

Combining Cover Crops, Strip Tillage and Biodegradable Mulches in Carrot Production

Jesse Puka-Beals, Department of Plant Sciences, North Dakota State University
Greta Gramig, Department of Plant Sciences, North Dakota State University

NDSU PLANT SCIENCES



Figure 1. Hydromulch application at Absaraka ND on June 19, 2018.

SIGNIFICANCE

- Cover crops provide numerous benefits to organic vegetable growers but often displace crop production.
- Strip tilling into cover crops may allow for simultaneous crop and cover crop production, but how do we suppress weeds in the strip till zone (STZ)?
- Mulches made from waste materials like newspaper and animal manure may provide a biodegradable alternative to plastic mulch.

METHODS

Cover crop treatments

- red clover (RC)
- white clover (WC)
- perennial ryegrass (PR)
- weed-free check (WF)
- weedy check (WK)

Mulch treatments

- compost blanket (CB)
 - Mixture of composted cow manure and hemp hurd at a 2:1 kg ratio
- hydromulch (HM)
 - Shredded newspaper and water at 1 kg 35 L⁻¹
- no mulch (NO)



Figure 2. Direct seeding carrots into a compost blanket treatment at Fargo ND, June 27, 2018.

RESPONSE VARIABLES OF INTEREST

- Carrot emergence
- Carrot yield
- Weed count and biomass

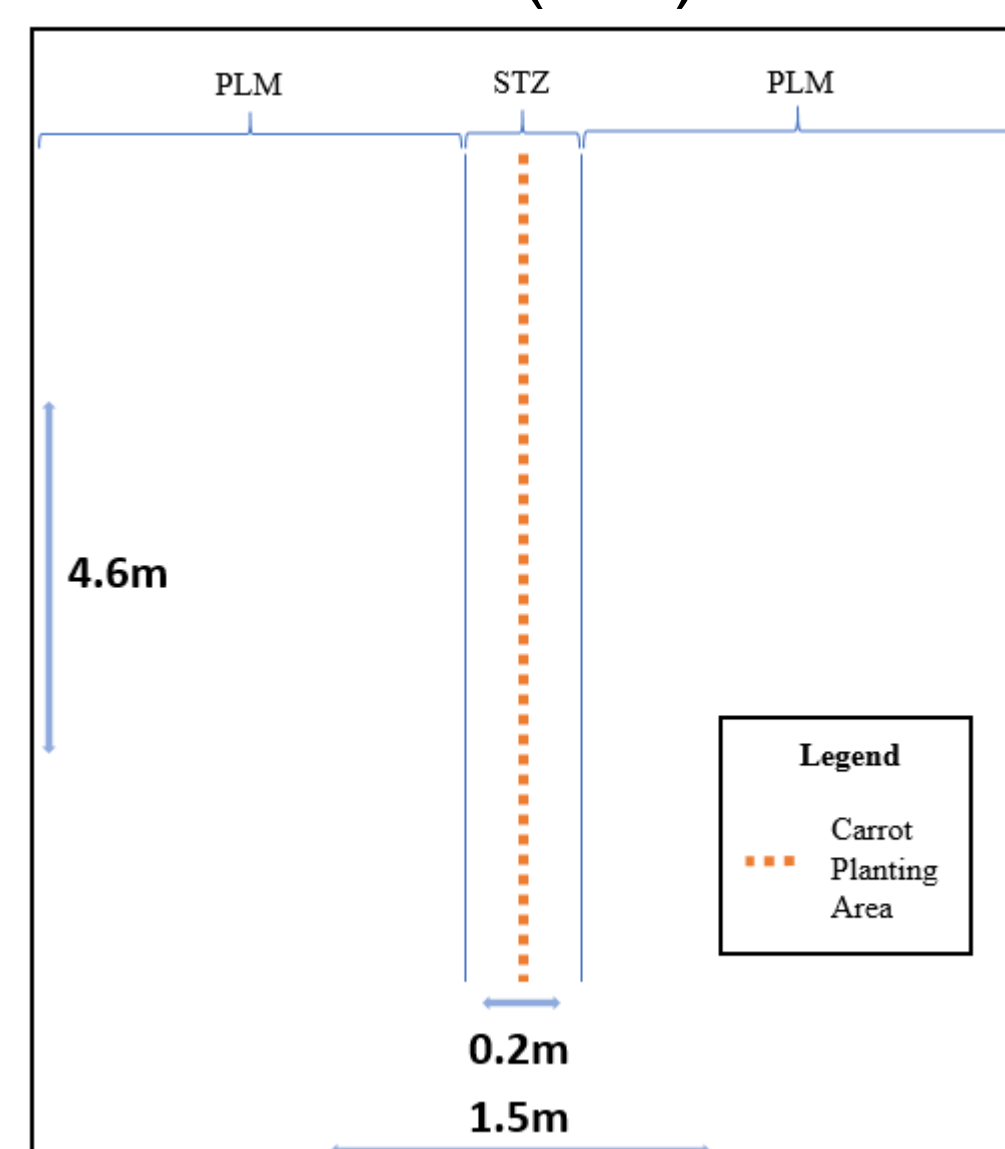


Figure 3. Experimental unit dimensions.



Figure 4. The 5x3 Randomized Complete Block Design at the Absaraka ND research site.

