MEASURE PHASE
PALM HARVESTER

Sponsor:	**Dr. Okoli**	
Advisors:	Dr. Chuy	Dr. Frank
Team:	Talya Levin	Thomas Baker
	Shaneatha Gates	Maurice Derius
	Amber Smith	Christopher Chiros

PRESENTATION AGENDA

- Introduction
- Background Research
- Recap of the Define Phase
- Process Improvement
- Mechanical Systems Overview
- Budget
- SWOT Analysis
- Design Improvement
- Conclusion

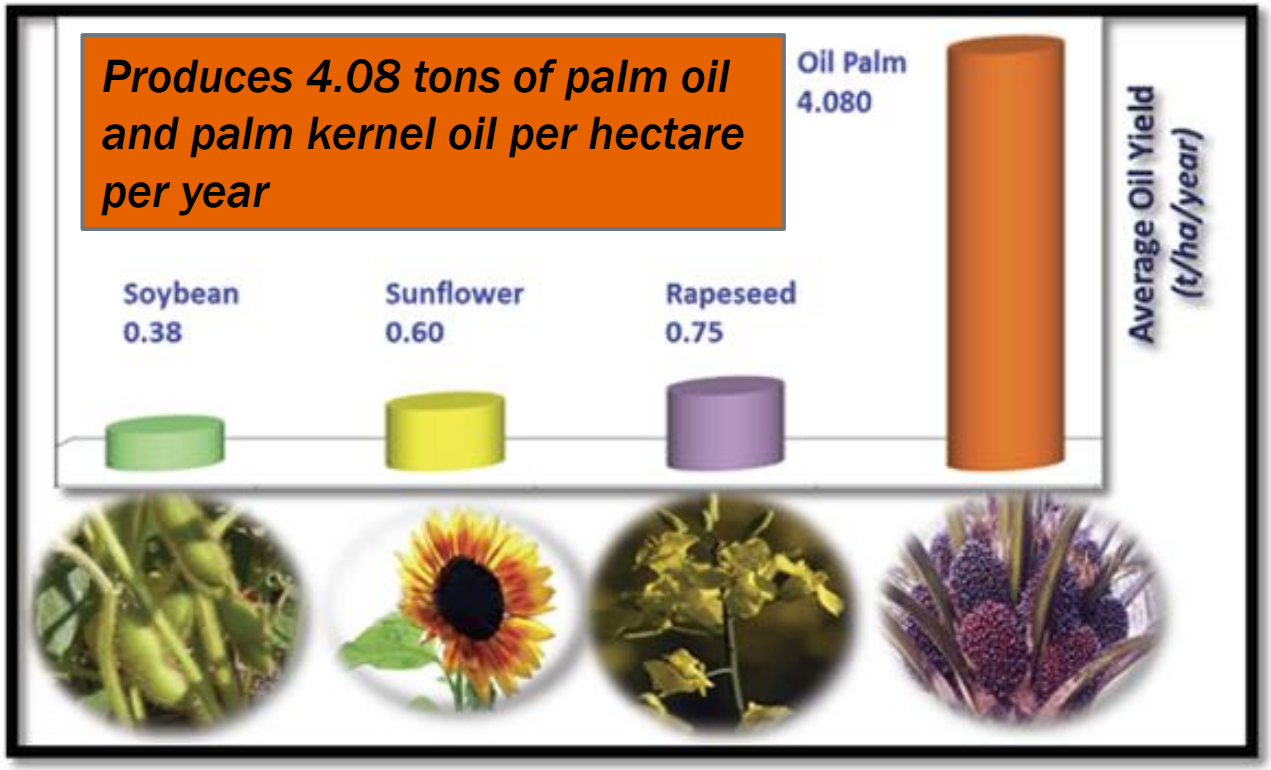
INTRODUCTION

- Improve working conditions at palm plantations
- Improve last year's mechanism
- **Define Phase:** Gave the areas of improvement
- **Measure Phase:** Tests current mechanism in those areas of improvement

BACKGROUND RESEARCH

- Palm oil is the 2nd most consumed oil in the world after soybean oil
- Malaysia is the 2nd largest producer of palm oil after Indonesia
- Malaysia has less strict laws on palm oil plantations than Indonesia

