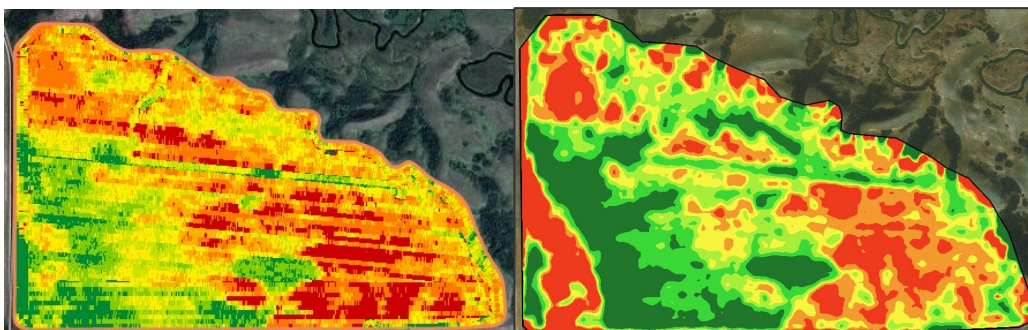
**Table 3.** Yield (bu/ac) of demonstration areas compared to check.

Treatment	Yield (bu/acre)	Difference
Check	<b>16.9bpa Average</b> (2440lbs/2.88Acre)	<b>+12.13</b> <b>(+172%)</b>
Ripping 60”	<b>29.03bpa Average</b> (4180lbs/2.88Acre)	



**Figure 14.** Aerial image of deep ripped treatment area compared to untreated check, taken August 10, 2023.

Several reasons could be suggested as to why this treatment resulted in such a dramatic difference in this dryland canola crop. Disrupting the hard-panned soil could have allowed the roots to grow deeper, and access deeper moisture during the July drought. Additionally, by rooting deeper, this allows the plant to stay cooler during the several +30-degree days this crop experienced in July.



**Figure 13.** Field analyzer in John Deere Operations Center displaying the yield map (left), and in season NDVI imagery provided by TELUS Agriculture (left) taken on July 1, 2023.

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### ADDITIONAL RESOURCES

- [Tillage | John Deere CA](#)
- [2100 Minimum Till Ripper | John Deere CA](#)
- [Unverferth MODEL 132, 122 & 112 ZONE-BUILDER](#)

### RESOURCES

- <https://www.soils.org/news/science-news/soil-compaction-and-freeze-thaw-cycles/#:~:text=It%20reports%20compaction%20as%20the,compacted%20soils%20C%E2%80%9D%20says%20Jabro>.
- <https://www.sciencedirect.com/science/article/abs/pii/S0378429014001014>
- <https://www.sksis.ca/map>