

Elizabeth Carpenter (BE), Rushi Patel (BE), David Rokhinson (BE), and Emily Wright (BE)

Background

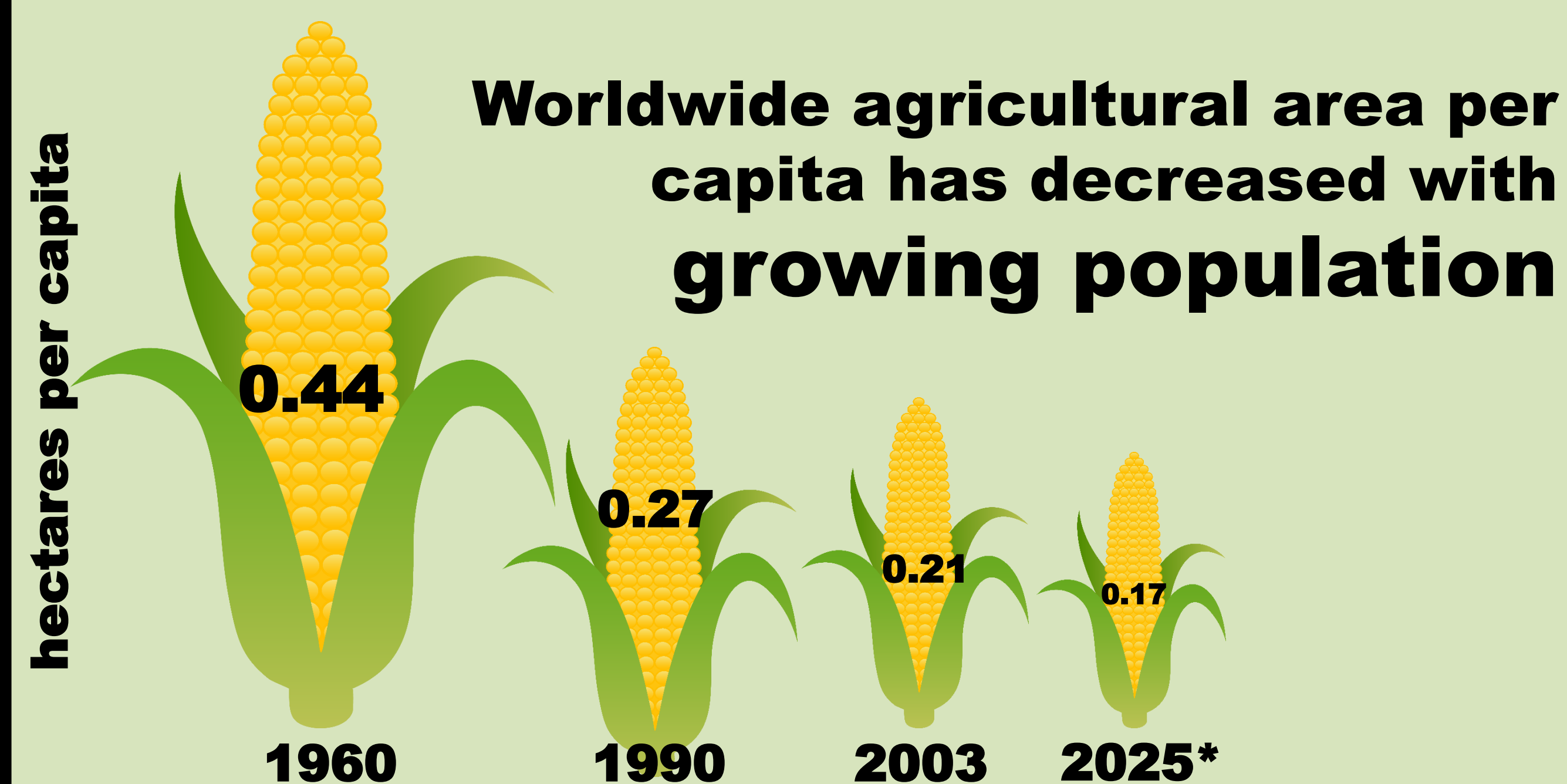
Problem Statement

- Growing population is increasing pressure on global food supply
- Decreasing availability of agricultural land