BACKGROUND RESEARCH

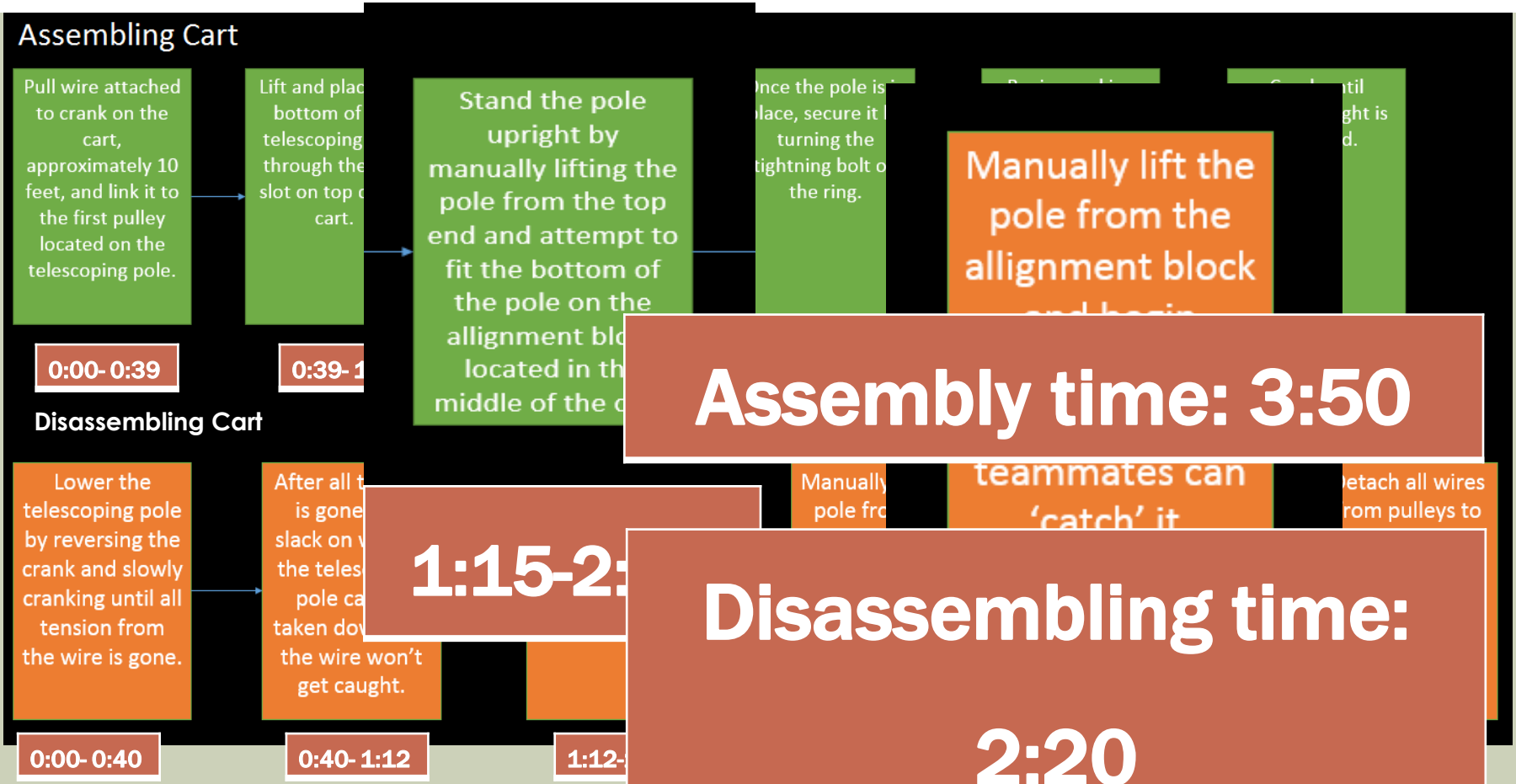


Oil Palm – the most productive oil crop [2]

RECAP OF THE DEFINE PHASE

- **Objective:** Create a safe, reliable, inexpensive and competitive device to retrieve palm fruit.
- **Budget:** $2,500.00
- **Improvements:**
  - Pulley System
  - Materials
  - Mobility
  - Automation

