Coffee Processing
Roasted and Freeze-Dried Coffee

University of Hawaii
Mike Kawate
James Kam
Julie Coughlin
Coffee Processing Flowchart

Field Phase
Field sample to green bean coffee for processing approx. 3 days per sample.

1 Day
- Harvest coffee cherries in the field
- Pulp and Demucilage coffee cherries
- Dry parchment coffee beans
- Remove parchment from coffee beans
- Green Bean Coffee

Processing Phase
Green bean coffee to final processed fraction approx. 2 weeks per sample.

1 Day
- Green Bean Coffee transferred to Processing Lab
- Remove Green Bean 'Grab' Sample
- Roast remaining Green Bean coffee

- Grind Roasted Coffee Beans
- Remove Roasted Coffee Sample (Whole Bean)

1 Day/batch
- Extract & Freeze Coffee

4 Days/batch
- Freeze Dry Coffee
- Freeze Dried Coffee Sample

Typically, 2 batches per sample
- SOP 6-1.0
- SOP 7-3.0
- SOP 7-1.0
- SOP 7-6.0
- SOP 7-1.0
- SOP 6-2.0
- SOP 7-1.0
- SOP 7-2.0
- SOP 7-2.0
- SOP 7-2.0
- SOP 7-2.0
- SOP 7-2.0
- SOP 7-2.0
- SOP 7-8.0
- SOP 7-2.0
- SOP 7-2.0
- SOP 7-10.0
- SOP 7-2.0
Field Phase

- Harvest coffee cherries in the field
- Pulp and demucilage coffee cherries (1 Day)
- Dry the wet parchment coffee beans (1 Day for RAC sample, 2 Days for processing sample)
- Remove parchment from dried coffee beans
- Coffee green beans

Field sample to coffee green beans sample (RAC) approximately 2 days per sample. Coffee green beans RAC sample size approximately 2.0 lbs.

Field sample to coffee green beans sample for processing approximately 3 days per sample. Coffee green beans sample size for processing approximately 15.0 lbs.
Coffee green beans received by processing lab from field

Remove coffee green beans ‘grab’ sample

Roast remaining coffee green beans

Grind roasted coffee beans

Remove roasted coffee beans sample (whole beans)

Extract ground coffee & freeze coffee extract

Freeze dry frozen coffee extract

Freeze dried coffee sample

1 Day

Typically, 2 batches per sample
Processing Lab

- Green Bean coffee sample delivered to processing lab (15 lbs)
- Remove green bean ‘grab’ sample (2.0 lbs)
- Roast remaining green beans
- Remove roasted sample (2.0 lbs)
- Remove enough roasted beans to produce freeze dried sample (7.0 lbs)
- Grind these roasted beans
- Extract ground coffee
- Freeze dry coffee extract to produce sample (1.5 lbs)
Green Bean Coffee (RAC)
Roasted Coffee
Coffee Roasting
Coffee Grinding
Ground Coffee

Ground coffee is held in bags and placed into the freezer until extraction. Bags are labeled with Field ID, Sample ID, and Treatment No.
Coffee Extraction
Coffee Filtering
Cooling Extract
Freezing Coffee Extract
Freeze Drying
Freeze Dried Coffee
Documentation

Datasheets used to document process
## Coffee Processing Timetables

### Roasting

<table>
<thead>
<tr>
<th>SAMPLE ID</th>
<th>TRT#</th>
<th>DATE / INITIAL</th>
<th>START TIME</th>
<th>FINISH TIME</th>
<th>ROASTED BEAN WEIGHT</th>
<th>SOP(s) FOLLOWED</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>01</td>
<td>12/2/13 gc</td>
<td>7:45 am</td>
<td>10:50 am</td>
<td>13.80 lbs</td>
<td>7-2.0, 7-7.1</td>
</tr>
</tbody>
</table>

**Notes:**
Before roasting, I removed 2.0 lbs green bean Sample G. I roasted the remaining green beans. Then, I removed 2.0 lbs roasted Sample I. Then, I removed 3200 g roasted beans for grinding. I put the extra roasted coffee beans (4.75 lbs) into a labeled IR-4 sample bag. See Part 3, pages 3-4 for more details. gc 12/2/13

