

Better Weed Control with a Modern Harrow

by Philip Bauman

Hello from Cedar Ridge Acres! My name is Philip Bauman and together with my wife and two children, aged 3 and 1, I live and farm on a 170 workable acre certified organic farm located in southern Bruce County, near the town of Mildmay. I have been farming organic cash crops for 10 years, having grown up on a family dairy farm where we farmed without the use of synthetic fertilizers or pesticides. My father's intention for this style of farming was to leave the land better than he found it for the next generation — and he realized that the heavy use of chemicals would not attain that end.

We also rent an additional 100 acres of organic crop land, working in cooperation with my brother-in-law who farms a number of organic acres and assists with the field work in the busy seasons. We do custom planting, weeding, inter-row cultivation, and combine harvesting services for a small number of organic farmers within a 50 km radius of our home base.

As most farmers know, farming is not only a matter of seeding and harvesting but also managing the weeds in the crop, for which there are various approaches. Some do this with no-till practices and chemical weed management, others use heavy tillage and reduced chemicals, and still others use extensive cover crops in combination with reduced tillage and minimal to no chemical use. For certified Organic farmers, chemical herbicides are not an option, so integrated and coordinated management practices are required.

For many years the moldboard plow was the foundation of the tillage and weed management on our farming operation due the fact that the weed control equipment we had available to us was not able to accept any significant crop residues on the soil surface. A prime example of this is the tool known in North America as a *tine weeder*. There are many different brands of this type of weeder available today, and most of them share similar characteristics. The primary function of these weeders is to uproot weeds that are beginning to grow at the soil surface after the main cash crop has been planted. They operate by a series of spring tines set in ranks to scratch through the soil and disturb the entire surface of the field to a depth sufficient for removing the weedlings — but not so deep as to uproot the crop, which typically is planted deeper than where weeds germinate. This method can pose a significant challenge depending on weather, crop advancement, weed advancement, soil conditions and residue presence. This challenge is amplified by the crucial need to weed the field at very specific intervals, which is dictated by the presence of what I call white root hairs: the first root shoot that is sprouted from the weed seeds before an upward shoot is visible above the soil. The window of maximum effectiveness for tine weeding can be very short in good growing conditions. Sometimes as little as 12 hours can

make the difference between a successful result and only a modest reduction in weed population.

Having used an Einbock Aerostar weeder rented from a fellow farmer for a number of years, I was frustrated with its inability to tolerate any significant volumes of residue, especially corn stalks, and more importantly its inability to quickly adapt to changing soil textures and conditions. What brought my frustrations to a head was learning that, due to the geometry of a coiled spring tine which has a very small window of travel while maintaining similar pressure on the soil, I was in fact not even weeding the soil in the any low divots of the soil surface, such as the depression left behind by the planter. Instead, I was partially filling it in with loose dirt from a higher spot of the soil surface. This not only does not remove the weeds in the crop row, but actually increases the weed's rooting depth, making it harder to remove in any subsequent passes.

In 2018, while attending the Guelph Organic Conference, I met and spoke with Jos and Ana Pelgrom from Man@Machine in Holland, who were presenting the Treffler lineup of machinery in Canada for the first time. Treffler specializes in machinery that is specifically tailored for the Organic farmer. They have ingenious approaches to the challenges we face.

The flagship machine of this company is — low and behold — a tine weeder (or harrow)! At my first introduction to this machine, I was able to see that Treffler has pushed the standard of effective weeding *far* above the ability of any other weeder I had ever seen. The design of this harrow was such that it would either eliminate or vastly improve all of the issues I had with other brands of harrows.

Because each hinged tine is fastened to its own spring and cable, and attached to a central tensioning system operated by a hydraulic remote from the tractor seat, the issue of needing rapid adjustment and fine tuning for changing conditions while moving through the field is completely solved. In addition, due to the genius design of the hinged tine and spring, now the tension of the tine against the soil will remain constant. This means that if the frame is set to a height that accommodates the entire soil surface profile, each tine still fully follows the contour of the soil it encounters, independent of any of the other tines surrounding it. Bingo!

Now the low divots will be harrowed equally as effectively as the high spots and the high spots will not be over-harrowed and dragged into the low spots. Also, now that the tine tension does not increase as the tine moves backwards, it no longer gathers and holds crop residues nearly as readily. When residue comes in contact with the tine, the drag increases and the tine rises. The residue is released and flows through (it is not impossible to clog the machine with residue, but the instance of this happening is significantly reduced).

In addition to these important design advances, Treffler also offered an exclusive option of a carbide tipped tine, which increases the wear factor by seven times. More importantly,

because the carbides are inset into the face of the tine, the tines always maintain a sharp leading edge, which increases crust penetration through the life of the tine.