PROCESS IMPROVEMENT



Define Phase Recap | Process Improvement | Mechanical Systems Overview

Presenter: Chris Chiros

MECHANICAL SYSTEMS OVERVIEW

Telescoping Pole

Cart

Pulley System

Automation

TELESCOPING POLE

Shape and Material

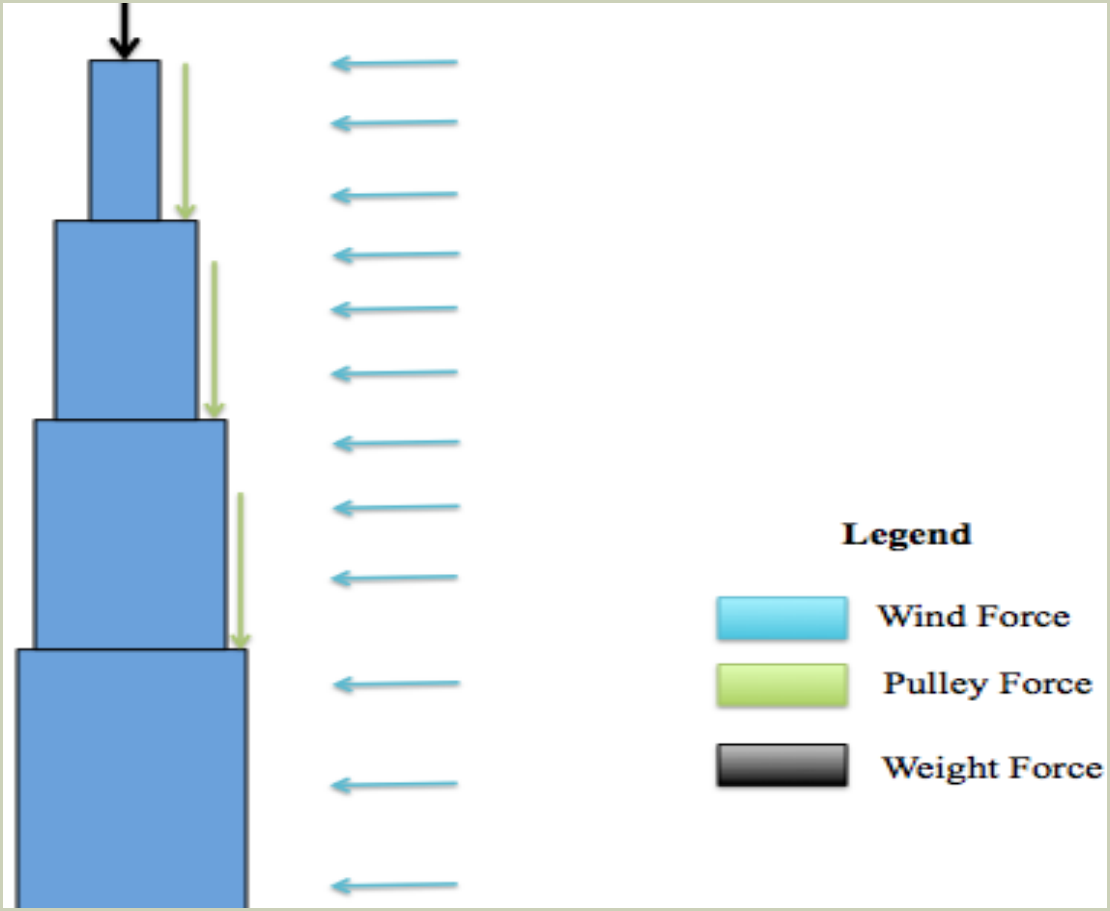
Stress

Deflection

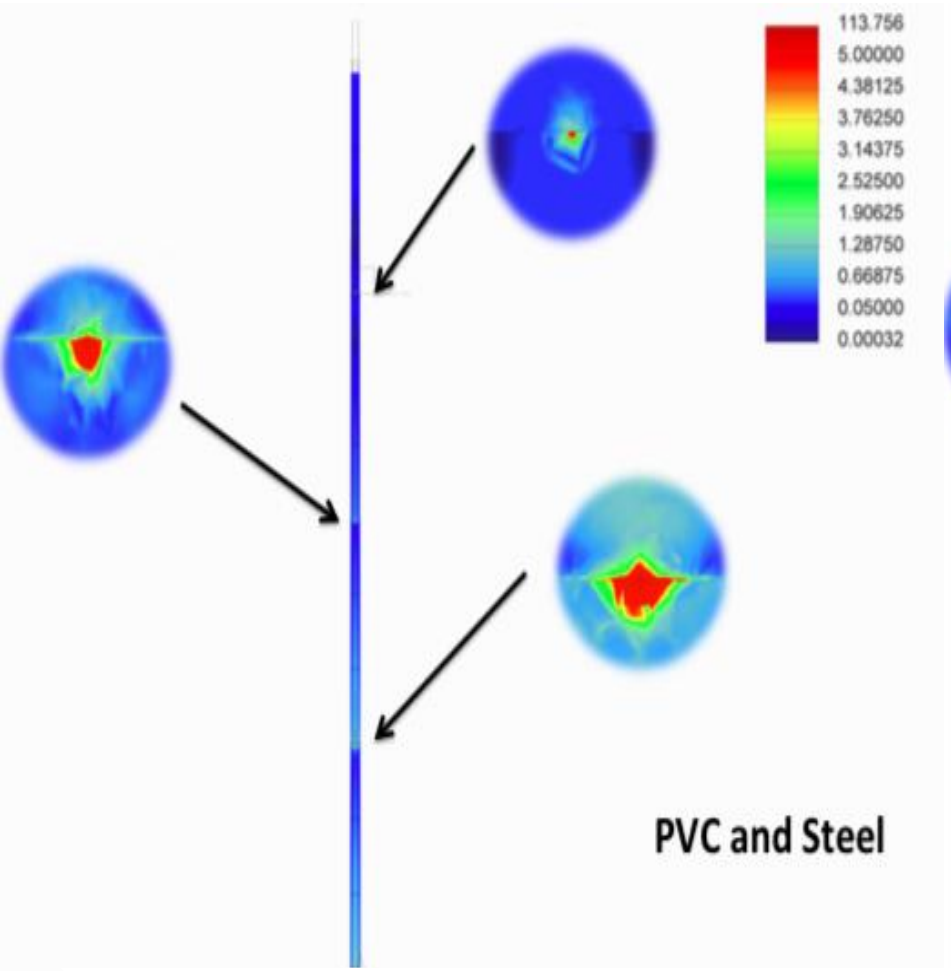
CROSS-SECTIONAL SHAPE AND MATERIAL

- Switched from circular to square cross section
- Pole rotation is avoided
- Changed from PVC/Steel to Aluminum
- Improved ductility

