

TricTrac: prototype manufacturing steps

The first TricTrac (tricycle tractor) prototype was designed as the driving unit for a pedal-powered rice transplanting machine for women. The rice transplanting trailer hasn't been successfully tested yet. This document presents the main manufacturing steps of the TricTrac as build in November 2016 at Amrita University, India, by a local manufacturer.



Bicycle preparation



For this prototype, a second hand ladies' bicycle was used. Wheels, gear set, brakes and accessories were removed. Wheel hubs, sprockets and crank set were kept aside.

Back wheels system

Back and front wheels



Back and front wheels were made by bending and soldering steel sheets (1" wide for back wheels). Spikes were cut out of a 90° extrusion, opened up and welded to the wheel. The front rim is connected to a standard bicycle wheel hub. The back wheels have a pipe (1" inside) as a hub.

Sprockets



Front and back sprockets were reversed for easy pedalling as high speed is not required for envisioned agricultural applications. The front chain ring was welded on a back sprocket and freewheel attached to the back axle. The back sprocket was welded in the front to the crank set. A test was also made with a 10/50 gear set bought on the market which further reduced the speed and required operation force. The alignment (both vertical and horizontal) caused friction and derailing issues.

Gear ratio	User input RPM	RPM back wheels	Speed in kph
22/26	80	65	3.1
18/40	80	36	1.7
10/50	80	16	0.8

Axle



The main axle is a 1" rod with threaded ends. The wheels are resting on the threading and bolted tight. On smooth ground and while driving straight, the wheels are both driving. When taking curves, the inside wheel slips on the axle, enabling sharp turns. This may cause problem on highly uneven ground where both wheels may slip.

Bearings



The bicycle frame is connected to the back wheels axle by 1" bearings welded to the frame with an intermediate piece allowing easier removal. One part of the bearing "sandwich" contained the bearing itself and was attached to the axle. The opposite part of the sandwich was shaped as an open "C", welded to the bicycle frame and to be fitted around the bearing and bolted in place.

This design is put the weight of the TricTrac and its user solely on the bolts holding the bearing sandwich, which in turn got distorted. A better solution should be provided for next prototype so that the weight is resting on the bearings and not on the bolts.

TricTrac assembly

Front wheel has standard bicycle hub so is easy to bolt in place in the fork.

Back wheels are bolted on the 1" axle, on which bearing and sprockets have been attached. The back wheels + axle are attached to the bicycle frame with the "bearing sandwich".

An extra sprocket on the back wheel's axle enables rotation to be transmitted to a mechanised trailer.