EMERGENCE

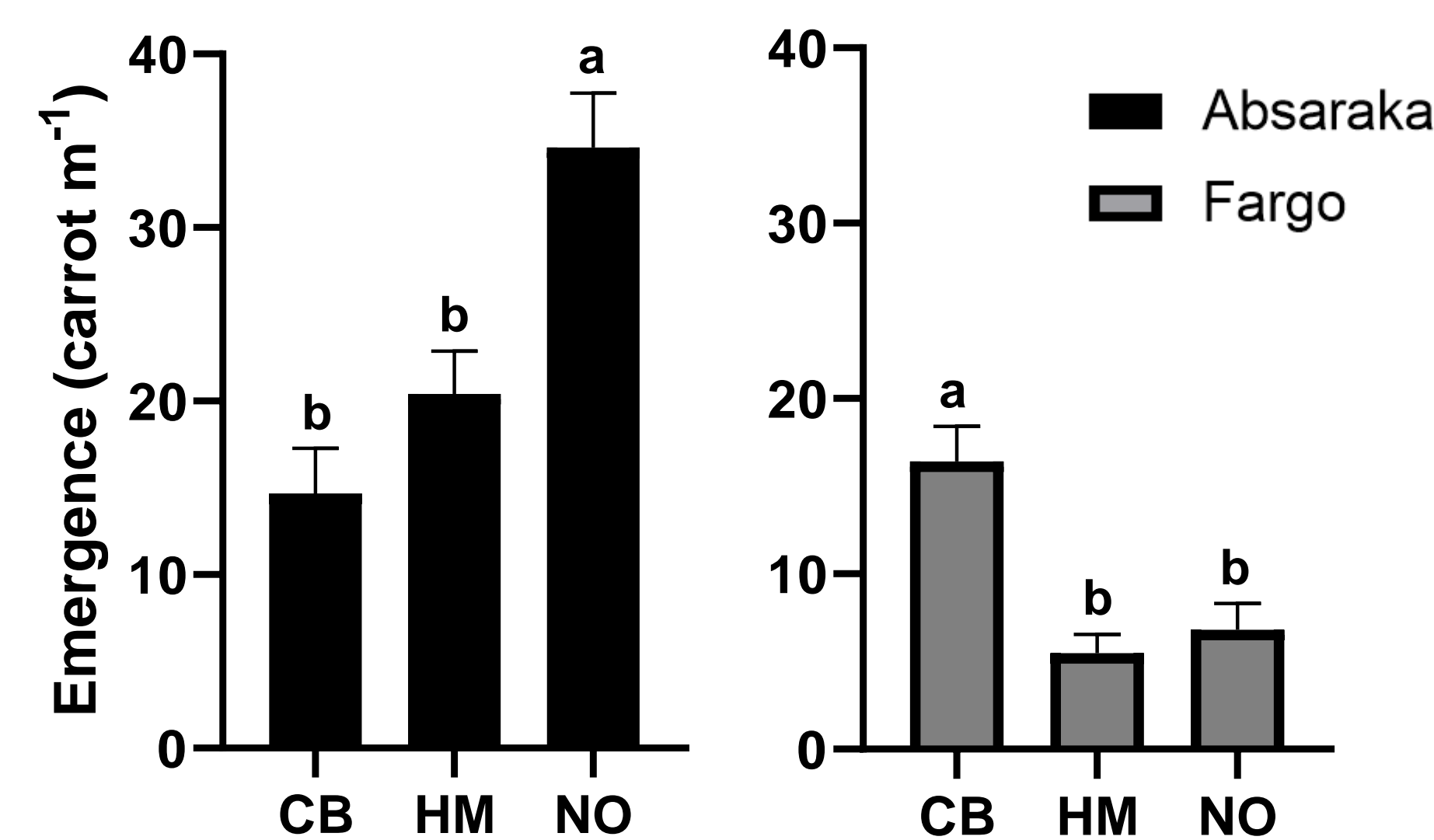


Figure 5. Emergence mean (\pm S.E.) for carrots compared among mulch treatments. Different lowercase letters denote mean separation according to Tukey's HSD ($\alpha = 0.05$).



Figure 6. Carrots emerge on June 26th, 7 days after planting in Absaraka ND.

