Cultivar group: ABB - Pisang Awak

1. Estimate yield potential in monoculture without limiting factors:
   Biggest recorded bunch weight: 75 kg
   Days to harvest: 450 days
   Plant density for high density annual planting: 1000 plants/ha
   Plant density for perennial monoculture: 900 plants/ha
   Formula for estimating yield potential (Ortiz and Vuylsteke, 1998):
   \[
   \text{Yield Potential in tons/ha} = \frac{\text{biggest recorded bunch weight in kg} \times 365 \times \text{plant density ha}^{-1}}{(\text{days from planting to harvest} \times 1000)}
   \]
   Calculated yield for high density annual monoculture: 60.83 tons/ha
   Calculated yield for perennial monoculture: 54.75 tons/ha

2. Estimate yield variability for two important contrasting production systems or production zones for the cultivar group following the diagram:

   ![Yield Variability Diagram]

   Global yield potential
   Above average farmer yield in production zone
   Average farmer yield in production zone
   Below average farmer yield in production zone
   Worst case scenario yield
2.1 Identify major production zones/production systems you are most familiar with:

1) Asia - India - Karpooravalli - Small-holder monoculture 1+2 (1 mothercrop + 2 ratoons); Malaysia - Kluai Namwa - small-holder monoculture

2) Africa - Kayinja - Low-maintenance, low-density perennial

2.2 From the list, select two contrasting production systems in different production zones or common production system in two contrasting zones and estimate yields:

Production system 1:
Location: India, Southern India (country, zone)
Cultivar name: Karpooravalli (Pisang Awak)
Production system: Small-holder monoculture 1+2, irrigated
Brief description of total rainfall, length of dry season(s), altitude, longitude/latitude:
Total rainfall: 200-400 mm/year - irrigated
Length of dry season: 9 months
Altitude: 0-600 masl
Long/Lat: look it up - southern India

For this zone, estimate the average yield/ha/yr, above average farmer yield and below average farmer yield (using bunches ha/yr and mats/ha). Finally indicate yields/ha/yr if important pest/disease and production problems are severe (worst case scenario).

Above average farmers – production system 1:
Yield: 25.6 t/ha/yr  Bunches/ha/year:  900  Mats/ha: 1000

Average farmers – production system 1:
Yield: 20.1 t/ha/yr  Bunches/ha/year:  900  Mats/ha: 1000

Below average farmers – production system 1:
Yield: 14.6 t/ha/yr  Bunches/ha/year: 900  Mats/ha: 1000

Worst case scenario – production system 1:  Yield: 0 t/ha/yr (Fusarium wilt)

Production system 2:
Location: Uganda, Tanzania, Rwanda, Burundi, Eastern DRC (country, zone)
Cultivar name: Kayinja (Pisang Awak)
Production system: Low-maintenance, perennial, rain-fed, low-density
Brief description of total rainfall, length of dry season(s), altitude, longitude/latitude:
Total rainfall: 800-2000 mm/year
Length of dry season: 2 dry seasons - 5 months total
Altitude: 800-2000 masl
Long/Lat: Look it up - EAH

For this zone, estimate the average yield/ha/yr, above average farmer yield and below average farmer yield (using bunches ha/yr and mats/ha). Finally indicate yields/ha/yr if important pest/disease and production problems are severe (worst case scenario).

