Increasing Tea Yields Versus Maintaining Quality: Managing yields through tea products diversification

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Programmes

1. Crop Improvement and Management (CIM)
2. Tea Processing and Value Addition (TPVA)
3. Sustainable Ecosystem Management and Conservation (SEMC)
4. Economics, Field Advisory and Corporate Communication (EFACC)
5. Support Services Management (SSM)
Crop Improvement Management

Broad objective
To develop and avail tea varieties/ clones that combine high yields and acceptable orthodox/CTC black/green/purple/white/oolong tea quality of the processed tea as desired by consumers
Phases of Tea Improvement at TRFK

Base Population
- Nursery

Progeny Tests
- Nursery

Clonal Field Trials (DUS Tests)
- Nursery

Clonal Adaptability Trials (DUS Tests)

Multiplication Plots

Release to farmers

1 Year: Pollination and seed development
1 Year: seedlings rearing
7 Years: OP & HP seedlings
1 Year: VP plants
8 Years
1 Year: VP plants
5 Years: Participatory
3 Years: Upscaling

Maximum period = 23 years
OVERVIEW

• Tea is produced in 52 countries in the world which comprise of mainly tropical and sub-tropical countries;
• In Kenya it is grown exclusively in the highlands at attitudes ranging from 1500 to 2700m;
• Kenya is the third largest producer of tea in the world after China and India and it is also the world’s largest exporter of black tea;
• Tea cultivation and manufacturing are presently being practiced in 18 of Kenya’s 47 counties and impacts a large proportion of Kenya’s over 40 million people;
• In Kenya, tea is the largest employer in the private sector, with more than 4 million people working in the tea sector. Over 60% of Kenyan tea is grown by smallholders;
• It is the largest single export commodity and major foreign exchange earner for Kenya;
• In 2014 for example, Kenya exported 445.1 million kilograms of made tea, which resulted to over $ 1.15 billion foreign earnings.
Global Performance of the Tea Industry in 2014

- Although Kenya is ranked third in annual tea production after China and India with tea produced in Kenya accounting for about 10% of the world production and about 24% of the export share, Kenya has the highest productivity (yield per unit hectare).
- This is attributable to deployment of appropriate Research and Development outputs in the production value chain and favorable weather.

3-Year Mean Kg mt/ha

Tea productivity (KgMT/ha/yr) in major producing countries in 2014 (Source: International Tea Committee: Annual Bulletin of Statistics – 2015)
Productivity of Estates Vs Smallholders Sub-Sectors

• Production area has also been rising rapidly, mainly in the smallholder sub-sector as more area is put under the recently released high yielding and better quality clones.
• However, the last 10-year average yield of about 2,000 kilograms of made tea per hectare per year (kg/mt/ha/yr) among the small holders is still low compared to over 2,600 kg/mt/ha in the estate sub-sector. This yield differential in the two sub-sectors, is attributed to the different levels of adoption and deployment of recommended technologies by growers.
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Note: Assuming adoption of GAP and attainment of 1 Kg GL/Yr = 3,000 Kg mt/ha,
Percent share of World Tea Production in 2014

### Production of Diversified Tea Products in Major Tea Growing Countries in 2014 (In Thousand Metric Tons)

<table>
<thead>
<tr>
<th>Country</th>
<th>Production in Thousand Metric Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>1,108</td>
</tr>
<tr>
<td>Kenya</td>
<td>426</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>311</td>
</tr>
<tr>
<td>Indonesia</td>
<td>90</td>
</tr>
<tr>
<td>Vietnam</td>
<td>8</td>
</tr>
<tr>
<td>China</td>
<td>180</td>
</tr>
<tr>
<td>Turkey</td>
<td>230</td>
</tr>
</tbody>
</table>

**Production in Thousand Metric Tons**

- **CTC**: Green bars
- **Orthodox**: Green line

World Exports of Tea, 2014

% Share

- India: 16.5%
- Kenya: 27.3%
- Sri Lanka: 11.2%
- Indonesia: 7.2%
- Vietnam: 3.6%
- China: 17.4%

Value of Exports of Tea, 2014

<table>
<thead>
<tr>
<th>Country</th>
<th>Value of Exports (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sri Lanka</td>
<td>1,558,716.00</td>
</tr>
<tr>
<td>China</td>
<td>1,273,472.00</td>
</tr>
<tr>
<td>India</td>
<td>642,252.00</td>
</tr>
<tr>
<td>Kenya</td>
<td>1,150,097.00</td>
</tr>
<tr>
<td>Indonesia</td>
<td>134,584.00</td>
</tr>
<tr>
<td>Vietnam</td>
<td>228,000.00</td>
</tr>
<tr>
<td>Turkey</td>
<td>5,900.00</td>
</tr>
</tbody>
</table>

Leading Export Market for Sri Lanka, 2014

Metric Tons

- Russian Federation: 222,498.00
- Turkey: 208,830.00
- Iran: 156,501.00
- Iraq: 89,068.00
- UAE: 84,758.00

Leading Export Market for Kenya Black tea, 2014

Metric Tons

- Pakistan: 242,668.00
- Egypt: 228,409.00
- Afghanistan: 115,620.00
- UK: 112,449.00
- CIS: 104,076.00