YIELD

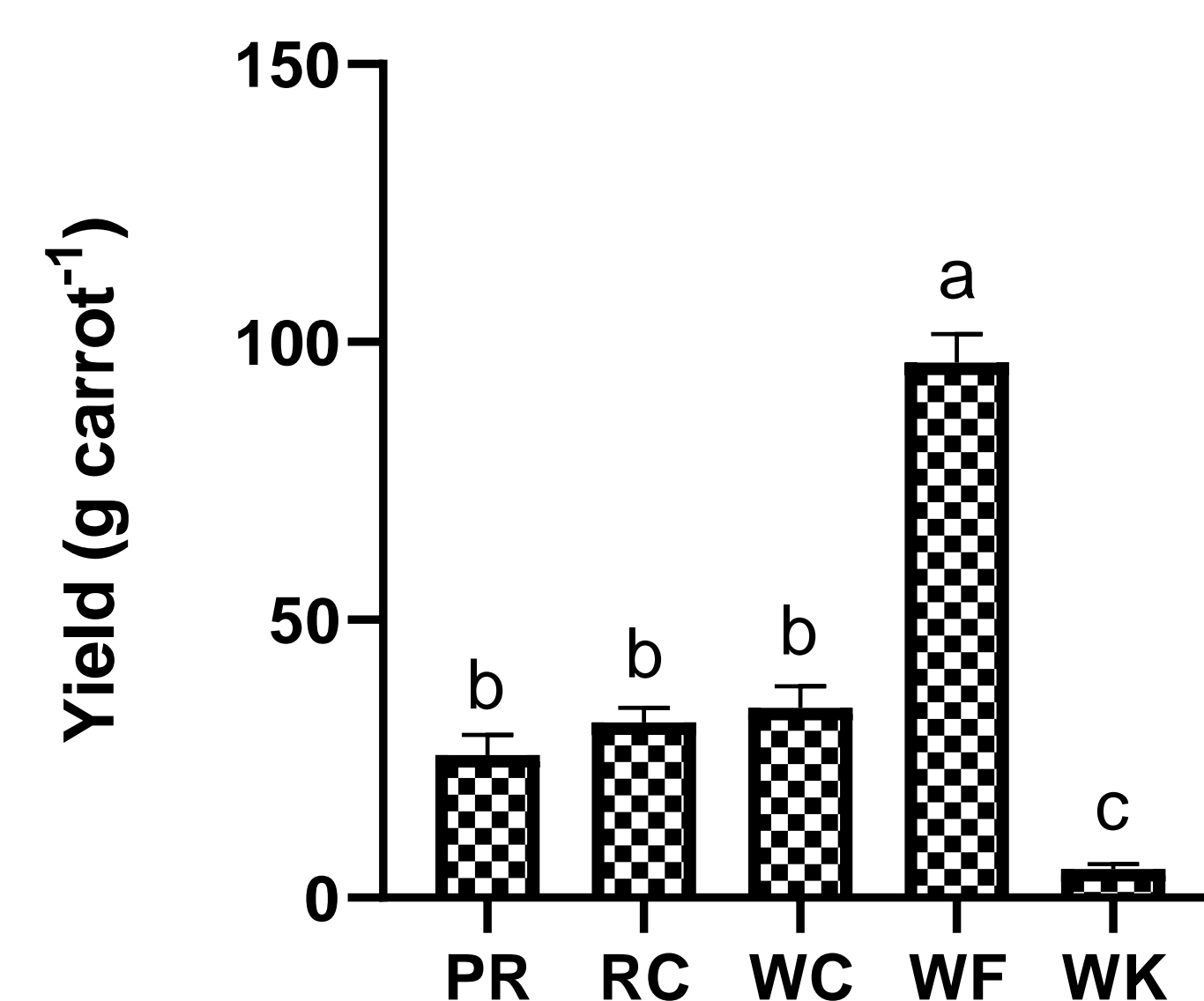


Figure 7. Average carrot weight (\pm S.E.) within different cover crop treatments. Sites were combined. Different lowercase letters denote mean separation according to Tukey's HSD ($\alpha = 0.05$).

