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Problem statement & Background:

To redesign and eliminate existing problems on a previous capstone project, in which students developed a mobile platform to assist a farmer in planting garlic. The existing propulsive system was moving the unit much too fast to be of use to the farmer. Although the cart was functional, it did not meet finished performance specifications

Cart Before Revision:



Figure 1: Garlic cart before revisions



Figure 2: Mr. Perkins and his father working with the garlic cart in the field before revisions

Suggested Improvements

1. Complete removal of the engine and hydrostatic assembly.
2. Install various tow points on cart frame.
3. Redesign wheel mounts to be stronger and install larger front tires.
4. Modify existing frame to have adjustable 24" of ground clearance.
5. Replace tray mounts with removable boxes.
6. Replace existing canopy with one that is rigid.
7. Make existing head rest adjustable to accommodate different sized operators.
8. Add additional storage space above the operator

Constraints

1. Chassis must be strong enough to support the operator and equipment over uneven ground
2. Cart must be light enough to be pulled by rototiller or winch.
3. Operator should be able to easily reach the ground at the lowest height.
4. Straight axles cannot be used due to the adjustable height requirement

Alternative Solutions

- 3 point hitch mounts - A 3 point hitch mount would allow the cart to be mated to a tractor. This would make for precise height and speed control.
- Onboard winch – a which could be mounted on the cart, allowing the cart operator to control cart speed.

Key Component: Telescoping Tubing

The key components of the height adjustability system are the individual wheel mounts. Each wheel mount can extend to give the cart up to 24" of ground clearance. Telescoping steel tubing was used to build the mounts because of its strength. Tubing with holes pre-drilled in 1" increments was chosen to allow for precise height adjustment.

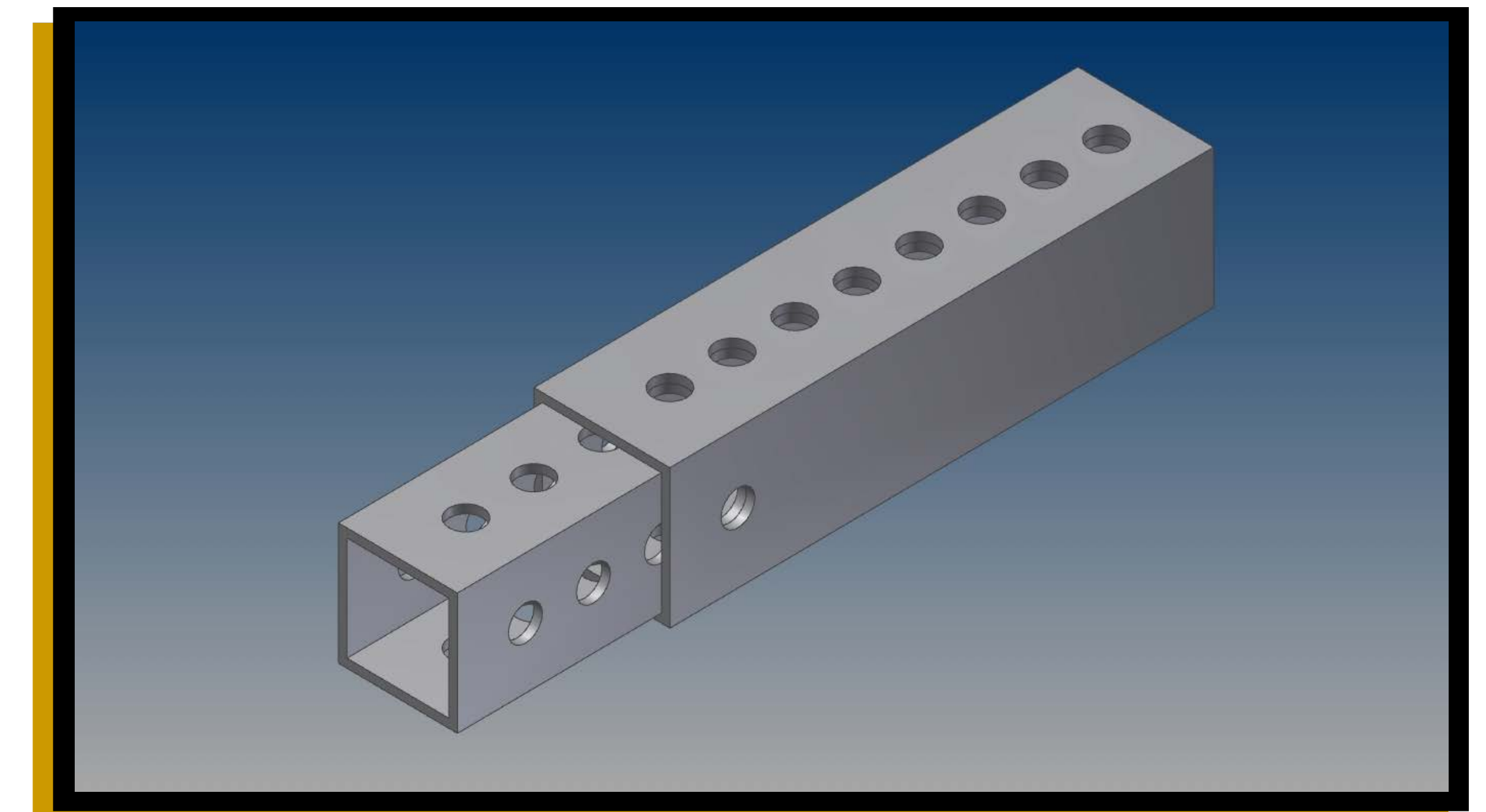


Figure 3: Telescoping steel tubes used

Global Impacts & Sustainability

This cart was designed with the small time farmer in mind. It's design is simple and rugged. It can be easily repaired or modified to meet operator needs. It is also light enough to be pulled by a wide variety of equipment. These attributes make this cart ideal for small farming operations around the world. The cart is also compatible with sustainable agriculture practices due to its simplicity, low energy demand, and small environmental footprint.

Conclusion

The garlic cart is now fully functioning as a towable implement. It now has a heavy duty and height adjustable chassis. The tires, canopy, garlic totes, and towing points have also been upgraded. The figures below show the cart in its completed state.

Budget:

- Two 13x5 flat free tires.....\$80.00
- 20" of Telescoping tubing...\$200.00
- 20" of 1" square tubing.....\$75.00
- Mounting points/materials....\$40.00
- Five 2x4x8 boards.....\$25.00
- Paint.....\$20.00
- Brackets and bolts.....\$30.00
- Hitch pins.....\$20.00
- Two garlic totes.....\$20.00
- Transportation and fuel.....\$175.00
- **TOTAL.....\$685.00**



Figure 4: Garlic cart after revisions (low height setting) 6" ground clearance



Figure 4: Garlic cart after revisions (high height setting) 24" ground clearance