FORCES ON THE POLE



STRESS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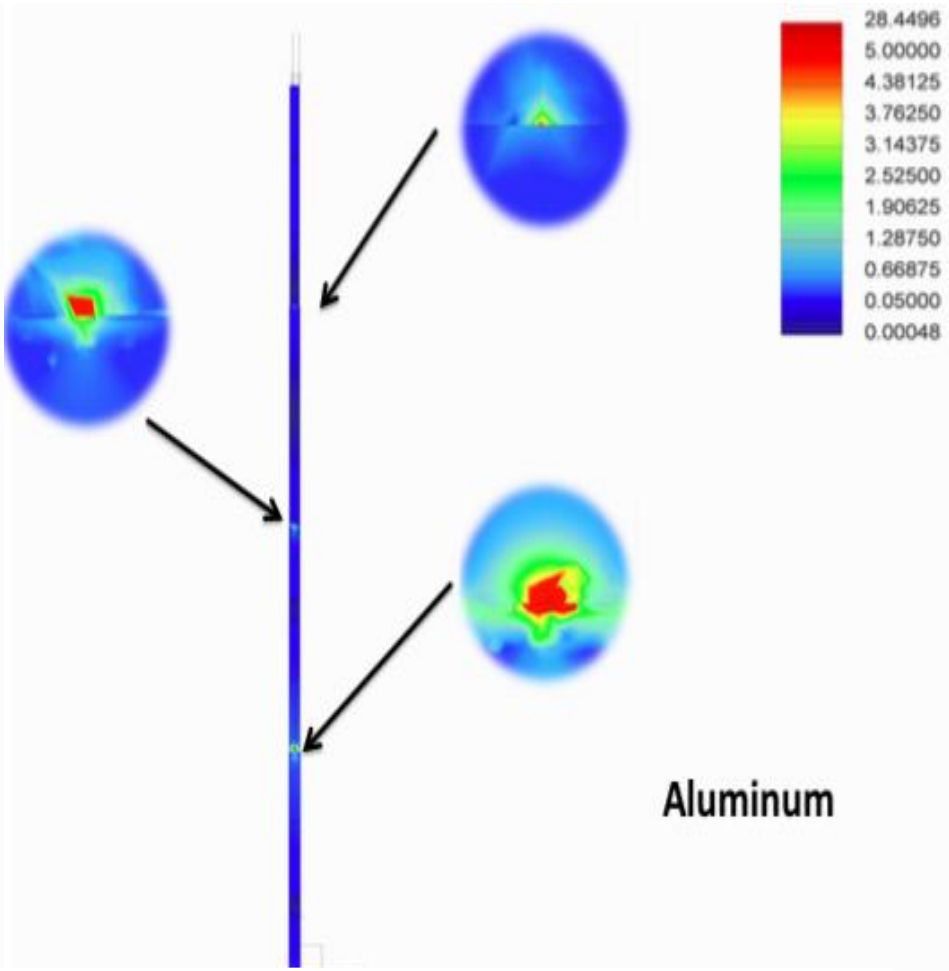
