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**RA2** **Vehicles & Vessels - Design, Development and Production**

**Key Characteristics:** Rear Loading Design, stable and simple bamboo frame • 150 Kg Cargo Capacity, suitable to carry agriculture products • Rear Differential, better movement in small area • Hemp-Resin Composite, strong, tough and lightweight joint • 7-Speed Gearing, comfortable and versatile cruising • Sustainable & Green, Less Carbon footprint than a traditional •

# Bamboo Cargo Bike

**The transportation of agricultural crops is a significant issue in developing countries, as agriculture represents the majority of employment, and limited access to well-maintained roads makes it more difficult for farmers.**

In the targeted country, Ethiopia, 80% of employment is due to agriculture and 75% of farms are not accessible by road. This country also has abundant resources of bamboo and utilising this resource would bring benefits to the socio-economic and ecological development of the country. It was determined that a cargo bike made of bamboo was a viable solution. The objective is to design and build a bamboo cargo bike with maximum durability, a functionality to match the local needs, a simple design, an affordable price with minimum impact on the environment.

To achieve these requirements, a design process to ensure a cargo capacity of 150 kg and 0.35 cubic metre, whilst being able to withstand the targeted rough terrain has been conducted, along with joint testing and Finite Element Method (FEM).

An orthotropic elastic model and hoop stress analysis were used in design iterations to achieve a five-year lifespan with a safety factor of 2 of failure hoop stress.

Compression and shear tests were performed to compare different types of joints, leading to a conclusion of vacuum infused joints with four layers of wraps to be the strongest (peak loads of 40 kN under shear) and provided more stiffness and less variability than other types •