### Grinding

<table>
<thead>
<tr>
<th>SAMPLE ID</th>
<th>TRT#</th>
<th>DATE / INITIAL</th>
<th>START TIME</th>
<th>FINISH TIME</th>
<th>GROUND COFFEE WEIGHT</th>
<th>SOP(s) FOLLOWED</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>01</td>
<td>12/2/13 gc</td>
<td>11:25 am</td>
<td>11:45 am</td>
<td>3200 g</td>
<td>7-2.0, 7-8.0</td>
</tr>
</tbody>
</table>

**Notes:** (If applicable note the number of batches prepared for extraction and freeze drying runs, and refer to those batches in the subsequent tables.)
I prepared 2 batches of ground coffee, 2 x 1600 g. I labeled the ground coffee Sample E. I placed the ground coffee into 2 paper bags (800 g each) and then into a plastic ziploc bag for each batch. See Part 3, pages 4-5 for more details. gc 12/2/13

---

**Part 4 Page 1**

Total no. of pages in this section at initial pagination: 6
### EXTRACTING

<table>
<thead>
<tr>
<th>SAMPLE ID</th>
<th>TRT#</th>
<th>BATCH #</th>
<th>GROUND COFFEE WEIGHT</th>
<th>DATE / INITIAL</th>
<th>START TIME</th>
<th>FINISH TIME</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>01</td>
<td>1</td>
<td>1600 g</td>
<td>12/3/13</td>
<td>7:54 am</td>
<td>8:42 am</td>
<td>1600 g ground coffee + 10 liters water.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Soluble solids = 4.20 ppt (4200 ppm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Recovered 8884 ml coffee extract. 9/12/513</td>
</tr>
<tr>
<td>E</td>
<td>01</td>
<td>2</td>
<td>1600 g</td>
<td>12/5/13</td>
<td>8:51 am</td>
<td>9:41 am</td>
<td>1600 g ground coffee + 10 liters water.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Soluble solids = 4.30 ppt (4300 ppm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Recovered 8874 ml coffee extract. 9/12/513</td>
</tr>
</tbody>
</table>

### EXTRACT FREEZING

<table>
<thead>
<tr>
<th>SAMPLE ID</th>
<th>TRT#</th>
<th>BATCH #</th>
<th>START DATE / INITIAL</th>
<th>TIME</th>
<th>FINISH DATE / INITIAL</th>
<th>TIME</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>01</td>
<td>1</td>
<td>12/3/13</td>
<td>12:10 am</td>
<td>12/4/13</td>
<td>7:40 am</td>
<td>Followed SOP # 7-2.0</td>
</tr>
<tr>
<td>E</td>
<td>01</td>
<td>2</td>
<td>12/5/13</td>
<td>11:30 am</td>
<td>12/6/13</td>
<td>10:45 am</td>
<td>Followed SOP # 7-3.0</td>
</tr>
</tbody>
</table>

### FREEZE DRYING

<table>
<thead>
<tr>
<th>SAMPLE ID</th>
<th>TRT#</th>
<th>BATCH #</th>
<th>START DATE / INITIAL</th>
<th>TIME</th>
<th>FINISH DATE / INITIAL</th>
<th>TIME</th>
<th>FREEZE DRIED COFFEE WEIGHT</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>01</td>
<td>1</td>
<td>12/4/13</td>
<td>7:42 am</td>
<td>12/7/13</td>
<td>4:57 am</td>
<td>339.1 g</td>
<td>Followed SOPs 7-2.0 and 7-10.0</td>
</tr>
<tr>
<td>E</td>
<td>01</td>
<td>2</td>
<td>12/8/13</td>
<td>10:50 am</td>
<td>12/11/13</td>
<td>1:00 am</td>
<td>338.6 g</td>
<td>Followed SOPs 7-2.0 and 7-10.0</td>
</tr>
</tbody>
</table>