PVC and Steel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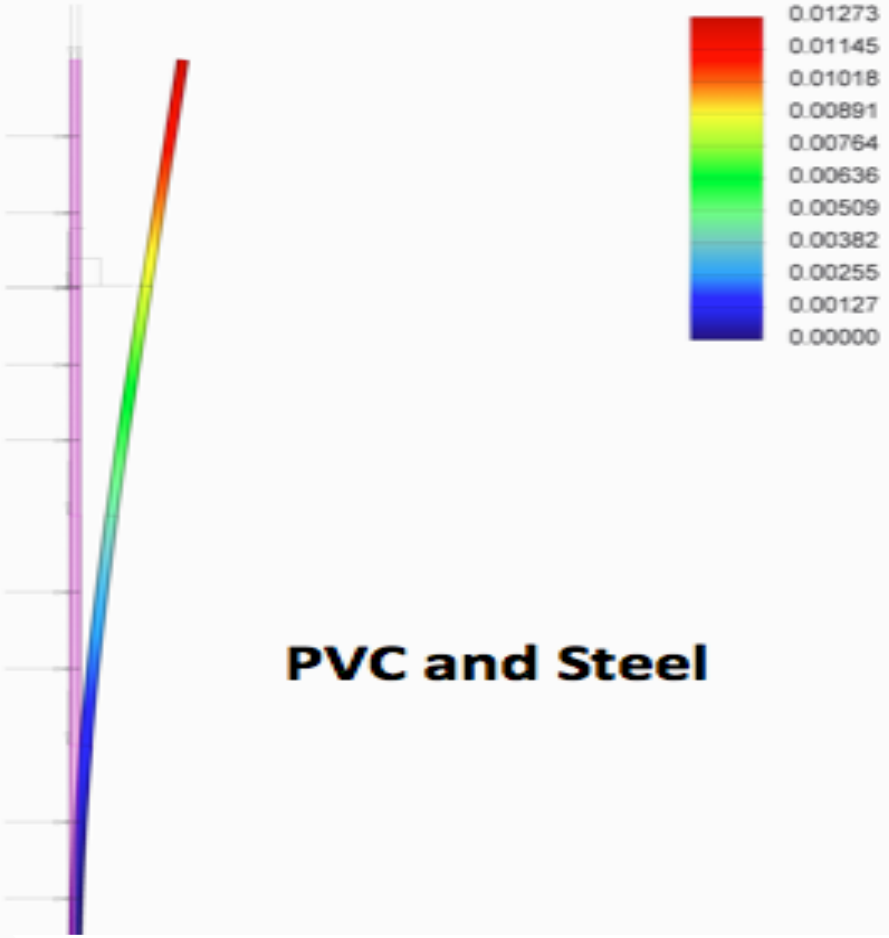
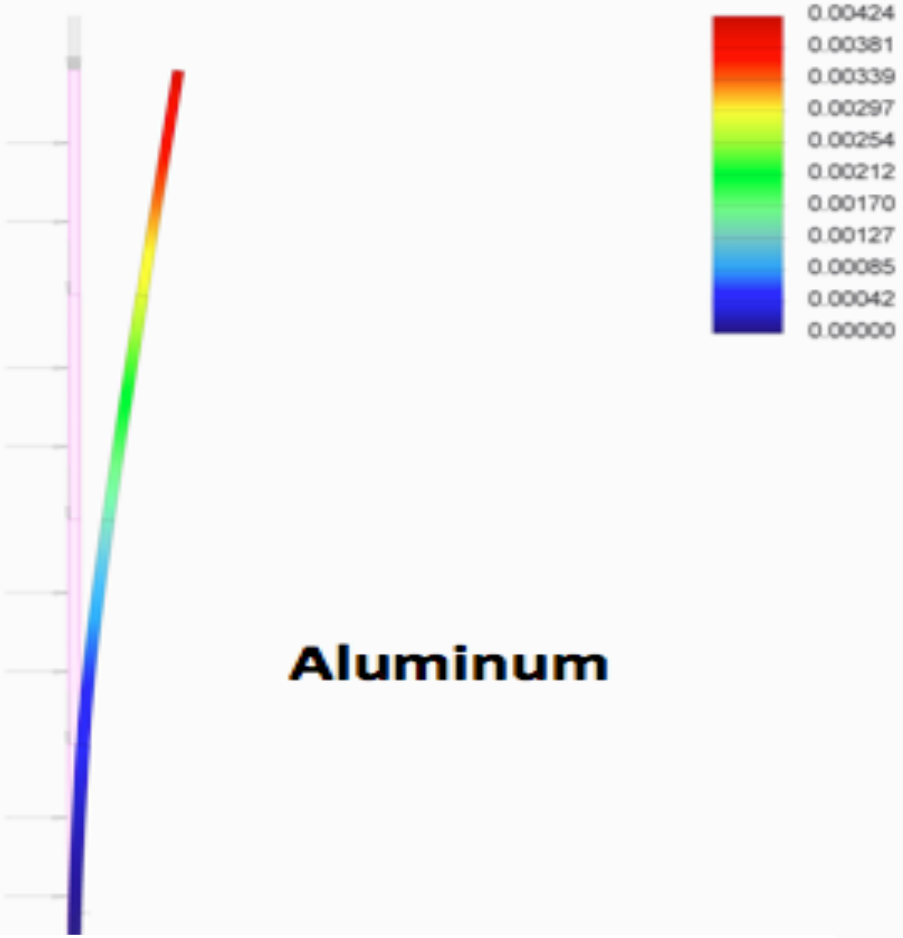
Aluminum

