

# Case Study

## Would you eat what you grow?

### *Tilling in a no-till system to replace persistent herbicides*



Supported by Western SARE #SW23-952

## Goal

A producer in Arriba, CO tried using “true vertical” tillage to combat weeds, especially herbicide-resistant kochia. He wanted to reduce the need for herbicides that persist in the soil and retain as much surface residue as possible.

## Motivation

The producer asked: “If I were growing my own food, would this be the way I would do it?” He believes this landscape was never meant for annual cropping. In that case, what would be an “appropriate” level of disturbance in an essentially unnatural agricultural system? Can we compare the disturbance from chemicals and tillage, and balance them?

## Region & Context

The case study took place on a dryland farm in 2025 in the semi-arid High Plains of CO at an elevation of 5150 ft during a relatively wet season. The soils are predominantly sandy loam, and the field was in chem-fallow prior to the experiment. Annual precipitation 15.5 in, annual potential evapotranspiration 55 in.

**“Could I eliminate paraquat using physical disturbance, and does that harm my fungi? Is the trade-off worth it?”**

## Equipment

The CurseBuster. A primary tillage tool that combines rotating tines with rotary harrows. The machine can be configured in multiple ways to suit different purposes. Here, it was configured to manage weeds while causing minimal soil disturbance.



Above: Rotary harrows of the CurseBuster.

Below: 3 weeks after tillage in tilled and no-tilled strips.

## Timeline

- 2024 ● Last amendments or fertilizers applied
- 2025 ● Delivery of Curse Buster
- May ● Field sprayed with broad-spectrum burn down mix (atrazine, metolachlor, 2,4-D, fluroxypyr, glyphosate, mesotrione). This mixture has worked well in the past, but not for kochia.
- June ● Cursebuster tilled a single strip in the field
- Aug ● Paraquat applied to entire field
- Sept ● Overwinter grazing mix (Danko rye, triticale, hairy vetch, sweet clover, Austrian peas, turnips, radish, and rapeseed) planted.



# Results

(1) Tillage altered the weed composition: it eliminated nearly all Russian thistle, but kochia appeared to be almost stimulated by the disturbance. Maybe tilling earlier would have been more effective, when the kochia was 2-3" tall.

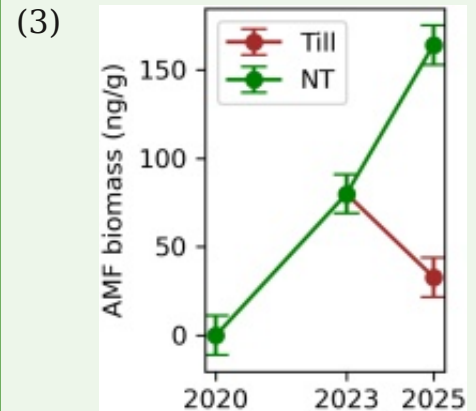
(2) This 'vertical' tillage unexpectedly buried a significant amount of residue. The producer suspects that he didn't configure the machine ideally for both weed control and residue preservation.

(3) Arbuscular mycorrhizal fungi (AMF) biomass was 80% lower on the tilled section compared with the no-till section, suggesting that vertical tillage may not be as benign as expected. There wasn't a significant difference on other soil health measures after the single tillage pass.

(4) Tillage had no noticeable effect on infiltration rates.

(5) No noticeable difference in the subsequent cover crop emergence.

**Arbuscular mycorrhizal fungi, AMF:** these fungi form symbiotic relationships with plants, helping access nutrients and water. They are sensitive to tillage and chemicals, especially fungicides



Arbuscular mycorrhizal fungal biomass (ng/g) from PLFA in this field from 2020, 2023, and 2025 in tilled and NT strips. Error bars show the approximate variability in this region



## Costs

CurseBuster. \$6-15/ac

Avoided spray costs. \$19/ac for paraquat if this machine controlled all the weeds. However this was not the outcome in this experiment, and paraquat had to be applied in addition to tillage, which was the opposite of the initial goal.

## Recommendations

The producer recommends to start small! The CurseBuster is a complex machine, and the tines and harrows operate independently. There are many possible setups, and different objectives require different configurations. He would recommend sharing the machine so people can learn from each other, share experiences, and apply the machine in diverse scenarios. It might be helpful if Extension or NRCS are available to help document the outcomes.

***"When you take part in a paradigm shift and think you're thinking outside the box, always ask yourself: are you just moving into another box?"***