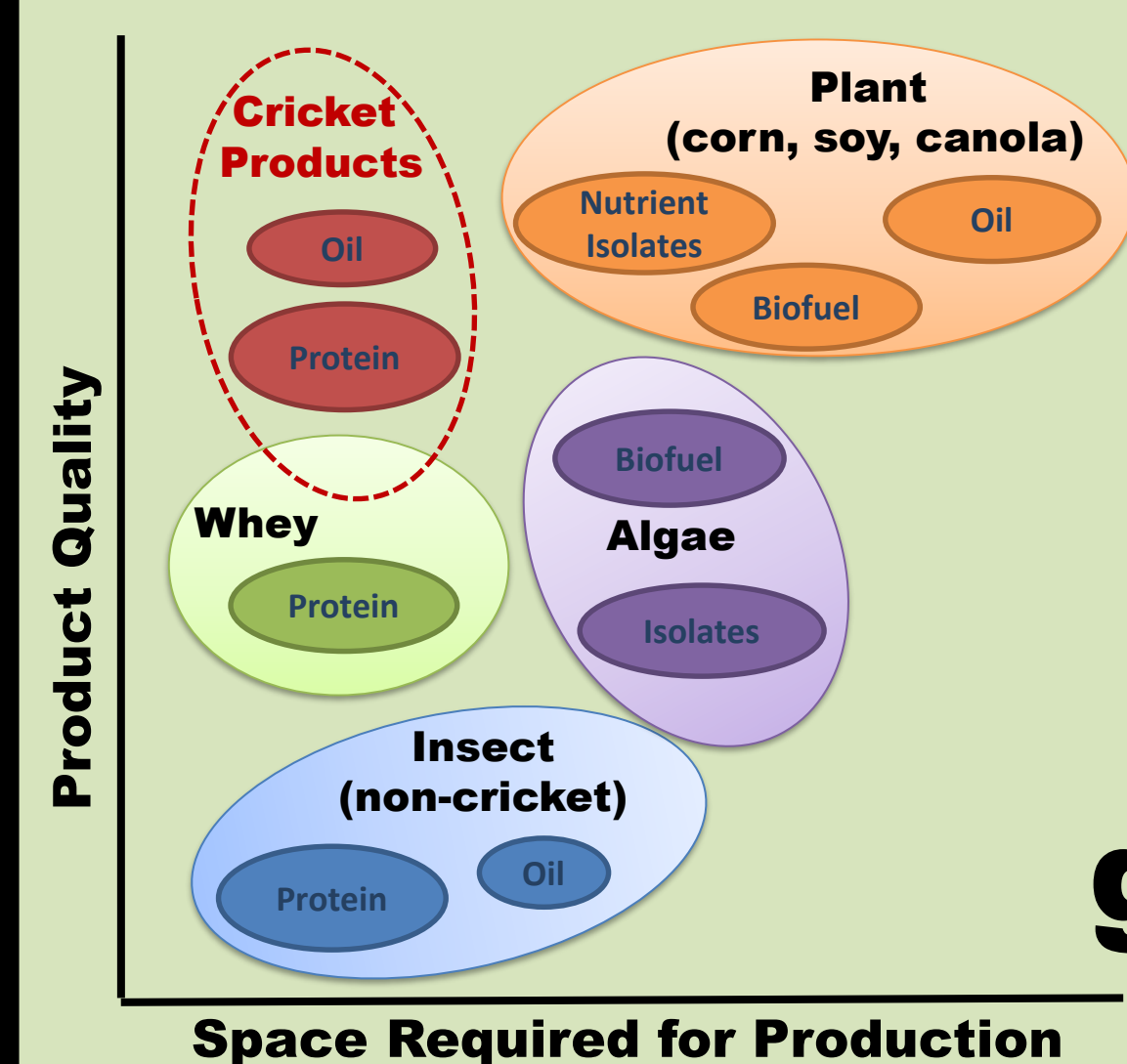