DEFLECTION



PVC and Steel



Aluminum

CART

Lowering the Center of Gravity

Wheels

Locking Mechanism

LOWERING CENTER OF GRAVITY

- Pole will rest on the bottom level of the cart
- Height of pole above cart will decrease
- Stability of the mechanism will increase

WHEELS

Pneumatic Swivel Caster Wheels

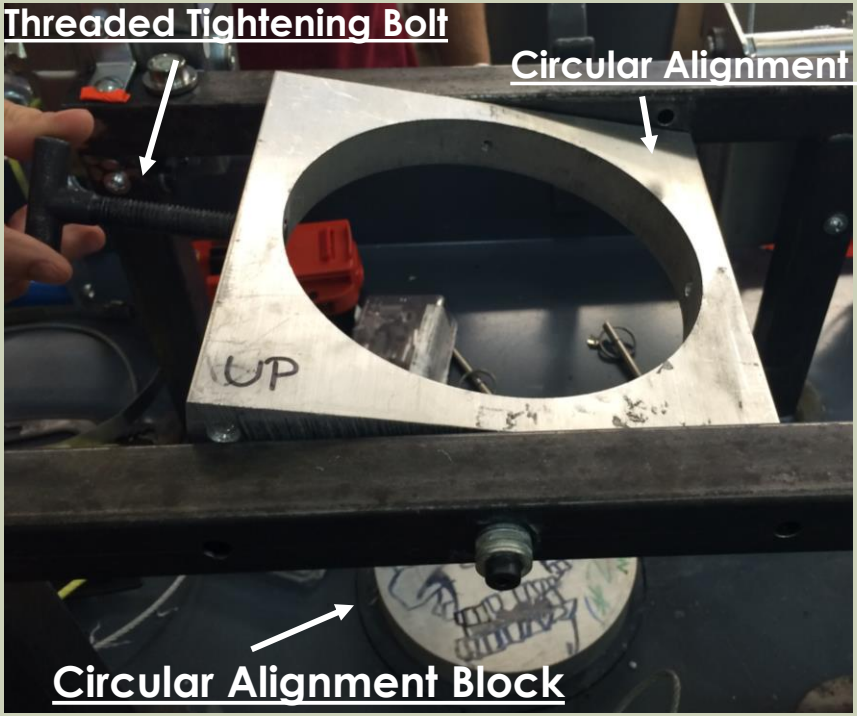
[3]

No-Flat Replacement Turf Tire

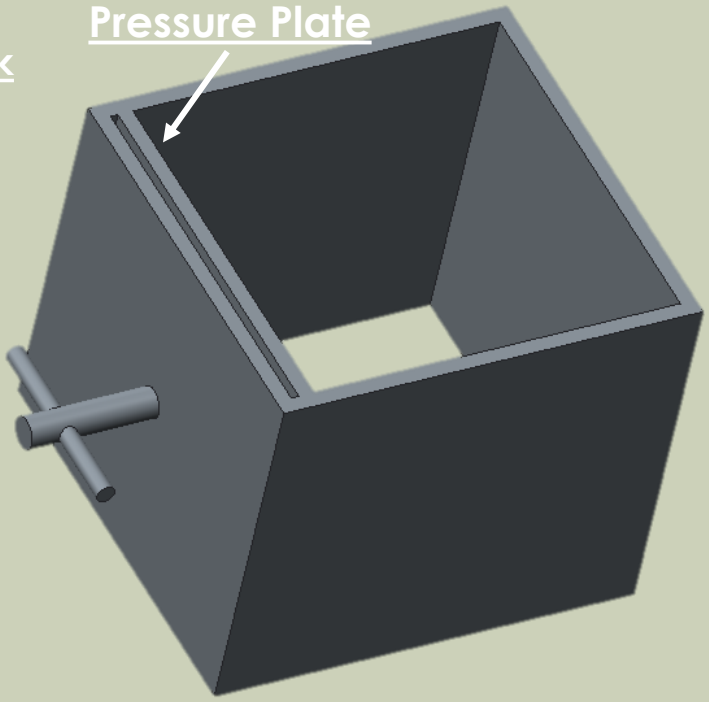
[4]

LOCKING MECHANISM

Old Pivot Model



New Pivot Model



PULLEY SYSTEM

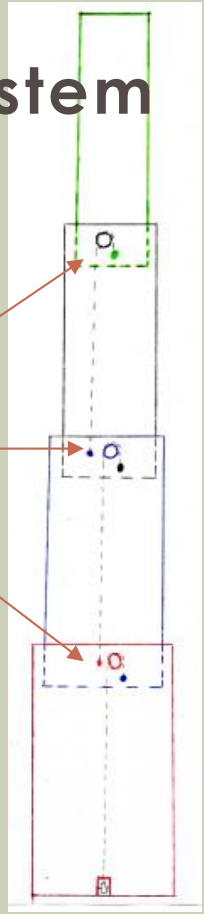
Inner Pulley System

INTERNAL PULLEY SYSTEM

Current Pulley System

Internal Pulley System

[5]