Sample K total weight = 677.7 g
<table>
<thead>
<tr>
<th>DATE/INITIAL</th>
<th>TIME</th>
<th>SAMPLE ID</th>
<th>TRT#</th>
<th>BATCH#</th>
<th>TC 3 [T3] (°C)</th>
<th>VACUUM [V1] (mTorr)</th>
<th>SHELF TEMP (°C)</th>
<th>TEMP [C]</th>
<th>REL TEMP [RT] (°C)</th>
<th>AIR TEMP [AT] (°C)</th>
<th>VOLTAGE [LV] (volts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/4/13</td>
<td>8:00</td>
<td>E</td>
<td>01</td>
<td>1</td>
<td>-42</td>
<td>134</td>
<td>-03</td>
<td>-46</td>
<td>1.1</td>
<td>25</td>
<td>202</td>
</tr>
<tr>
<td>12/4/13</td>
<td>2:20</td>
<td>E</td>
<td>01</td>
<td>1</td>
<td>-29</td>
<td>387</td>
<td>-04</td>
<td>-38</td>
<td>31</td>
<td>31</td>
<td>200</td>
</tr>
<tr>
<td>12/5/13</td>
<td>6:35</td>
<td>E</td>
<td>01</td>
<td>1</td>
<td>-19</td>
<td>789</td>
<td>-05</td>
<td>-38</td>
<td>23.6</td>
<td>28</td>
<td>202</td>
</tr>
<tr>
<td>12/5/13</td>
<td>2:30</td>
<td>E</td>
<td>01</td>
<td>1</td>
<td>-15</td>
<td>797</td>
<td>-03</td>
<td>-36</td>
<td>31.4</td>
<td>32</td>
<td>200</td>
</tr>
<tr>
<td>12/6/13</td>
<td>9:45</td>
<td>E</td>
<td>01</td>
<td>1</td>
<td>-11</td>
<td>430</td>
<td>-02</td>
<td>-41</td>
<td>50.7</td>
<td>29</td>
<td>200</td>
</tr>
<tr>
<td>12/6/13</td>
<td>2:45</td>
<td>E</td>
<td>01</td>
<td>1</td>
<td>18</td>
<td>457</td>
<td>29</td>
<td>39</td>
<td>55.6</td>
<td>31</td>
<td>199</td>
</tr>
<tr>
<td>12/7/13</td>
<td>8:45</td>
<td>E</td>
<td>01</td>
<td>1</td>
<td>34</td>
<td>154</td>
<td>30</td>
<td>-43</td>
<td>73.5</td>
<td>29</td>
<td>201</td>
</tr>
<tr>
<td>12/7/13</td>
<td>4:55</td>
<td>E</td>
<td>01</td>
<td>1</td>
<td>34</td>
<td>150</td>
<td>31</td>
<td>-44</td>
<td>81.7</td>
<td>28</td>
<td>200</td>
</tr>
<tr>
<td>12/8/13</td>
<td>11:05</td>
<td>E</td>
<td>01</td>
<td>2</td>
<td>-32</td>
<td>246</td>
<td>-06</td>
<td>-42</td>
<td>0.7</td>
<td>24</td>
<td>204</td>
</tr>
<tr>
<td>12/8/13</td>
<td>12:50</td>
<td>E</td>
<td>01</td>
<td>2</td>
<td>-25</td>
<td>590</td>
<td>-05</td>
<td>-35</td>
<td>2.5</td>
<td>29</td>
<td>200</td>
</tr>
<tr>
<td>12/9/13</td>
<td>6:25</td>
<td>E</td>
<td>01</td>
<td>2</td>
<td>-16</td>
<td>880</td>
<td>-05</td>
<td>-38</td>
<td>20.0</td>
<td>28</td>
<td>203</td>
</tr>
<tr>
<td>12/9/13</td>
<td>2:30</td>
<td>E</td>
<td>01</td>
<td>2</td>
<td>-14</td>
<td>717</td>
<td>-03</td>
<td>-38</td>
<td>28.0</td>
<td>31</td>
<td>200</td>
</tr>
<tr>
<td>12/10/13</td>
<td>7:25</td>
<td>E</td>
<td>01</td>
<td>2</td>
<td>-3</td>
<td>370</td>
<td>-01</td>
<td>-41</td>
<td>45.0</td>
<td>29</td>
<td>202</td>
</tr>
<tr>
<td>12/10/13</td>
<td>4:30</td>
<td>E</td>
<td>01</td>
<td>2</td>
<td>32</td>
<td>243</td>
<td>31</td>
<td>-41</td>
<td>54.0</td>
<td>31</td>
<td>200</td>
</tr>
<tr>
<td>12/11/13</td>
<td>6:10</td>
<td>E</td>
<td>01</td>
<td>2</td>
<td>33</td>
<td>133</td>
<td>31</td>
<td>-44</td>
<td>67.6</td>
<td>29</td>
<td>200</td>
</tr>
<tr>
<td>12/11/13</td>
<td>12:55</td>
<td>E</td>
<td>01</td>
<td>2</td>
<td>35</td>
<td>142</td>
<td>31</td>
<td>-42</td>
<td>74.3</td>
<td>31</td>
<td>201</td>
</tr>
</tbody>
</table>