Problem Statement
Watermelon lacks sugar and flavor needed to make a quality wine product. A standard process for making watermelon wine does not currently exist.

Objectives
1. Design a standard process for making watermelon wine for a student operated business.
2. Develop optimal quality product using a zero discharge, minimum energy plant.

Background
Watermelon season in Indiana lasts from mid-July to mid-October [2]. On average, watermelon contains 8% sugar and 92% water [1]. The U.S. alcoholic beverage market is a $211.6 billion industry [3]. Within this market, wine makes up about 15% of $211.6 billion in retail sales dollars, a $31.74 billion market [3].

Market Analysis
Strengths
- Availability of locally sourced fruit.
- Wine product designed to appeal to young women.
- Minimal waste.
- Minimal overhead cost.

Weaknesses
- Juice production step of process must be seasonal.
- Small-scale means little product availability.
- Barriers to entry: cost of equipment.

Threats
- Unknown brand with little brand loyalty.
- Obtaining a liquor license in West Lafayette.
- Competition in the marketplace.

Opportunities
- Wine sales growing each year, key growth among young women [4].
- Growing popularity of micro-breweries and wineries [5].
- Interest stated by consumers in the Lafayette area.

Key Experiment
A small-scale experimental trial of the freeze concentration process was performed as a way to understand and compare the theoretical and practical aspects of the process. Data was collected throughout in order to later be extrapolated for future use in our student run winery.

Collected Data:
1. Freezing Patterns
2. Initial Freezing Temperature
3. Freezing Time

Alternative Solutions
For each of the three main production steps (juice extraction, concentration, and fermentation), multiple methods were evaluated to determine the best options for our specific requirements.

Economic Analysis

<table>
<thead>
<tr>
<th>Equipment Cost ($)</th>
<th>Total Capital Investment ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basin Sink 650.00</td>
<td>18,927.00/yr KI 7%</td>
</tr>
<tr>
<td>Walk-in refrigerator 4,000.00</td>
<td>16,163.27/yr P 33 yr</td>
</tr>
<tr>
<td>Hand Wine Press 225.00</td>
<td>4,728.00/yr CI 540,000</td>
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<tr>
<td>Labor 1,750.00</td>
<td>2,400.00/yr PP 33 yr</td>
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<tr>
<td>Distillery License 750.00</td>
<td>2,150.00/yr CI 540,000</td>
</tr>
<tr>
<td>Fermentation Tank 1 2,150.00</td>
<td>2,150.00/yr PP 33 yr</td>
</tr>
<tr>
<td>Water 9.69</td>
<td>2,095.10/yr PP 33 yr</td>
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<tr>
<td>Filter System 184.44</td>
<td>424.99/yr PP 33 yr</td>
</tr>
<tr>
<td>Electricity 424.99</td>
<td>424.99/yr PP 33 yr</td>
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<tr>
<td>Bottle Filler 499.00</td>
<td>499.00/yr PP 33 yr</td>
</tr>
<tr>
<td>Label Applicator 499.00</td>
<td>499.00/yr PP 33 yr</td>
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<tr>
<td>Total cost 10,283.43/yr</td>
<td>10,283.43/yr PP 33 yr</td>
</tr>
</tbody>
</table>

Summary
- Total Capital Investment: 18,927.00/yr KI 7%
- Profit: 2,763.73/yr PP 33 yr

Global/Societal Impact
- Low waste process.
- Provide on-campus jobs that allow Purdue students to gain valuable hands-on experience.

Works Cited
2. Indiana State Department of Agriculture. “Indiana Fruits and Vegetable Harvest Calendar.”
5. Number of Breweries and Brewpubs in U.S.” Brewers Association.

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Technical Advisor and Instructor:
- Dr. Okos (Instructor)
- Coleen Riley (T.A.)