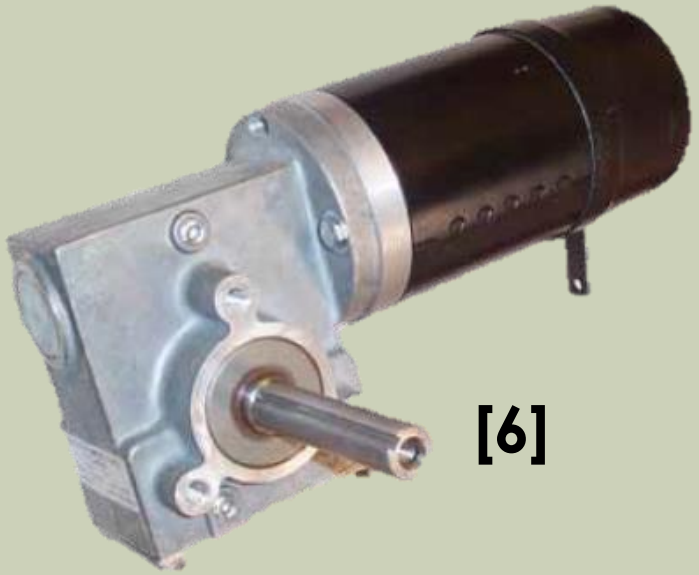


AUTOMATION

DC Gear Motor

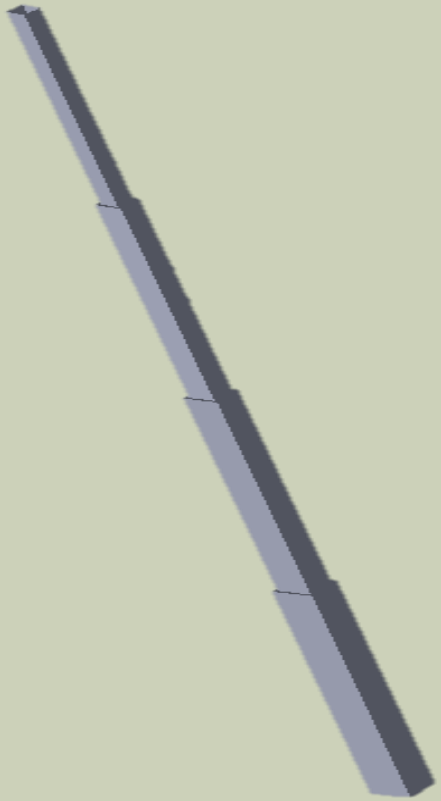
DC GEAR MOTOR

- Compact
- Light weight
- 36V needed to power
- Built-in worm gear
- Torque Needed: 38.1 N*m
- Max Torque: 44.8 N*m



[6]

EXPENSES



BUDGET

Part	Quantity	Price
Aluminum Square Tubes	4	$787.07
Pulleys	7	$34.46
Wheels	4	$119.96
Motor	1	$500.00
Miscellaneous (nuts, bolts, etc.)	-	$30.00
Total		$1,471.49

VOICE OF CUSTOMER ANALYSIS

SWOT Analysis

Improved Designs

SWOT ANALYSIS

Strengths

- Stronger and more wind resistant material
- Automation will simplify controls
- Easier to use over manual method
- Easy to operate

Weaknesses

- Large apparatus
- Cutting tool at top is not easily controlled
- Total process may take longer than traditional method so plantation owners may not see a need for it

Opportunities

- Rising demand for palm oil
- Lack of competition
- Reduce labor issues on plantations
- Commercial manufacturing

