

The Down Low on the In-row

Comparing in-row weeding tools run individually and in combination on carrots

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Why we did this

Mechanical Weed Control A greater percentage of carrots are grown organically in the US than any other crop. The hardest weeds to control are those within the row. Newer in-row weeding tools from Europe have become available. These tools are widely used in Europe. But there is little documented experience of these tools in the US. We wanted to trial these new in-row tools and some old ones to see how they can best be used, whether they work better in combination, and their overall promise for growers. We chose to trial the tools in carrots – a slow-growing, tender and popular crop, hoping that carrots would provide a good reflection of the strengths and weaknesses of each tool.

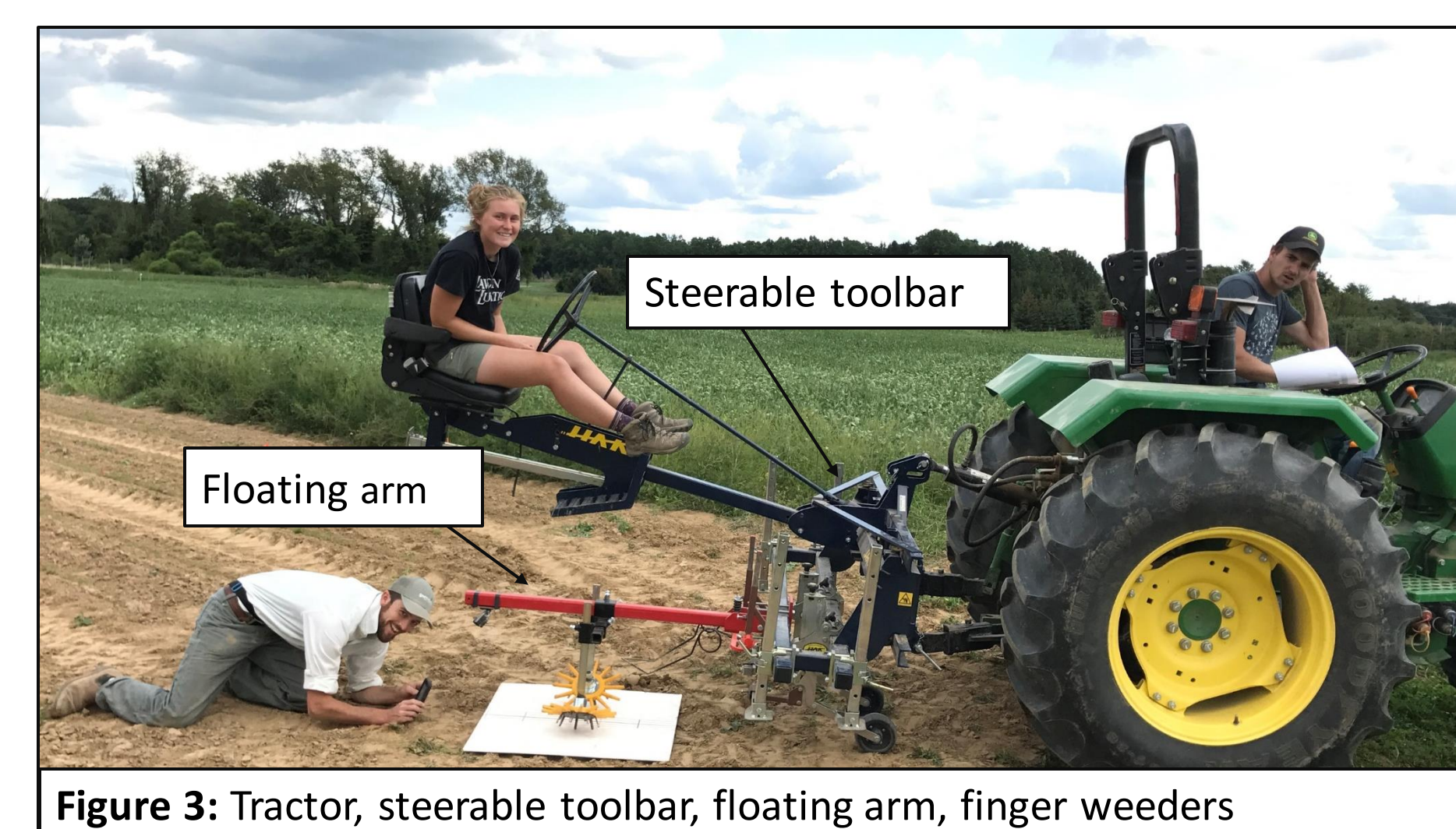
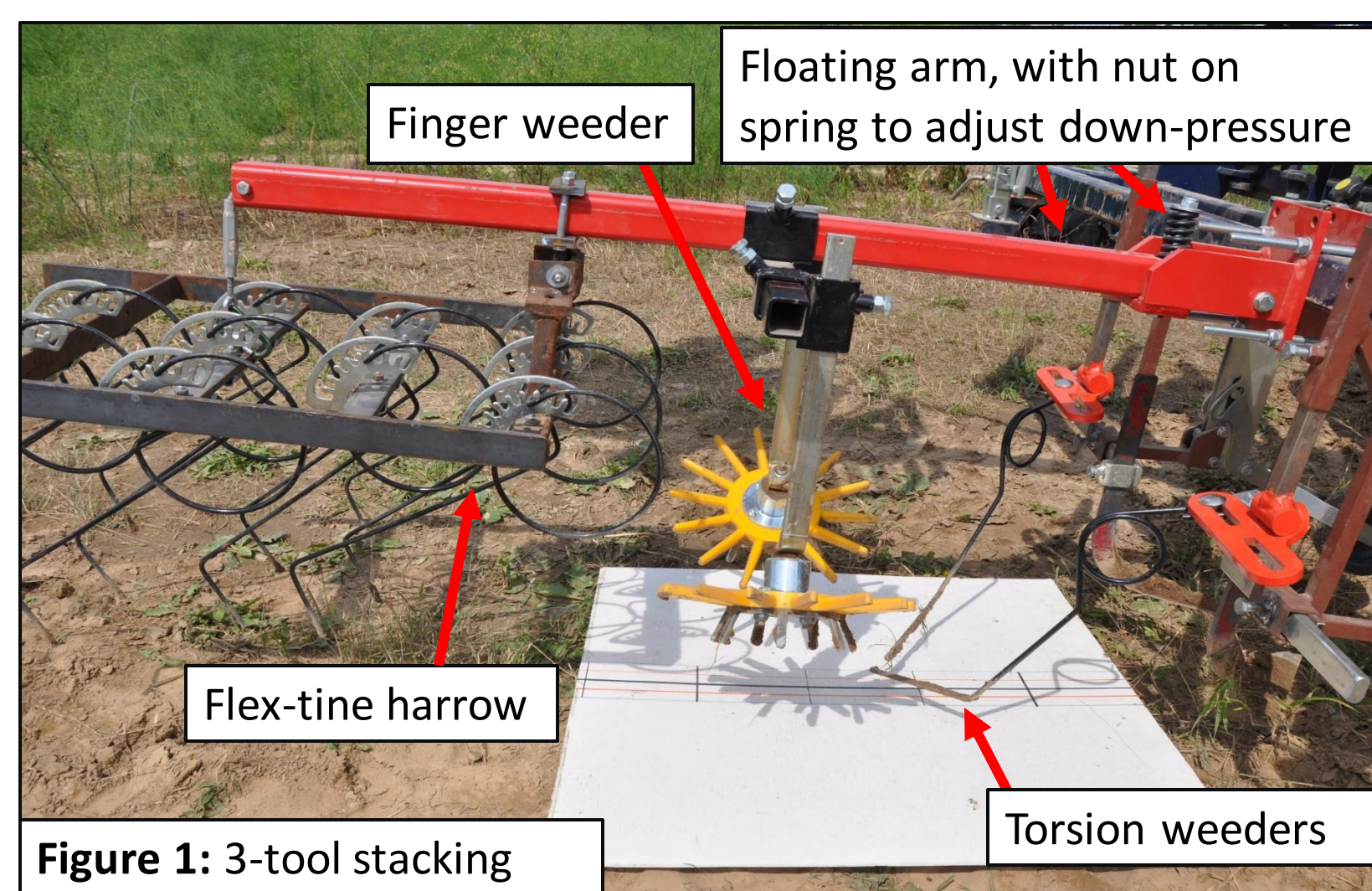
What we did

