

### 3-wheeled Bicycle E-tractor

Sponsors: VentureWell and Invent Idaho

Sponsor Contacts: **Dr. Matthew Swenson** and **George Tanner**

#### Background:

Dr. Swenson has initiated a collaboration with the statewide pre-collegiate Invent Idaho competition. Part of this initiative is to take participant invention ideas and convert them into Undergraduate capstone design projects.

One of the invention ideas from this year's Invent Idaho competition involves a bicycle mounted implement for sweeping sidewalks and was conceived and designed by a 1<sup>st</sup> grader (Branson Howard). This young inventor presented his invention at the 2022 EXPO and continues to inspire with his creativity and articulate explanation of his designs and vision.

#### Objective:

The objective of this project is to design and build a small, lightweight e-tractor that is based on a commercial e-bicycle chassis and electrical system. The "tractor" would potentially be able to accommodate multiple (non-ground engaging) implements including Branson's sweeper, a lawnmower deck, a sprayer, or a golf bag to make it a single-rider golf cart.

#### Project Vision:

The idea is to start with a commercial e-bicycle chassis such as the one shown in Fig. 1. Then, modify the front end to accommodate two wheels that are ~24 inches apart. This will likely require sourcing an additional fork, wheel, and tire and fabrication of framework to enable the operator to steer with the handlebars. Ideally, the operator could also lean side-to-side for operation on uneven terrain.



Figure 1. Example bicycle chassis that could work for this project.

This three-wheel configuration of the bicycle will then allow the attachment of implements. For powering of the implements, it is possible to source an additional e-bike conversion kit to acquire another motor, battery, and control system to facilitate operation, or they could be sourced separately.

Some options include:

- 1) Addition of a lawn mower deck in the front in between the two front tires. This would require a power system with a likely gear or belt reduction to achieve the correct speeds, as well as safety features.
- 2) Addition of a lawn sprayer (likely mounted to the back of the e-Tractor) with a tank, a small boom with spray nozzles, and a small pump. The sprayer will need a control system to coordinate spray volume with the tractor groundspeed.
- 3) Mounting for a golf bag.

Example configurations:

Sprayer



Golf cart



The budget for the project will be ~\$2500 for prototyping purposes. More money can be available if the project can justify it. Pitch us a good idea!