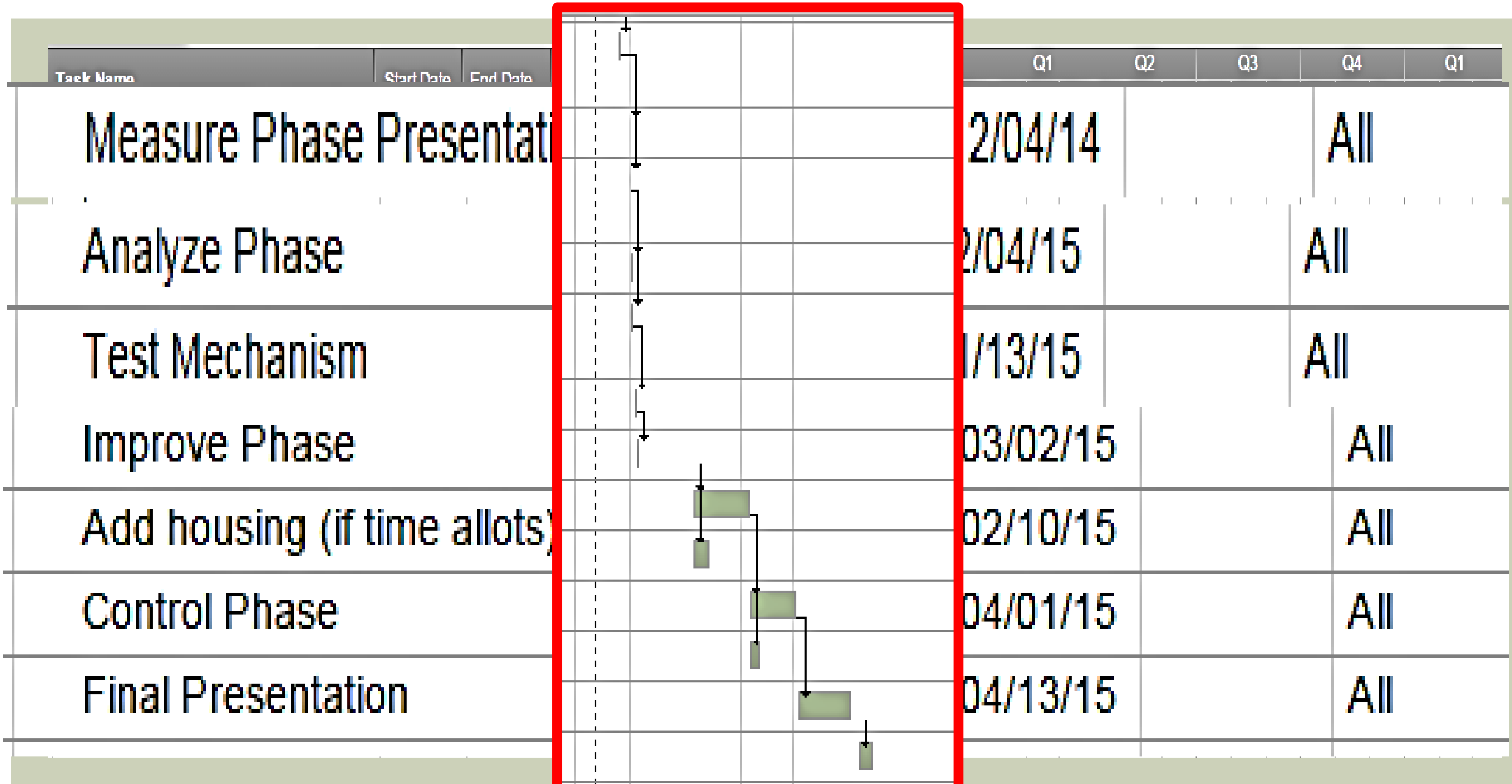
Threats

- Future designs that may be more efficient
- No safe fall method for the fruit

IMPROVED DESIGNS

- Automated Telescoping Pole
- Square Cross-Section
- Aluminum Telescoping Pole
- Lowering Center of Gravity
- Internal Pulley System
- Polyurethane Wheels

GANTT CHART



Improved Designs | Gantt Chart | Conclusion

Presenter: Amber Smith

CONCLUSION

- **Objective**: Create a safe, reliable, inexpensive and competitive device to retrieve palm fruit.
- **Measure Phase Goals**:
  - Make measureable improvements to last year's mechanism
  - Demonstrate difference between last year's mechanism and current design
  - Create small scale model
- **Next Steps**: Order parts & assemble mechanism

QUESTIONS

REFERENCES

- [1](CoverPicture)http://www.soapqueen.com/business/on-palm-oil/
- [2]"Official Palm Oil Information Source." *Welcome to the Malaysian Palm Oil Board // Malaysian Palm Oil Industry // Washington, DC // 1-202-572-9768*. Web. 2 Dec. 2014. <http://www.palmoilworld.org/about_malaysian-industry.html>.
- [3] "10 In. Pneumatic Swivel Caster." *Harbor Freight Tools*. Web. 2 Dec. 2014. <http://www.harborfreight.com/10-inch-pneumatic-swivel-caster-38944.html>.
- [4] "Farm & Ranch FR1030 10-Inch No-Flat Replacement Turf Tire for Hand Trucks and Utility Carts." *Amazon.com : : Wheels For Cart : Patio, Lawn & Garden*. Web. 2 Dec. 2014. <http://www.amazon.com/FR1030-10-Inch-No-FlatReplacement-Utility/dp/B003OANJMY>.
- [5] Web. 2 Dec. 2014. <http://www.lowes.com/pd_348562-273-T7550502_0__?productId=3594202>.
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