Hard Cider and Apple Brandy Production

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PROBLEM STATEMENT
Many small to medium sized apple orchards lack the resources to produce hard apple cider and/or applejack. However, there is a large demand on the market for these products, and a need for higher profit margins.

Overall Goal: Design a way to increase the profit of apples sold at small to medium sized apple orchards

Design Objectives:
1. Design and size proper equipment for hard cider and applejack production
2. Determine initial cost and prices of products to allow for a return on investment of 20% and a profitable business after 5 years
3. Design process to be zero discharge

The design includes:
- Fermentation process for conversion of apple cider to hard apple cider (4-7% alcohol content)
- Distillation process for conversion of hard cider to applejack (40% alcohol content)
- Piping system to connect existing equipment with new equipment
- Yeast filtration system for yeast recovery

Final Design:

Economic Analysis:
Our economic analysis assumes that the orchard already has an operational and optimized system in place for harvesting, washing, and grading the apples as well as producing the apple cider. Our process should be able to be added onto the existing processes. We are able to sell our hard cider at $8.00 and apple brandy at $20.00. We calculated a Fixed Capital Investment at $200,732.80, a Working Capital at $30,109.92, for a Total Capital Investment of $230,842.72.

Market Analysis:
Purpose: Identify emerging trends and demographics for local orchards to capitalize on underserved market demands.
Methods: Analysis of multiple reporting streams, including Mintel, news sources, and specialty websites for orchards and brewers.
Findings: Increasing demand for local, small-production products from small businesses by educated, middle and upper class persons. Particularly, very large and increasing demand for cider products, including apple brandy.

Strengths
- Local, small-production
- Potential for flavor variety
- Cider-making equipment already purchased

Weaknesses
- Fermentation/Distillation equipment needed
- Apple production varies yearly
- May take >1 year to age and perfect cider recipe

Opportunities
- Potential to distribute to local breweries and restaurants
- Can bring further business for other orchard products

Threats
- Macro brewery production (Angry Orphans, Woodchuck, Oliver)
- Obtaining license
- EPA/OSHA requirements

Alternative Solutions:
Fermentation Tanks:
- 17,150 gallons of fermentation liquid
- Allows for operation at 80% operating capacity per year
- Minimum 2 fermenters for scheduling
- 2 – 217 gal vessels at $6,700 each
- 2 – 310 gal vessels at $7,400 each
- 3 – 465 gal vessels at $10,250 each
- 2 – 620 gal vessels at $12,250 each

Distillation Options:
- Natural vs. Blended Liquor
- Freeze Distillation
- Pot Distillation

Yeast Waste:
- Recycle yeast
- Make into yeast extract
- Sell to company to make yeast extract

Experimental Design:
We were able to perform small scale production of hard cider and applejack. We were able to measure the amount of alcohol at both stages as well as the amount of yeast produced.

Global/Societal Impact:
We are hoping that this can become a potential trend setting for other orchards which will allow for a focused local culture. This will aid in the shop local movement.

Reference

Sponsor: Doud Orchards, Kelly and Rebecca Shanley

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