

# What tools are in your AgrAbility truck?

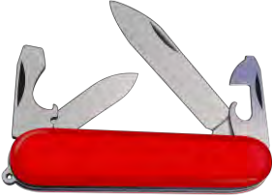


Kyle Haney



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# Site Visit "Go Bag"



# Common Items For Your Vehicle





# Common Items For Your Vehicle

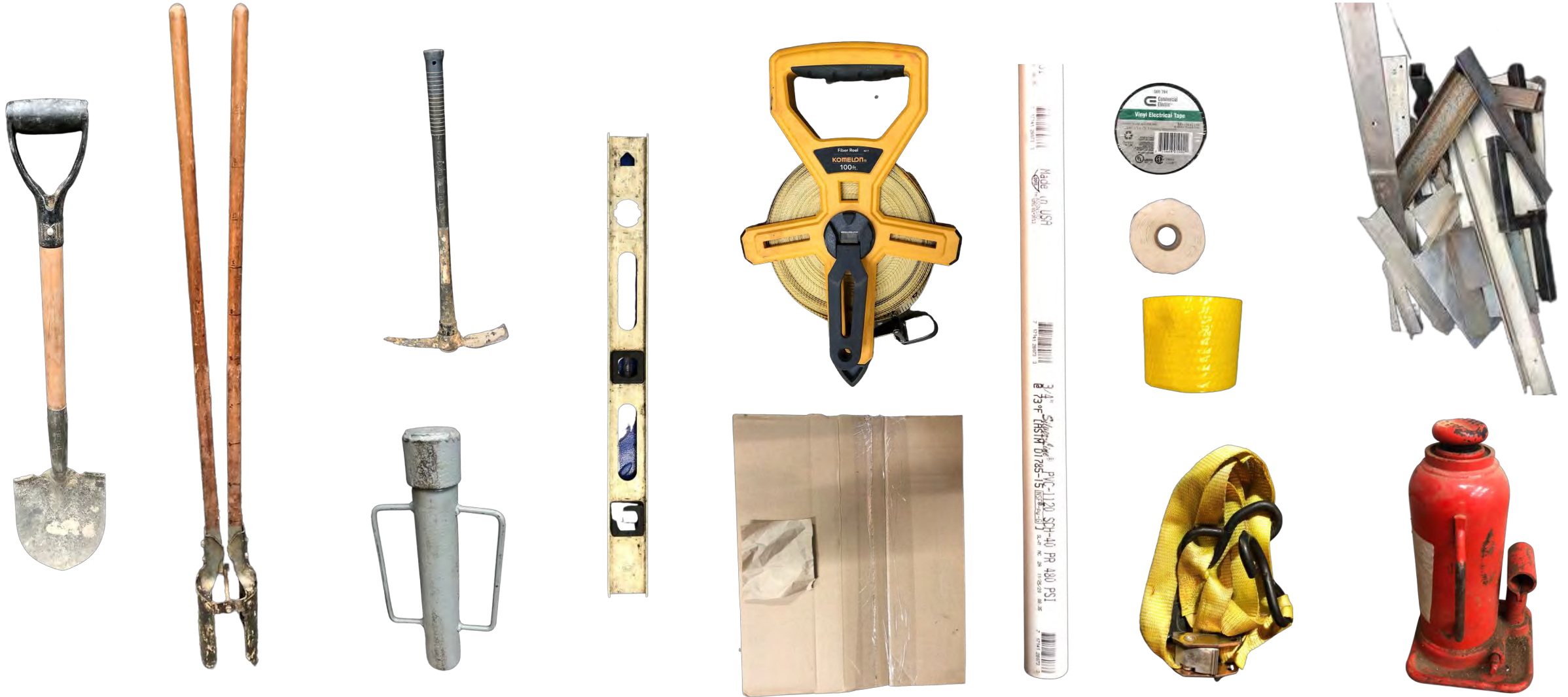


# Common Items For Your Vehicle





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# Common Items For Your Vehicle





# Common Items For Your Vehicle





# Unique Items In Our Vehicles



# Unique Items In Our Vehicles





# Unique Items In Our Vehicles



# Unique Items In Our Vehicles





# Unique Items In Our Vehicles: Use my recommendations





# Unique Items In Our Vehicles: Use my recommendations





# Unique Items In Our Vehicles



# How To Fund Tools

- Donations
  - Companies
  - Private Individuals – word of mouth or advertise in the classifieds of a local paper
- Charging for Installations
- Fundraisers
  - Sell food items
  - Go Fund Me
  - Golf Tournament
  - ETC...
- Federal Surplus
- State Surplus
- University Surplus
- Salary Savings





