PLASTIC MULCH HOLE BURNING AND CUTTING FOR STRAWBERRY PLANTING

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Introduction

Creating wide holes in plastic mulch on strawberry beds in preparation for planting helps with preventing plants from growing under the plastic and increases the amount of water and sunlight available. Currently, this process is performed by hand, either using a knife to cut open the plastic mulch or burning it with a handheld burner, which makes it a labor-intensive operation in strawberry production. To assist growers in reducing the effect of labor shortages, two new mechanical hole-cutting systems have been developed. The first device was developed as a new implement to automate the hole-burning process. The second device was designed to be retrofitted on conventional hole punchers, which would make perpendicular cuts on the plastic mulch.

Mechanical Hole Burner

- Designed for the Watsonville/Salinas Regions.
- Current practices use hand crews to burn 3-inch circles in the plastic.
- Ground driven wheels turn the burning assembly and create holes at the desired plant spacing.
- New design iterations:
    - Hydraulic side-shift for centering machine on hilly terrain
    - Independent burning assemblies for increased performance
- Requires only 1 operator
- Delivers burned holes that are consistent in size and spacing.

Figure 1: A worker hand burning holes in Watsonville

Figure 2: Version 1 of the Mechanical Hole Burner being tested in Watsonville

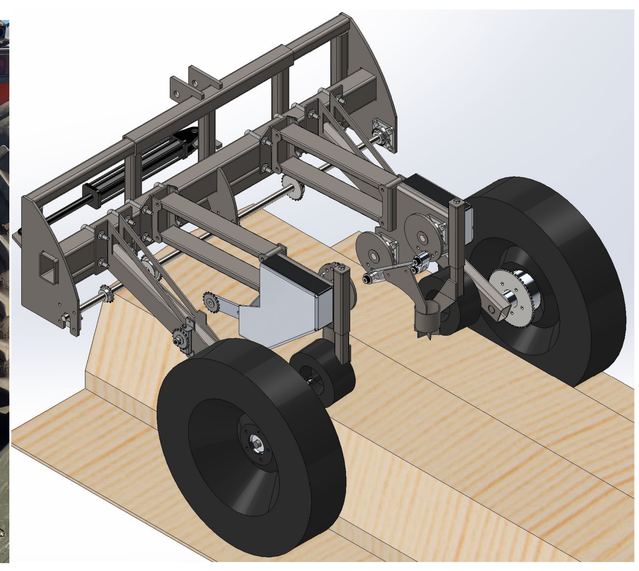

Figure 3: Version 2 of the Mechanical Hole Burner to be built in 2023

Results and Discussion

- Version one of the Mechanical Hole Burner successfully burned 35 acres
- Safely operated at 5 MPH in sandy soil conditions
- In heavier soil conditions, speed was reduced, yet still accomplished burning 1.5 to 2 acres/hour
- Propane torches worked well at high speeds and when plastic was wet
- Accommodates a wide variety of bed heights and plant spacings typically used by growers
- Conservatively 10 times faster than current practices
- Reduces safety concerns and labor requirements

Figure 4: The burned hole created by the Mechanical Hole Burner

Conclusion

Overall, version one of the Mechanical Hole Burner surpassed our expectations of what can be achieved with a purely mechanical burning system. Version two will be tested later this year and will address additional needs put forth by the growers. This machine will allow the growers to perform their hole-burning operation safely with only one operator and allow the redistribution of employees to other tasks.

Cross Hole Impact Puncher

- Designed for the Santa Maria and Oxnard regions.
- Current practices use a spike wheel to create long, narrow slits at the proper plant spacing followed by hand crews cutting perpendicular slits.
- Cross Hole Impact Puncher is an attachment that mounts to grower's existing hole puncher.
- Consists of a link arm frame mounted to the axle of the spike wheel.
- Support wheels maintain a fixed ride height on the bed, to deliver consistent cuts.
- Compared to other cross-hole punchers, this design eliminates hole collapse and soil accumulation on the spikes.

Figure 5: The Cross Hole Impact Puncher mounted on a hole puncher in Santa Maria

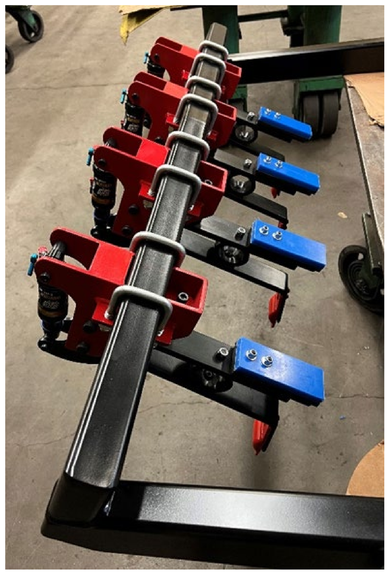

Figure 6: Detailed view of the punching mechanism

Results and Discussion

- The Impact Puncher achieved 97% successful cuts at a speed of 3 MPH
- More data required to understand the effect soil types have on the percentage of successful cuts.
- In sandy loam soil types, the beds are uniform and smooth, resulting in higher percentage of cuts.
- Relatively inexpensive option that requires minor modification to grower's current hole punchers.

Figure 7: The widened cut in the plastic created by the impact puncher

Conclusion

This attachment concept has shown promising results, which allows us to continue in the right direction with the research and development required to create a product that reduces replanting rates, labor, ands costs.