



Portable Drip Irrigation Cart

by Irroro

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PROBLEM

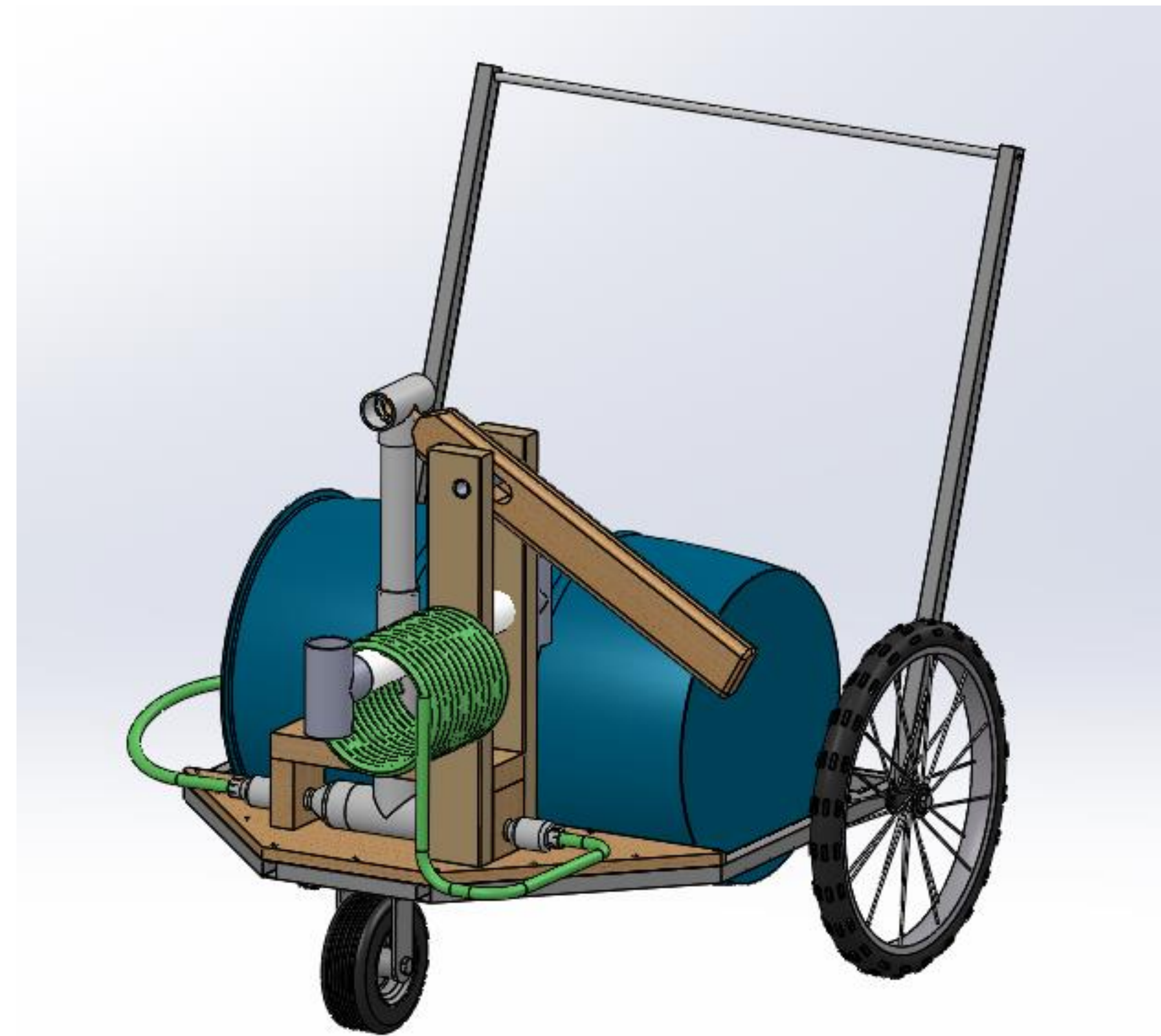
Problem: Food security is a major issue in developing countries around the world. Irrigation can double crop yields, but current systems are very **expensive** and **require resources and infrastructure** that are often unavailable. Additionally, many current systems **use water inefficiently**.

Goal: To help **small family-owned farms** in **Senegal** increase **crop yields** and **improve food security** in a manner that will be easily integrated into their existing practices by creating a **portable irrigation tool**.