Leading Export Market for China Black tea, 2014

Metric Tons

USA: 8,022.00
Hong Kong: 3,357.00
Germany: 3,041.00
Pakistan: 2,070.00

Leading Export Market for China Green tea, 2014

Metric Tons

Morocco: 58,536.00
Togo: 16,884.00
Uzbekistan: 16,329.00
Algeria: 14,997.00
Senegal: 13,189.00

VARIOUS HIGH VALUE TEA PRODUCTS FROM OTHER TEA PRODUCING COUNTRIES
The tea processing methods include non-aerated for, (1) white, (2) non-aerated green orthodox tea (3) non aerated purple orthodox tea (4) yellow orthodox (5) aerated black orthodox (6) brick-pu-erh (7) pu-erh orthodox tea. (8) Black CTC tea.
Comparison of catechin levels between Kenyan and high value Chinese and Indonesian green orthodox teas

% Catechin contents of various green orthodox teas

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GA (%)  EC (%)  CAF (%)  EC (%)  EGCG (%)  ECG (%)  TCC (%)

TRFK 597/1  TRFK 704/2  TRFK 301/3  JFK S 15/10  TRFK K-PURPLE  TRFK 6/8  TRFK 91/1  JFK TLT 4/41  JFK TLT 20/51  JFK ARD5  Feng shan  Lougjin 43  2 Tang Finest Tea
### Yield Reduction of CTC Tea by 30% Production of Black Orthodox

<table>
<thead>
<tr>
<th>Production (Kg)</th>
<th>Estate</th>
<th>Smallholder</th>
<th>Total</th>
<th>Value of CTC Alone (USD)</th>
<th>Value of CTC &amp; ORTH (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100% CTC</td>
<td>182,686,124</td>
<td>262,418,610</td>
<td>445,104,734</td>
<td>1,023,740,888</td>
<td></td>
</tr>
<tr>
<td>70% CTC</td>
<td>127,880,287</td>
<td>183,693,027</td>
<td>311,573,314</td>
<td></td>
<td>716,618,622</td>
</tr>
<tr>
<td>30% Orthodox</td>
<td>54,805,837</td>
<td>78,725,583</td>
<td>133,531,420</td>
<td></td>
<td>667,657,101</td>
</tr>
<tr>
<td>Grand total</td>
<td>182,686,124</td>
<td>262,418,610</td>
<td>445,104,734</td>
<td>1,023,740,888</td>
<td>1,384,275,723</td>
</tr>
</tbody>
</table>

**HOW?**

1. All Kenyan tea improved cultivars are suitable for black orthodox and oolong teas;
2. Some selected cultivars low in catechins are suitable for green orthodox teas;
3. One cultivar is suitable for unoxidised orthodox purple tea;
4. Several Kenyan cultivars are suitable for silvery tips;
5. Investing in appropriate processing facilities;
6. Vigorous marketing of Kenya tea based on health and cleanliness from pesticide residues;
7. Supporting R&D for product development, value addition, validation and characterization for nutritional information.
TRFK 306

Special attributes

• Anthocyanin-rich (purple pigmentation) - medicinal tea product
• Drought, frost, disease and pest resistant
• Yield potential similar to the high yielding standard check and commercial clone TRFK 31/8
• Wide adaptability and suitable for all designated tea growing regions
• Suitable for extraction of high quality tea seed oil
• Released in July 2011
TRFK 371/8

- High Yielding (3 Kg/bush/year)
- High black tea quality under hand and machine harvesting
- Moderate to poor fermenter: good for processing of green tea
- Moderately tolerant to drought effects
- High levels of theaflavins (TF) and thearubigins same as TRFK 6/8
- Medium-high levels of total polyphenols: 22.5%
- Highly tolerant to root knot nematode
- Suitable for silvery tips (white tea)
- Wide adaptability
- Granted provisional release in 2015
Special attributes

- Low caffeine (< 2.0%)
- Drought, frost, disease and pest tolerant
- Yield potential similar to the high yielding standard check and commercial clone TRFK 31/8
- High catechin content - suitable for catechin tablets & capsules
- Wide adaptability and suitable for all designated tea growing regions
- Suitable for high quality black orthodox or CTC tea
- Granted provisional release certificate in 2014
Special attributes

- Low caffeine
- Drought, frost, disease and pest tolerant
- Yield potential similar to the high yielding standard check and commercial clone TRFK 31/8
- Low catechin content - low astringency
- Wide adaptability and suitable for all designated tea growing regions
- Suitable for high quality green orthodox or CTC tea
- Granted provisional release certificate in 2014
Tea product = Cultivar (C) + Processing technology (PT) + Manager (M) + Environment (E) + C x PT x M x E
LET’S DIVERSIFY BY PROCESSING NOVEL TEA PRODUCTS LIKE GREEN, PURPLE & BLACK ORTHODOX TEAS, OOLONG, WHITE TEA, TEA SEED OIL, TEA EXTRACTS FOR PHARMACEUTICAL, COSMETICS AND CONFECTIONERY INDUSTRY IN ORDER TO REDUCE LARGE QUANTITIES OF CTC TEAS

THANK YOU