WEED SUPPRESSION

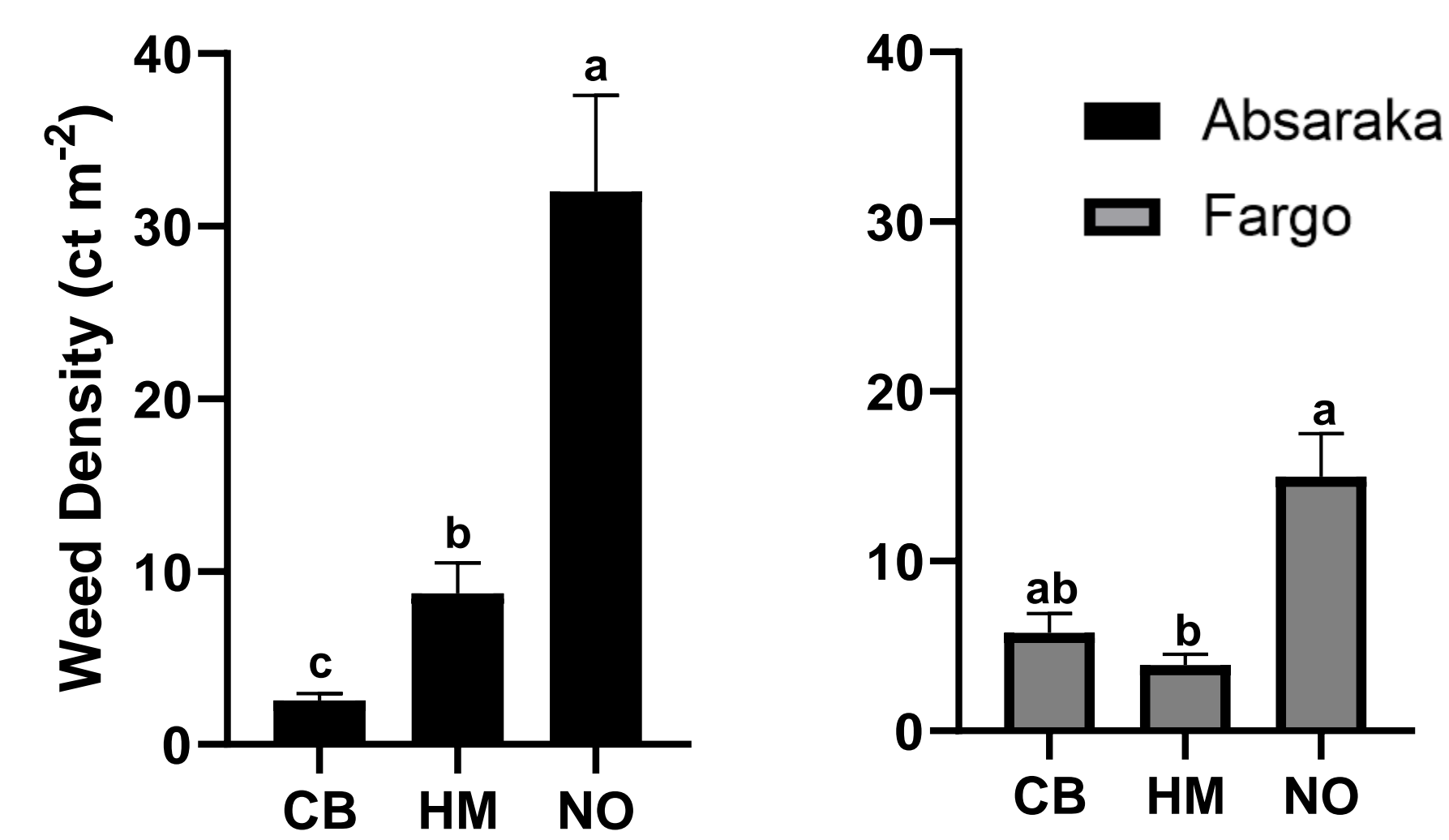


Figure 8. Weed count mean in STZ compared among mulch treatments. Different lowercase letters denote mean separation according to Tukey's HSD with a Bonferroni correction at ($\alpha = 0.0167$).

