Almond Shell Composites

Evaluating the market for more durable and heat tolerant plastic composites produced from diverted almond shell and plastic wastes in California

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Problem Statement

Initial Statement

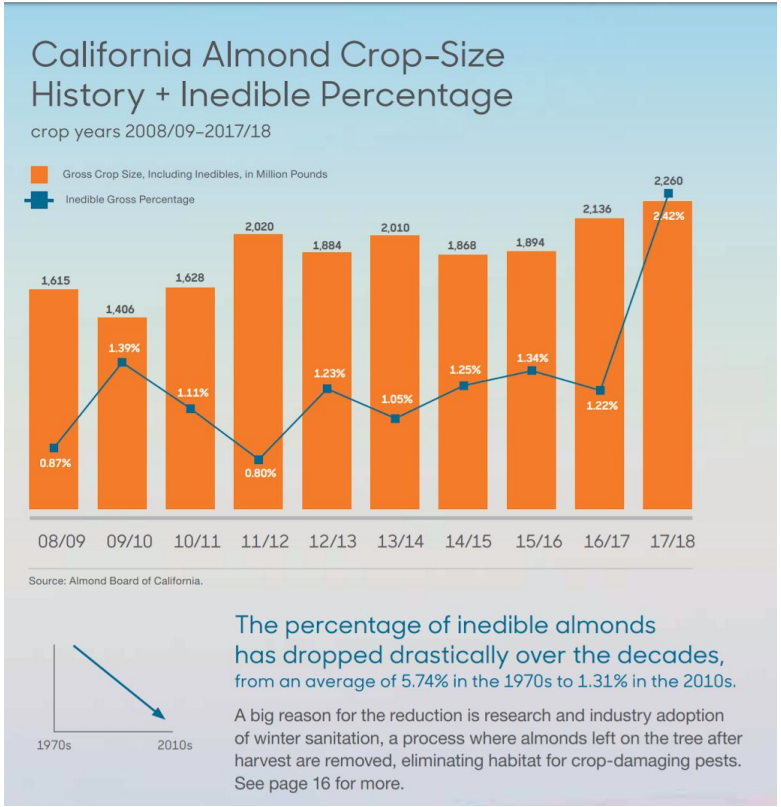
Finding commercial applications for the creation of alternative plastics from diverted landfill plastic and almond shell waste.

Final Statement

We are students in Geography, Environmental Planning, and Atmospheric Sciences working with the USDA to determine the techno-economic feasibility of bringing torrefied almond shell composites to the market. The goal is to effectively divert plastic and almond shell waste from landfills to improve material properties of degraded plastic with the torrefied almond shells, creating more durable and heat tolerant plastic pellets that plastic manufacturers can use in place of virgin plastic or recycled plastic for consumer product production.

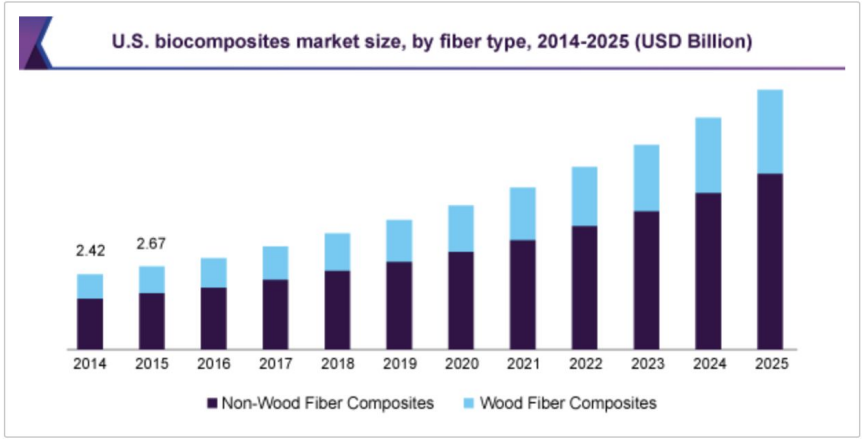
Background

- Over 80% world's almonds produced in California
- Over 1.5 billion pounds almond shells produced per year
- With an increase in consumption and limitations of dealing with plastic waste, these wastes would end up in the landfills and potentially lead to environmental pollution.