Target customer: Senegalese groundnut farmers with less than 0.2 hectare of farm land and limited access to tap water or electricity.



SOLUTION



- Welded steel frame chassis
- Independent wheel axles for easier turning
- Hand operated PVC pump
- 30 gallon barrel
- 100 foot drip irrigation hose

TESTING



Maneuverability Test	Result
Turn radius	0 ft
Travel 0.5 miles at a leisurely pace (full barrel)	10 min
Height of obstacle cleared	3 in
Clearance (barrel – ground)	6 in
Pump Flow Test	Result
Flow rate	2.83 gal/min
Force Requirement Test	Result
Force to pump	15 lbs
Initial force (grass)	45 lbs
Force to maintain rolling (grass)	15 lbs
Initial force (pavement)	15 lbs
Force to maintain rolling (pavement)	7 lbs

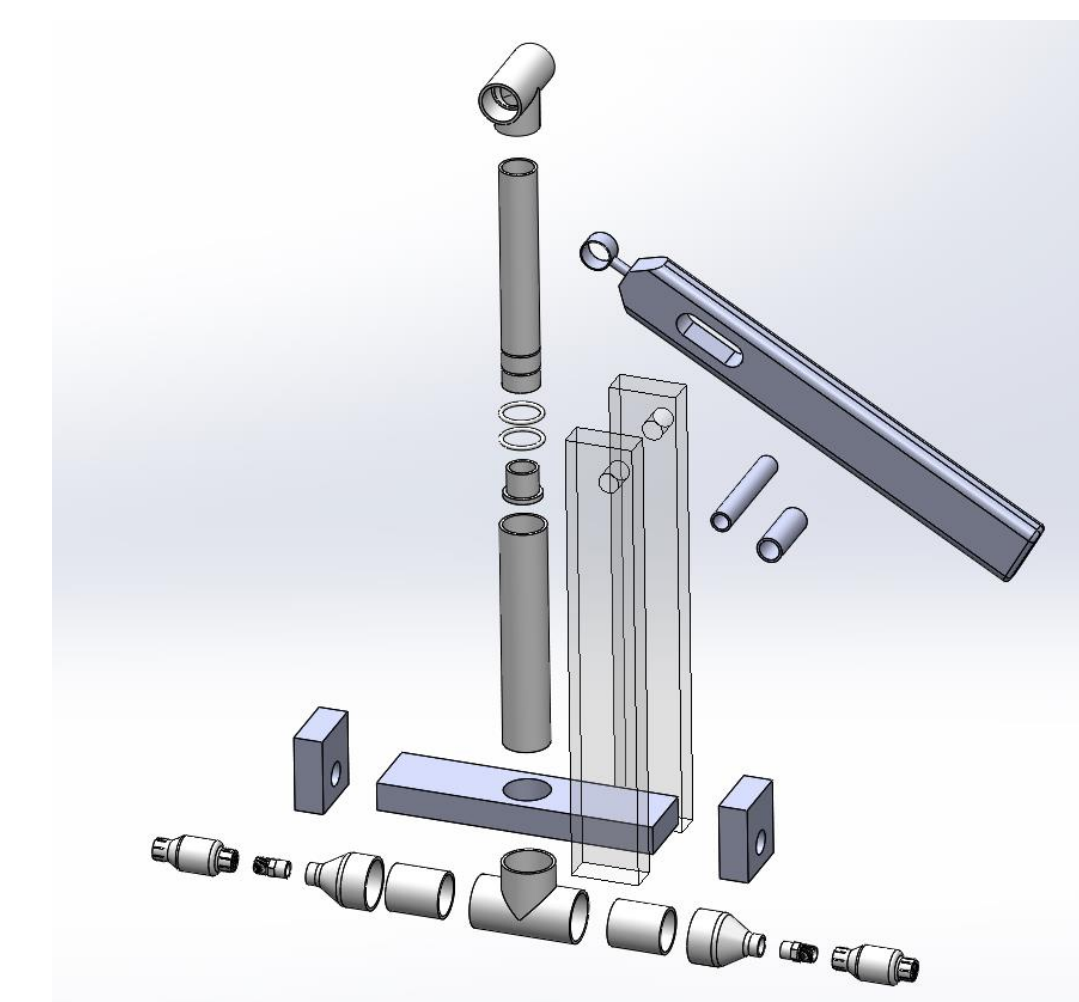
BENCHMARK COMPARISON

	TIPA Project	DRAMM Watercart	Solar iDE Pump	Irroro
Does not need electricity	✓	✗	✗	✓
Does not need water tap	✗	✓	✗	✓
Less than \$500	✗	✗	✗	✓
Portable	✗	✓	✗	✓