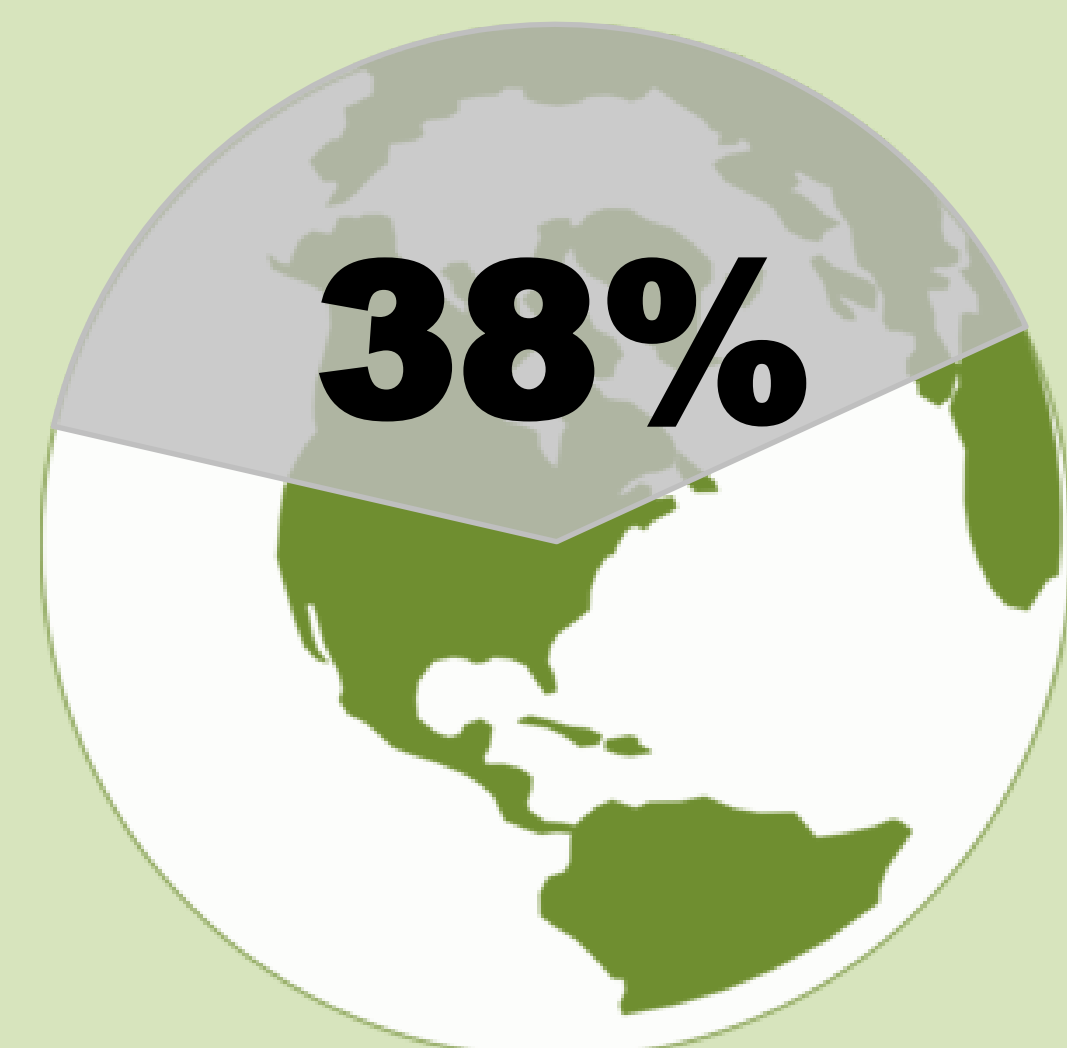
Objectives

