Mechanical Bareroot Transplanter

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According to the 2026 acreage report conducted by the CSC, California has 43,726 acres of strawberries planted. Assuming that it costs ~$1,000 per acre to plant strawberries (UC ANR 2024), the total labor cost associated with planting is $43 million. This project first timed each subtask required in a manual planting operation to achieve a 5% replant threshold. It was found that 36% of the time associated with planting was spent on repetitive, non-precision tasks such as waiting on boxes, walking to get more plants from boxes, and separating bareroot transplants from each other. This data was collected across 5 days of planting with laborers being paid piece rate. Second, we experimented with various designs and materials (Figs. 1, 2, and 3) to develop a material handling system that can retain the benefits of a transplant plug without increasing the cost of a traditional bareroot transplant. Lastly, we analyzed and reengineered current mechanical planters outside of the strawberry industry (Fig. 4) to design one that would work for our industry (Fig. 5). A mechanical transplanter system could reduce replanting rate and j-rooting by increasing plant depth consistency. Furthermore, it provides a platform to introduce treatments (e.g., fungicidal dips) to each bareroot transplant.



Figure 1. Prototype 1 of a bareroot wrapping mechanism. The tension in the PVA material while wrapping was found to be desirable, however, the loading mechanism was too slow.

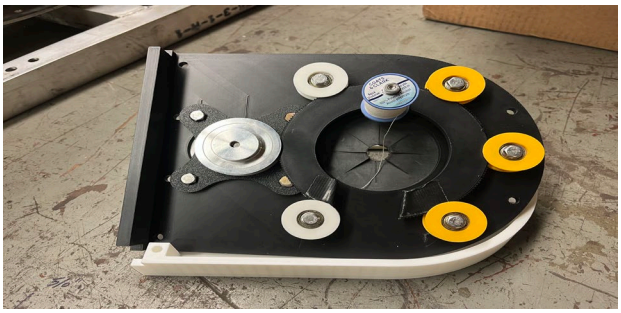


Figure 2. Prototype 2 of a bareroot wrapping mechanism. This design included both loading and manufacturability improvements, however, it lowered the tension consistency as the PVA material was wrapped around bareroots.



Figure 3. Commercial field testing of a custom PVA/glycerol material. This material retains all beneficial qualities of commercially produced PVA thread, while allowing flexibility and control of components and material characteristics.



Figure 4. A modified sweet potato transplanter that was used to test planting concepts such as conveyance methods, material handling, and a plant insertion systems.

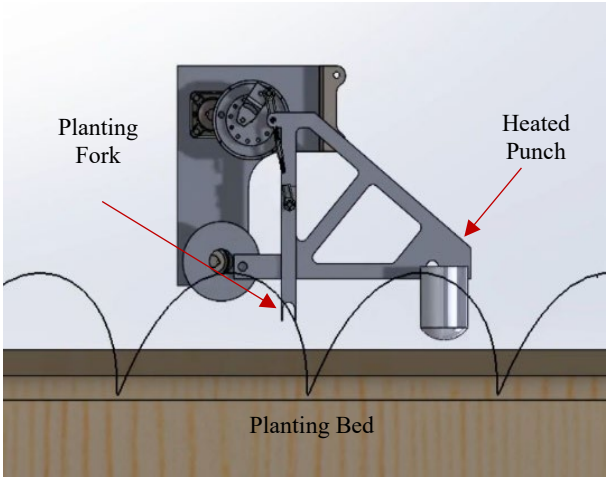


Figure 5. A model of the current development of a California strawberry-specific bareroot transplant planting implement. The idea is to punch holes in the mulch ahead of a planting fork that is attached to the same timing and driving mechanism as the heated punch. The fork will pick up individual plants and insert them into the next punched hole while the tractor is in motion.