MODELING

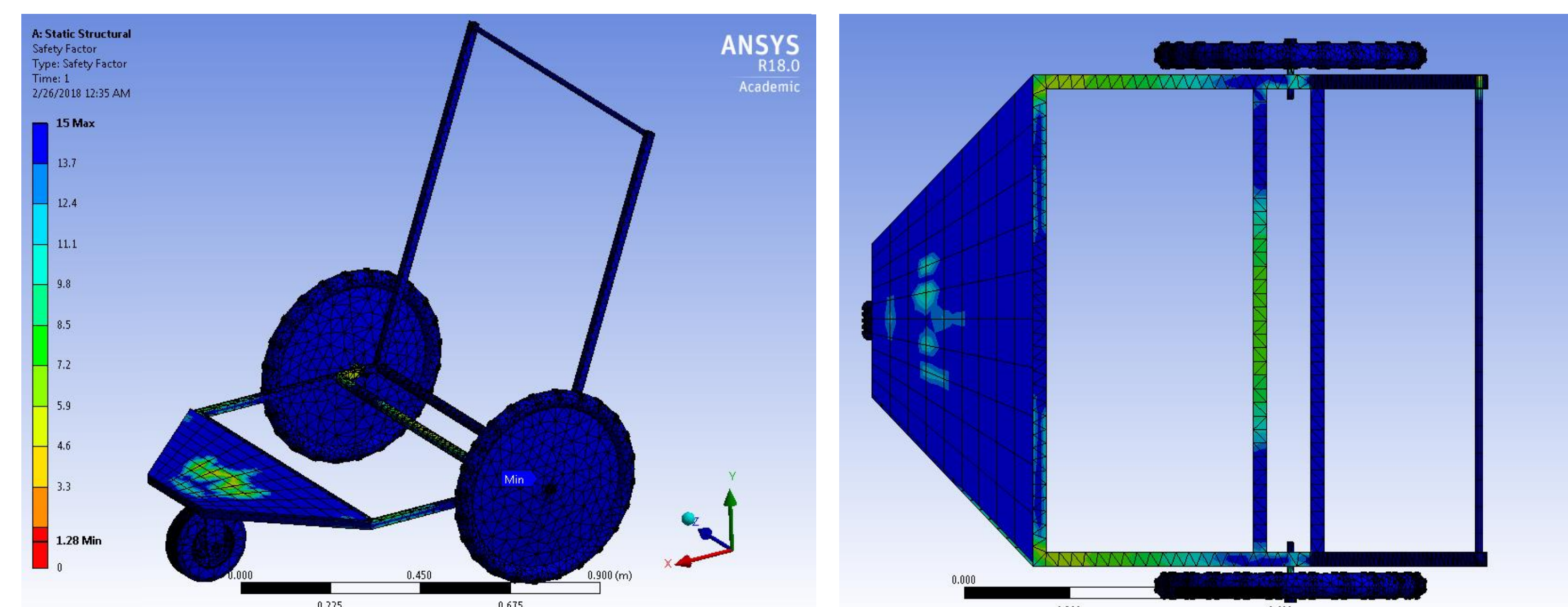
Piston Pump Design

Flow rate = 80 gph
 Bore diameter = 2 in
 Stroke length = 7 in
 Pump cycle = 3.5 s



Finite Element Analysis on the Chassis

Min. Factor of Safety for Max. Equivalent Stress = 1.28



MARKETABILITY

Cost Breakdown	Prototype	Unit
Chassis	\$185	\$154
Pump	\$58	\$46
Tank and Hose	\$108	\$55
Labor	\$0	\$73
TOTAL	\$351	\$328

The Market

- 750,000 hectares of unirrigated groundnuts in Senegal
- Rainy season is 4-5 months long; inconsistent rainfall
- 90% of farmland is subsistence agriculture on small farms

Foreign aid groups supporting agriculture in the region

- World Food Programme (WFP)
- USAID
- Israeli Foreign Aid Organization (MASHAV)

Partnership with NGO

- Sell price is \$450
- Use partnership to subsidize cost for farmers