Research Findings

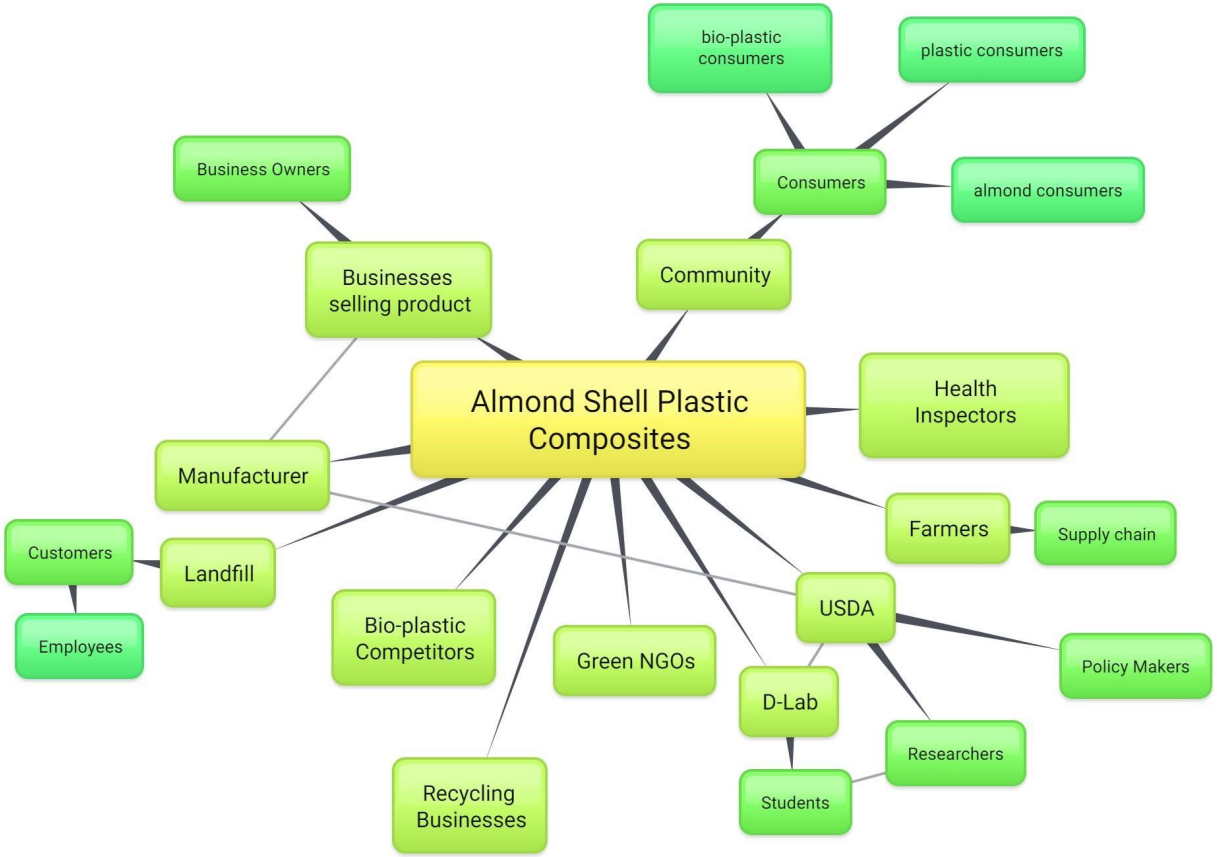
- Manufacturing bioplastics can lead to considerable energy and greenhouse gas savings, but it is important to consider bioplastics waste disposal. Mechanical recycling is the best solution for bio-based product disposal (Piemonte 2011).
- Most bioplastics end up in landfills, where they cannot break down. Landfills are absent of oxygen and light, which are needed for organisms to break down bioplastics. They remain in their manufactured forms, and leech out methane into the atmosphere (Baker 2019).
- Cost of production bioplastics can range between $4-16 per kg. $3-5 per kg to be commercially viable (Roland-Holst 2013).



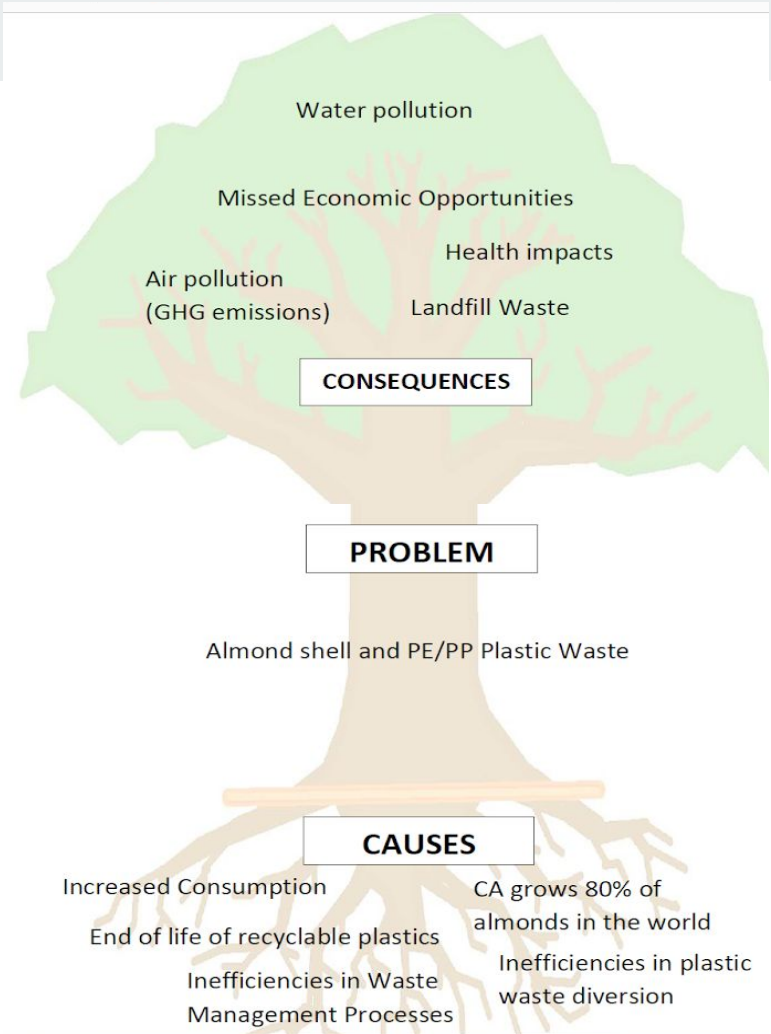
(Grand View Research 2018)

- Global biocomposite market size: $16 billion in 2016
- Expected to grow 12.5% annually by 2025 (Grand View Research 2018)

Stakeholder Analysis



Problem Tree



Moving Forward

- Life Cycle Assessment
  - Wastewater produced from treating the diverted plastic
  - End of Life analysis for these products
  - Will it successfully offset environmental impact?
- Determining total cost of production and manufacturing
- What are the incentives to better manage waste produced from almond shell composites production?