- To design a student operated plant for raw oil extraction from cricket flour
- Optimize equipment with respect to environmental impact and cost

Global Impact & Market



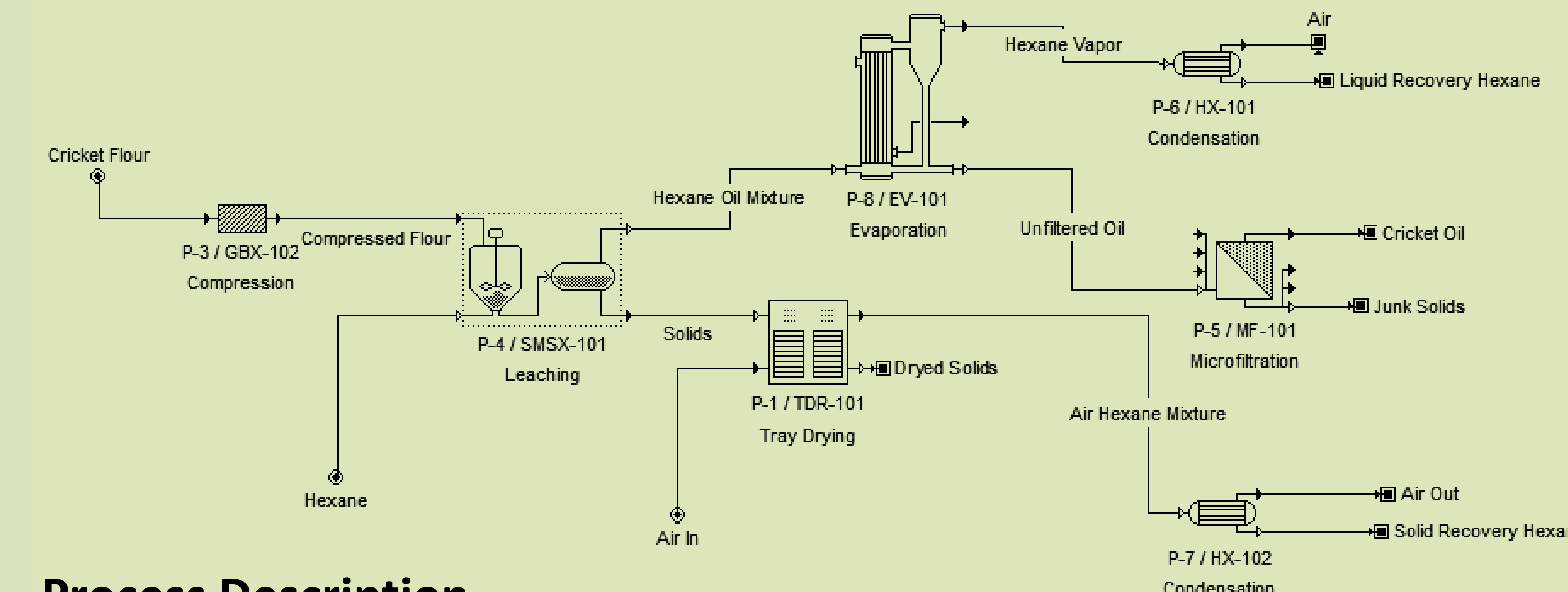
Between 1990 and 2012 the world land area used for agriculture has remained constant.