Experiment Carrots (variety *Bolero*) were planted on a flat, sandy field at the MSU horticulture farm. We flam-weeded just before emergence, trying to create the greatest size differential between carrots and weeds. Between-row tools were run along with handweeding to create a weed-free field. Mustard and Millet seeds were planted about 16 days after carrot planting (DAP) to act as surrogate weeds. About 23 DAP, when the carrots had one true leaf and the surrogate weeds were cotyledons, in-row tools were run through the carrots. Weeds and carrots were counted before and after applying the tools. After using tools carrots were handweeded and the time recorded. The carrots kept growing and we weighed and graded them at harvest. This trial was repeated 3 times in 2017.

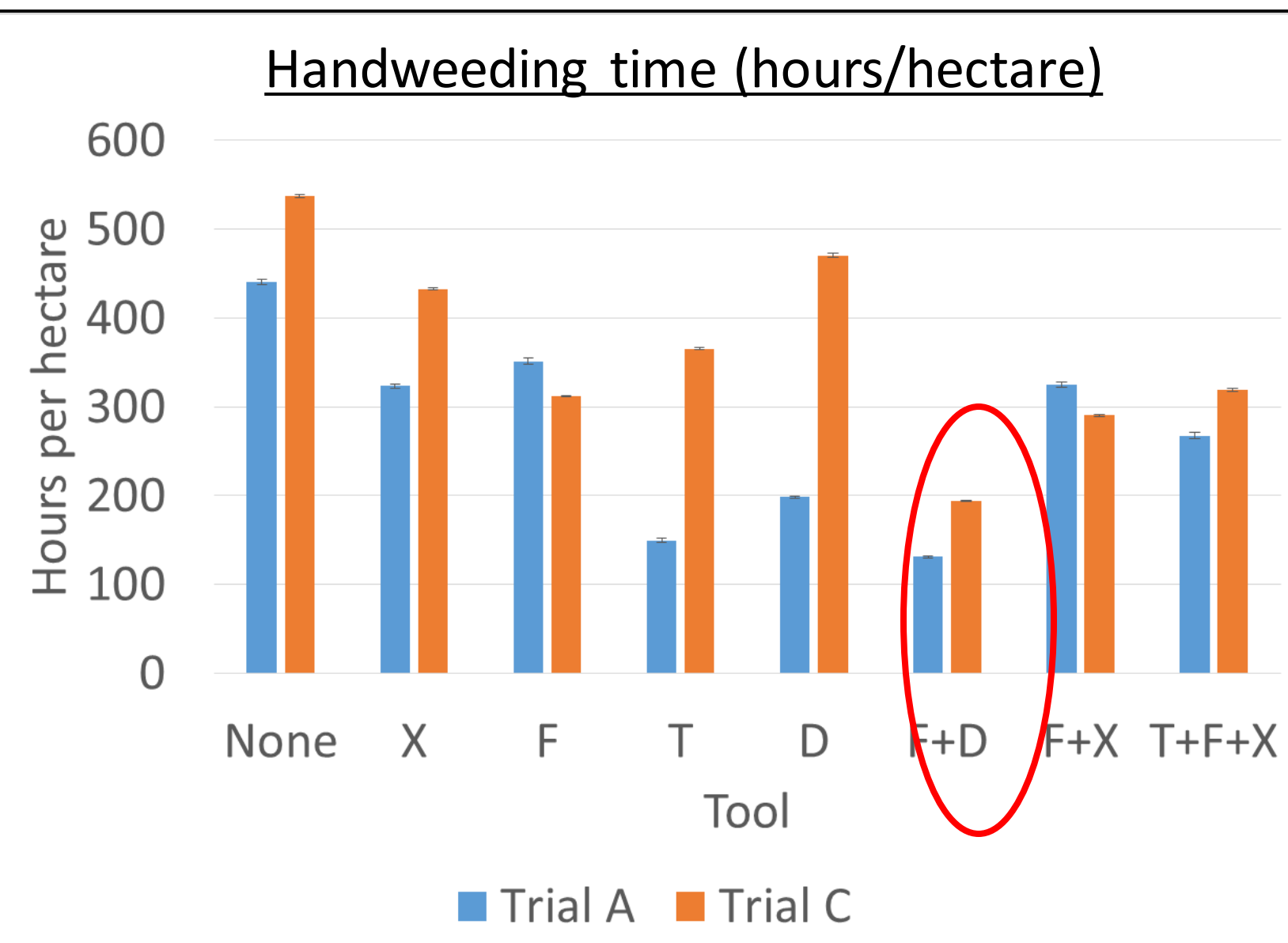


- Which in-row tools either alone or ‘stacked’ are the most effective?
- What are the tool’s effects on hand-weeding time and carrot yield?
- How does the amount of soil moved by the tool effect weed, carrot death?

The In-row Weeding Tools



Tool	Mounting system	Figure
None		
Frato Torsion Weeder (T)	floating linkage	Fig. 1
Cutum Lely Flextine harrow (X)	Custom on floating arm	Fig. 1
Kult-Kress Finger weeder (F)	floating arm	Fig. 1,2
Kult-Kress Duo-parallelogram (D)	floating arm, parallel linkage	Fig. 3
Kult-Kress Finger weeder + Kult-Kress Duo-parallelogram (F+D)	floating arm, parallel linkage	Fig. 1
Finger weeder + Flextine (F+X)	floating arm	Fig. 1
Torsion weeder + Finger weeder + Flextine (T+F+X)	floating linkage, floating arm, Custom on floating arm	Fig. 1