# How To Fund Tools: farmer to farmer





# How To Fund Tools: farmer to farmer






# How To Fund Tools: Garage sales, Craigslist, Auctions






# How To Fund Tools: Capstone projects



## Design of a Remote Control Gate Opener

Team #1  
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### PROBLEM STATEMENT

- We were contracted by AgrAbility to develop a low-cost farm gate-opener that would improve mobility of disabled farmers
- It needed to be easily manufacturable, if possible using a commercial garage door opener.
- It needed to be highly versatile with the capability of opening/closing gates from 50-200 lbs and 10-16 ft and with minimal structural modifications to the gate.

### BENCHMARKING AND SOLUTION ANALYSIS

- Commercial Benchmark: Mighty Mule 360
  - Lift capacity: 150 lbs
  - Maximum gate length: 16 ft
  - Cost: \$329.00
- Mounted Opener System:
  - Lift capacity: 400 lbs
  - Maximum gate length: 16 ft
  - Cost: \$200-250
- Optional improvements:
  - \$50-100 for a stronger garage door system would increase capacity
  - Added cost brings smartphone-connected functionality

### SUSTAINABILITY

- Materials
  - Minimal materials were required, minimizing environmental impact
  - The main material is easily recyclable steel
  - A small section of the gate is a recyclable plastic tote housing
- Environmental Impacts
  - Preventing the free-roam of livestock around open waterways reduces the likelihood of pollution
- Impact on Public Safety
  - Securing livestock in pens reduces the possibility of harm to people and property in residential areas

### PROPOSED ALTERNATIVES

**Concept 1: Linear Actuator**

- Based on converting a garage door opener into a linear actuator
- Advantages:
  - Completely enclosed and safe
  - Low profile and durable
- Disadvantages:
  - Complex and challenging fabrication

**Concepts 2 and 3: Ball-screw system**

- Both are variants on a ball-screw opener
- Advantages:
  - Easy installation
- Disadvantages:
  - Screw can be easily damaged causing critical failure
  - Icing issues in winter


**Concept 4: Linkage system**

- Based on the core system used with handicap-accessible doors
- Advantages:
  - Easy installation with few components
  - Bar system adds flexibility and versatility
- Disadvantages:
  - Bar system is exposed
  - Only works in one direction

**Concept 5: Mounted Opener System**

- Based on the geometric equations of triangles
- Advantages:
  - Easy installation without modifications to the gate
  - Little to no fabrication required
- Disadvantages:
  - Potential damage by ice and animals

### PHYSICAL ANALYSIS AND VALIDATION



### INSTALLATION

- Phase 1
  - Pre-drill hole to insert post at appropriate location.
  - Place post in hole, secure post such that it does not rotate, sink, or bend.
  - Fill hole with cement.
- Phase 2
  - Assemble motor and track before attaching to gate.
  - Attach motor/track to gate using U-Bolts.
  - Attach Arm to post and to cart.
  - Seal all hardware using adhesive.
- Phase 3
  - Attach PVC to rail to protect from snow and ice.
  - Perform validation to ensure track moves freely and gate opens up fully

### COST ANALYSIS

**Benchmark & Final Breakdown**

- Benchmark: \$400, cost of Mighty Mule 360 Gate Opener
- Cost Goal: \$250 or less as set by sponsor

**Final cost: ~\$218.00 depending on site-specific requirements:**

- Garage Door Opener: \$131.00
- Wooden Post: \$10.00
- Connecting Rod: \$23.00
- Plastic Tote Shielding: \$8.00
- PVC Pipe Shielding: \$10.00
- Miscellaneous Hardware: ~\$36.00

### ACKNOWLEDGEMENTS

- Dr. Ron Averill, Academic Advisor
- Ned Stoller, Industrial Advisor from AgrAbility
- Caleb Brown, Customer
- AgrAbility

### Decision Matrix

Design	Cost	Installation & Manufacturability	Availability	Maintenance	Safety	Overall
Linear Actuator	3	2	4	2	1	12
Ball-Screw Opener	3	3	3	2	2	13
Linkage System	2.5	3	4	2	1	12.5
Mounted Opener	2.5	1	2	2	1	8.5





What do you have in your  
AgrAbility vehicle?



# THANKS!

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