RESULTS

Emergence

- Both mulches were associated with different rates of carrot emergence that varied by site.
- Improved emergence of 141% was observed in compost blanket compared to no mulch in Fargo.

Yield

- Carrot yield was 59% to 98% lower when a cover crop was present.

Weed Suppression

- Weed count and biomass were lower in strip till zones with hydromulch and compost blanket.



Figure 9. Carrots emerge on August 30th, 2018 in Fargo ND.

DISCUSSION

- Proof of concept for hydromulch and compost blanket.
- Cover crops require management to limit competition with carrot.

FUTURE RESEARCH



Figure 10. Post emergence hydromulch application on common beans (*Pisum sativum*) in Fargo ND.

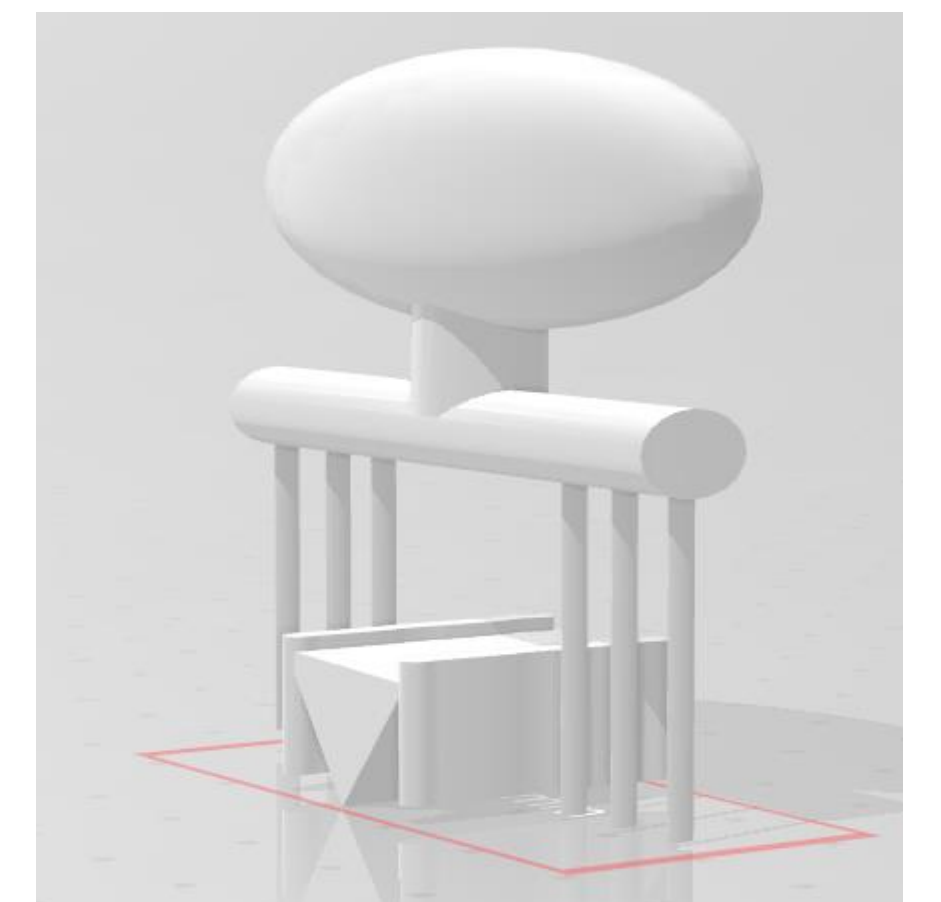


Figure 11. TinkerCAD model of integrated hydromulch and seeding equipment.

This research was supported by the USDA-Hatch Project # ND01583, North Dakota Specialty Crop Block Grant # 17-372.