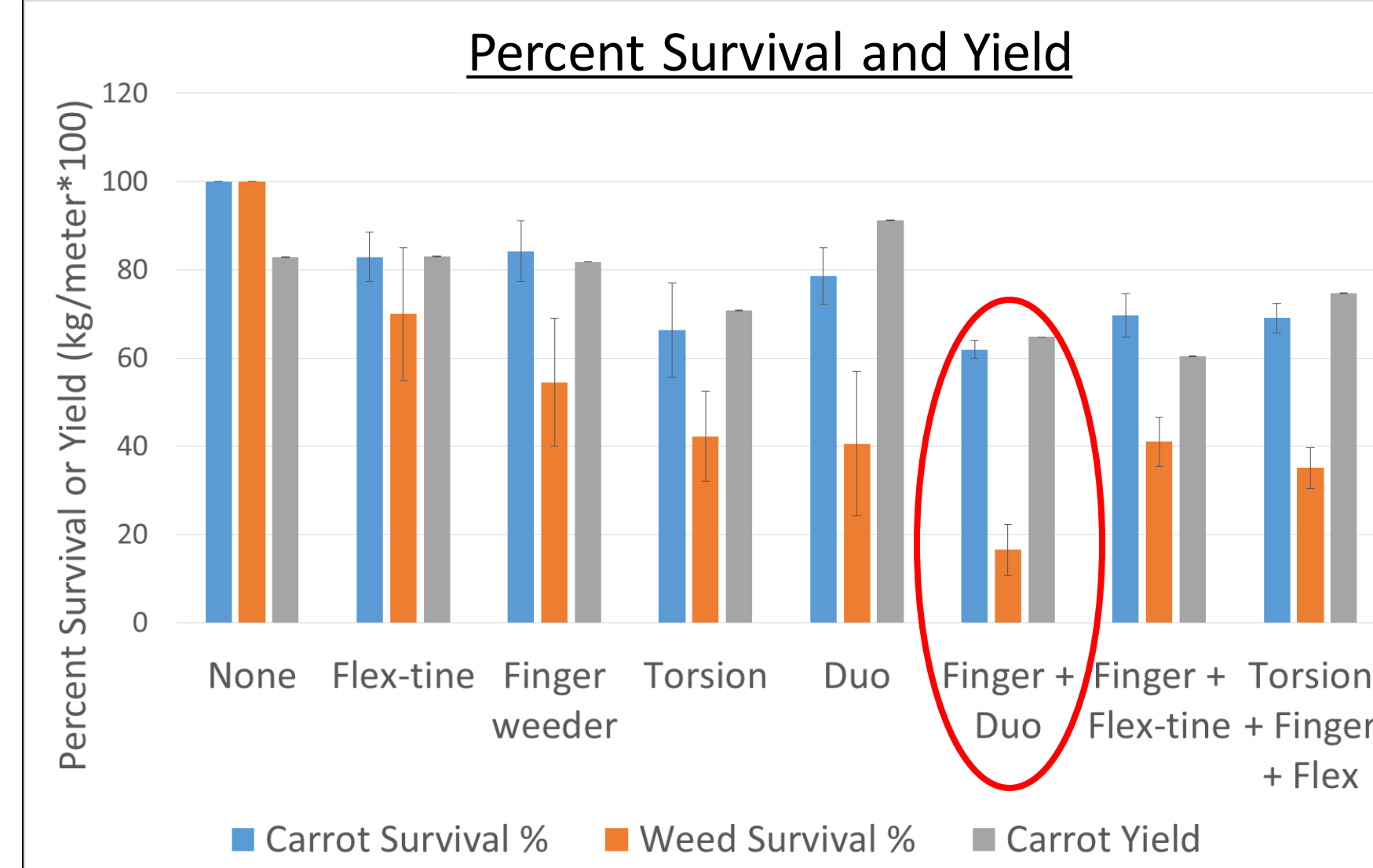
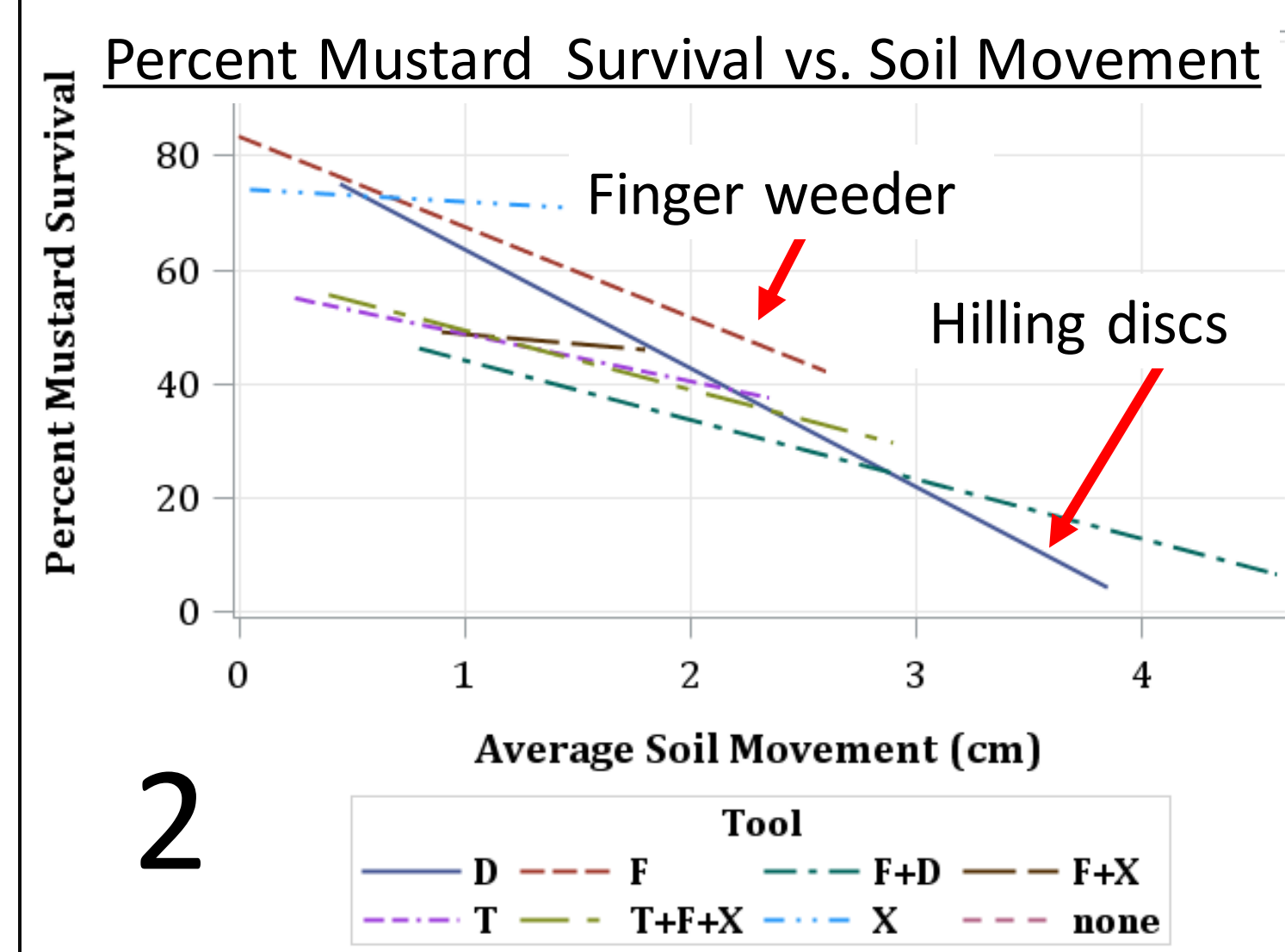
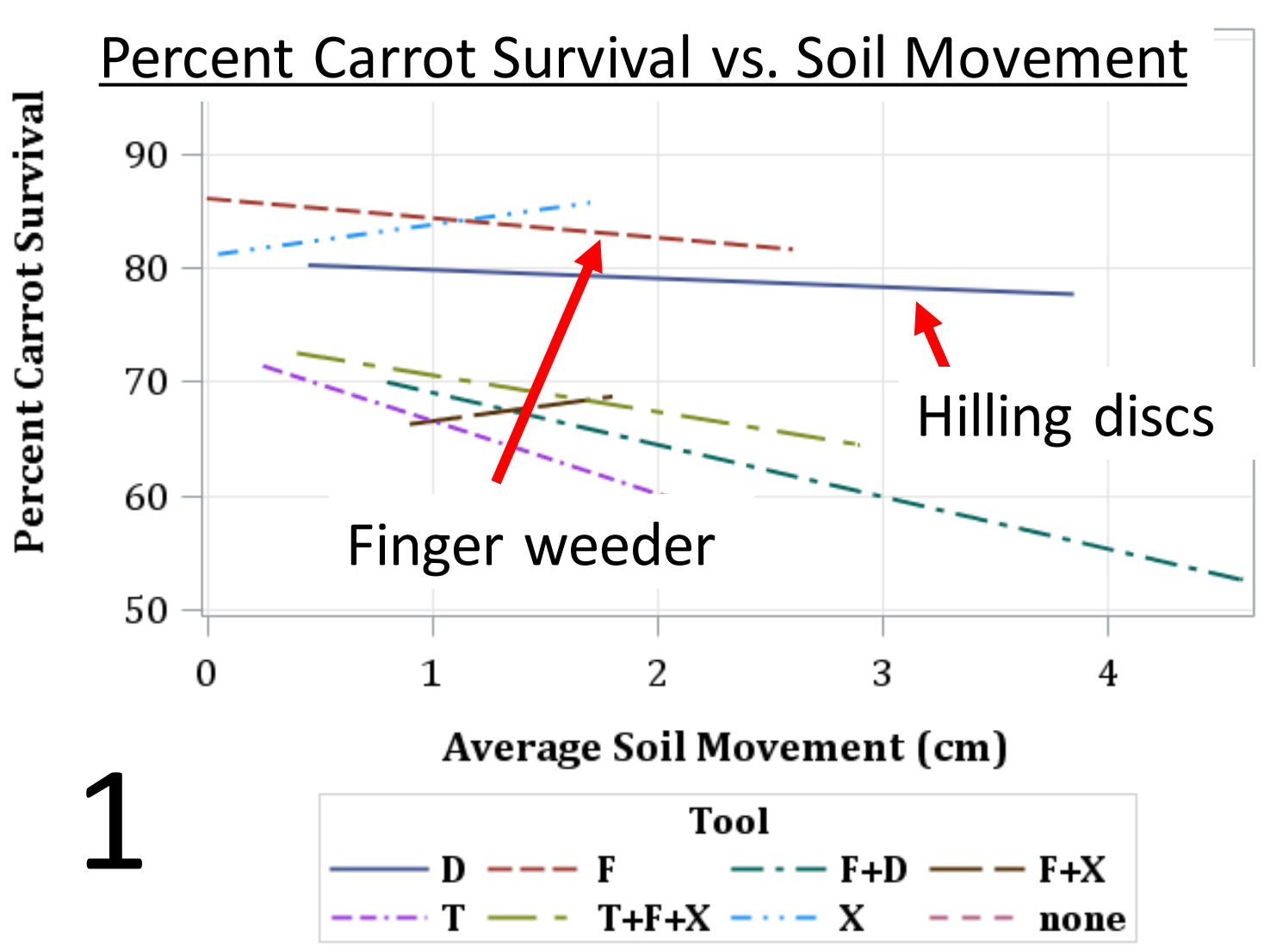


Look at the graphs below at graph 1: As the hilling discs (blue line) and the finger weeders (dashed red line) move more soil, carrot survival is barely effected.
Graph 2: But for mustard weeds, as the hilling discs and fingers move more soil, mustard weed survival goes down.
So . . . At the carrot/weed sizes we used, the hilling discs and finger weeders could be set to move more soil, which killed more weeds, but preserved the carrots – SELECTIVE TOOLS

Results

Conclusions

- In-row weeding tools can be calibrated for young carrots to kill weeds and preserve the crop
- The ‘Duo’ hilling discs and the Duo+Fingers were the most selective (they were the best at killing weeds without killing carrots)
- Duo+Fingers resulted in the least hand-weeding
- None of the in-row tools caused forks, nicks, or disease in carrot roots



Acknowledgements

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Resources

We produced a series of videos on these in-row tools – you will be able to find them, as well as other weeding-tool footage from Michigan and Europe, at **our youtube channel** – [MSU Mechanical Weed Control](#)
 2018 Midwest Mechanical Weed Control Field Day – September 26 at PrariErth Farm in Altanta IL – come see all of these tools in action as well as cultivating tractors, talk to farmers, researchers, and company reps. Take a flyer or find ‘Mechanical Weed Control Group’ on facebook