After seeing it in person, I knew that if I were ever to purchase a weeder of my own it would need to be a Treffler Harrow! In the winter of 2019/2020, I purchased a fully mounted TS1220 harrow, which is a 5-section folding 40-foot machine. I received my new harrow in April 2020 and have used it for well over 2000 acres of weeding so far. The machine exceeded my expectations, and is now opening up opportunities for me to adapt the tillage practices that we employ in favor of reducing deep tillage and increasing cover on the soil through cover crops and crop residues. This machine definitely gives us a step up in the journey toward increasing the health and vitality of our soils, which then increases productivity and quality.

Please visit www.organicmachinery.net for more information on Treffler machines and for contact information for your region. Or feel free to call me directly at (519) 292-8286.

Happy Farming!

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Another machine that I have now been able to use from Treffler which yet again opens up another window of opportunity in the space of conservation tillage and reduced invasiveness and presents an effective perennial crop termination method which holds much opportunity is the TG and TGA lineup of cultivators. These cultivators are specifically designed with the organic farmer in mind although its use is suitable for any farmer looking for the value it can add to an operation or system. In the organic system one of the biggest challenges is to effectively terminate perennial crops or cover crops such as Alfalfa, Clover and grasses, without resorting to deep invasive tillage such as plowing or else extensive multiple passes with shallower depth such as a disc which will not sever the entire root profile in the first pass at a reasonably shallow depth therefore requiring multiple passes. My experience so far has taught me that the first pass is always the best opportunity to achieve termination because after the first pass is done the soil profile has now been loosened to the degree that any subsequent passes are no longer effective at severing the roots from the growing point of the plant. I have observed that the most effective termination of any plant that does not propagate directly from its roots but from a growing point or crown, is best done by severing the plant from the roots directly below the growing point which is often at or near the soil surface. This effectively separates the new growth from the root reserve and the plant will die, especially when left exposed to the sun to dry out. I will also note that plants that grow from shallow rooter rhizomes such as quack grass can also be controlled successfully with this shallow tillage concept with proper management and timing, deep rooted rhizomes such as thistles pose a more difficult challenge that will require other management techniques to be integrated as well. These Treffler precision cultivators are built in a way that permits a very shallow working depth of as little as 2 cm while maintaining a complete shear action across the working width. This is accomplished by the specific design of the shank which pivots substantially higher and forward of the soil engagement point as compared to other types of cultivators. The shank is then spring loaded against a set of leaf springs that provide a very controlled vibration action that allows for limited rearward movement and facilitates penetration and ultimately root shearing action, and is also ultimately protected against large obstacle damage by standard shear bolt protection or an optional hydraulic trip protection. As with the Treffler tine weeder, this machine also has a carbide edged sweep option that I consider a very important factor. The placement of the carbide on the top leading edge or the sweep creates a wear pattern that keeps the leading edge of the sweep sharp throughout the life of the carbide. This sharp edge I consider critical due to two significant factors, 1: a sharp edge will always penetrate the soil and be able to cut roots effectively much better and 2: on the same token a sharp edge will also greatly reduce the problem of micro compaction at the bottom of the tillage depth. What I mean by this is that any standard steel soil engagement wear part on any tillage equipment that does not have a change in hardness from the bottom of the edge to the top of the edge will always WITHOUT FAIL, to my knowledge wear in a way that very quickly develops a blunted, round, leading edge, where the furthest forward surface is actually raised up from the lowest contact surface of the wear part when placed on a flat surface. This in effect produces the effect of the point or sweep actually compacting and in moist conditions smearing the

bottom of the tillage depth to the point of creating a compaction layer which limits root development and also hinders water infiltration and gas exchange in the soil profile. These sweeps are then positioned on the cultivator in a way that provides a balanced flow of material through the cultivator with a frame clearance of 72cm, adjacent shank spacing of 77cm. The total shank spacing throughout the machine is 17.7cm with the width of the sweep at 26cm, this gives it a 8cm overlap from wing to wing of the sweeps.

My goal with this tool is to integrate it into my vision of a tillage system that does not invasively till the soil deeper than absolutely necessary for proper termination of perennial species. I see it dovetailing beautifully with another tool that I have been utilizing for a number of years called a Curse Buster which is a machine specifically built for low invasion deep soil fracturing to break compaction layers and establish water infiltration and gas exchange in the soil. This is done by the use of a special aeration tine technology called the eagle tine, and is coupled with the rolling harrow commonly known as the Philips Harrow. More information on this machine can be found at www.soilcursebuster.com .

With this concept it is my opinion that I am striking a balance where we have suitable options to manage vegetation according to our needs but yet maintaining the benefits of no till such as stable field surfaces, increased water retention and delivery and maintaining a soil profile that fosters earth worms and fungi development particularly in the zone directly below the shallow surface tillage. This method also encourages the reduction of active weed seeds in the soil due to not burying them below the germination zone to be turned up later but rather keeping them close to the surface where they can readily germinate and be terminated by tine weeding or else be consumed by the various critters that dine on seeds throughout the season especially under cover of residue or cover crops. Although I have only briefly touched on a few of the key points of interest on this topic of reduced tillage and the goals and value of such a system, space and time does not allow for broadening expansively in this space. I trust that astute minds can absorb the potential and possibilities for themselves in each respective situation.

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