Crickets are a sustainable alternative to meet growing global food demand

Global Agriculture statistics from Statista studies

Final Design

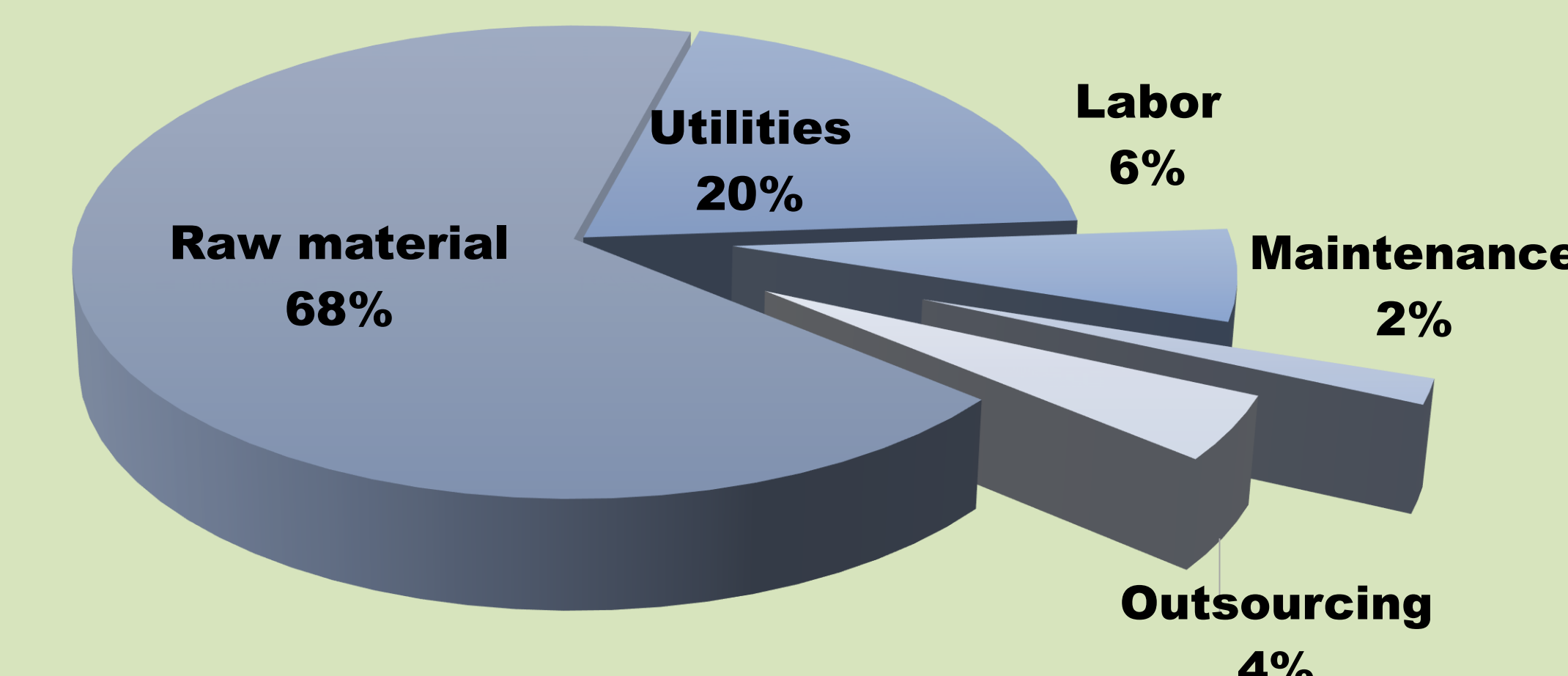


Process Description

- Mechanical expression produces press cake and high quality oil
- Leaching extracts remaining oil using hexane
- Evaporation recovers oil and recycles hexane through condensation
- Microfiltration removes remaining flour particles from oil product
- Dryer removes hexane from solid byproduct

Equipment	Cost
Batch Press	\$21,500
Leaching Unit	\$21,112
Evaporator + Condenser	\$149,000
Dryer + Condenser	\$177,000
Microfiltration	\$26,000
Fluid Transport	\$56,884
Total	\$432,496

Economic Analysis



Annual Cost	\$/Year
Raw Materials	\$1,497,000
Utilities	\$434,250
Labor	\$137,035
Maintenance	\$37,022
Outsourcing	\$96,369
Total Product Cost	\$2,201,676

Investment	Cost
Fixed Capital Investment	\$1,851,083
Direct Cost	\$1,306,138
Indirect Cost	\$545,945
Working Capital	\$321,372
Total Capital Investment	\$2,175,455

