Coffee Bean Sorter
## Preliminary Customer Contract

<table>
<thead>
<tr>
<th>Customer Need</th>
<th>Attribute</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accurately Removes Genetically Deformed Beans</td>
<td>Accuracy</td>
<td>80% of target defects removed from good beans</td>
</tr>
<tr>
<td>Low Power</td>
<td>Power</td>
<td>100-150w</td>
</tr>
<tr>
<td>Receive 150 lbs of beans at once</td>
<td>Capacity</td>
<td>Handle 150 lbs</td>
</tr>
<tr>
<td>Easy loading and unloading for a 5 foot tall man</td>
<td>Size</td>
<td>Height: less than 4 ft</td>
</tr>
<tr>
<td>Sorts 150 lbs/hour</td>
<td>Sorting Capability</td>
<td>150/hr throughput</td>
</tr>
<tr>
<td>Must be affordable for small farmers</td>
<td>Price</td>
<td>$300-500</td>
</tr>
</tbody>
</table>
Critical Issue:
Sorting Good beans from defective ones

- **Black**: Eye Only
- **Pergamino**: Size/Density
- **Rocks or Twigs**: Size/Density
- **Cherry**: Size
- **Genetically Deformed**: Density
Density Sorting

- Drum Sorting
- Vibrating Table
- Winnowing
Drum Sorting

*Testing results:*

All beans stick to side of walls
<no sorting>

*Next phase:*

Drum with MUCH BIGGER diameter
Vibrating Table

Testing results:
Peaberries sort from rest with >95% accuracy

Power: < 100W

Modification:
Different surfaces
Different motor orientations
Winnowing

**Testing results:**
Some bad beans in the good beans

**Modifications:**
Bean feeder setup
Fan angle
Barrier height
Barrier distance

**Power constraints on fans**
Key Risk Assessed

Accuracy

-88% defective beans sorted out
-Target Bin: 91% good beans

Drum Sorting
Vibrating Table
Winnowing
Power Analysis for Mock up Experiment

Large Winnowing Fan

3.8A·120V = 456W steady electrical power draw

Small Winnowing Fan

0.8A·120V = 96W steady electrical power draw

Table Vibrator

0.9A·120V = 108W steady electrical power draw

~100W

Also note: Mechanical Input Power < Electrical Power Draw
Conclusion

Feasible

Valid Alternative