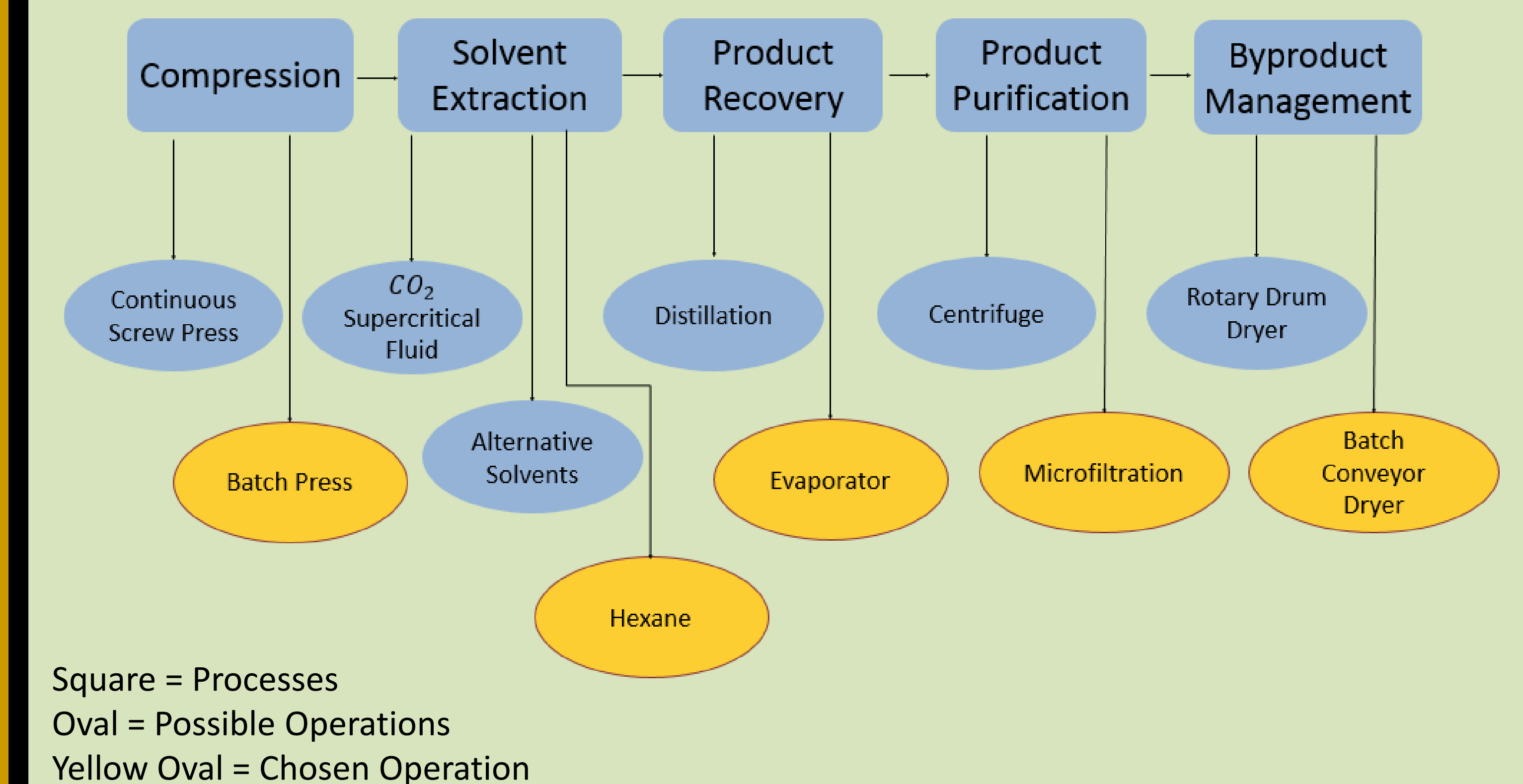
Product Pricing

- Mechanically expelled oil: \$70/kg
 - Hexane extracted oil: \$60/kg
- Processing 7,698kg of oil per year leads to a breakeven point after 10.3 years and a 10% return on investment

SWOT Analysis

Strengths	Weaknesses
• Two different grades of oil • Small land area required for cricket production • Solvent is recycled • Byproduct has market value	• Small annual product yield • Small and specific market • High raw material cost • Low initial ROI
Opportunities	Threats
• Environmentally sustainable • Novel product • Non-allergenic alternative • Organic product	• FDA regulations • Contradicts social norms • Further research and testing of insect pathogens is required

Alternative Processes



Plant Sustainability

- Plant has minimal discharge of environmentally harmful toxins
- Hexane is recycled for continuous usage
- Byproducts are sold as animal feed



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