**Above average farmers – production system 2:**
Yield: 23.7 t/ha/yr      Bunches/ha/year: 1300    Mats/ha: 1500

**Average farmers – production system 2:**
Yield: 11.9 t/ha/yr      Bunches/ha/year: 1300    Mats/ha: 1600

**Below average farmers – production system 2:**
Yield: 3.3 t/ha/yr      Bunches/ha/year: 1200    Mats/ha: 1700

**Worst case scenario – production system 2:** Yield: 0 t/ha/yr (Xanthomonas wilt)

2.3 Identify major factors explaining yield differences as shown in the diagram

<table>
<thead>
<tr>
<th>Major factors in yield variability</th>
<th>Production zone 1</th>
<th>Production zone 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type 1:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>difference between global potential and above average farmer yields</td>
<td>– irrigation management (dry season)</td>
<td>– selection of best ecotype</td>
</tr>
<tr>
<td></td>
<td>– fertilizer management</td>
<td>– fertilizer</td>
</tr>
<tr>
<td></td>
<td>– selection of the best ecotype</td>
<td>– water</td>
</tr>
<tr>
<td></td>
<td>– presence/absence of Fusarium and other diseases/pests</td>
<td>– disease management (BXW, Fusarium)</td>
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<tr>
<td></td>
<td>– control/management of</td>
<td>– weeds</td>
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<tr>
<td></td>
<td></td>
<td>– sucker density</td>
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<tr>
<td></td>
<td></td>
<td>– plant density</td>
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<tr>
<td>Type 2: difference between average and above average farmer yields</td>
<td>diseases</td>
<td></td>
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<tr>
<td>---------------------------------------------------------------</td>
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<td></td>
</tr>
<tr>
<td>− irrigation management</td>
<td>− good plantation management, e.g. desuckering, mulching, weeding</td>
<td></td>
</tr>
<tr>
<td>− fertilizer management</td>
<td>− some disease management</td>
<td></td>
</tr>
<tr>
<td>− sucker management</td>
<td>− water</td>
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</tbody>
</table>

<table>
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<tr>
<th>Type 3: difference between average and below average farmer yields</th>
<th>diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>− Fusarium wilt</td>
<td>− some management, e.g. some desuckering, some weeding</td>
</tr>
<tr>
<td>− long spells of drought</td>
<td>− water</td>
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</tbody>
</table>

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<thead>
<tr>
<th>Type 4: difference between below average farmer yields and worst case scenario</th>
<th>diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>− Fusarium wilt</td>
<td>− heavy infection of BXW</td>
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<tr>
<td>− typhoon (Philippines)</td>
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</tbody>
</table>
- accessibility to far-away good markets; transport is available, but low priority given to Pisang Awak (priority Grand Nain)
- very high dry matter, very sweet --> opportunity to produce juice, figs, ethanol and other processing
- processing process and technologies need to be improved
- no quality control
- no product differentiation, need improved packaging and marketing

ii) intra-household roles, decision making, and resource allocation

<table>
<thead>
<tr>
<th><strong>Production zone 1</strong></th>
<th><strong>Production zone 2</strong></th>
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<tr>
<td>women play small role, both in production and processing, marketing, ...</td>
<td>brewer can be both men and women</td>
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<tr>
<td>but women buy in the market, decide on what children eat</td>
<td>processing could be promoted for women</td>
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<tr>
<td></td>
<td>local selling is often women with children or older women</td>
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</tbody>
</table>

iii) household resource endowment (labor, capital, land, information)

<table>
<thead>
<tr>
<th><strong>Production zone 1</strong></th>
<th><strong>Production zone 2</strong></th>
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<tbody>
<tr>
<td>access to subsidies provided by government</td>
<td>uses a lot of family labour (including children)</td>
</tr>
<tr>
<td>exchange with extension agencies - information to new technologies</td>
<td>if they want to improve production, they need to manage their crop (rather than leaving the crop unmanaged) --&gt; this means need to allocate more labour</td>
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<tr>
<td>high-quality planting material (disease-free)</td>
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2.5 Identify trends or (likely) future changes (e.g. climate change, spread of diseases) which may alter the importance of limiting factors or the opportunities for smallholders producing this cultivar group?

If climate change would increase drought in these regions, then this would further reduce yield.

Migration to urban areas would reduce labour force; maybe Kayinja will become more popular because it is a low-maintenance crop. But there will also be a higher demand for locally produced beer.
Changing consumer preferences - banana juice is becoming more and more popular.

Distillation is forbidden, but not enforced. If this would become enforced, that would have a major impact.

2.6 Based on the factors explaining yield variability, other intervention options and trends and changes, select up to 8 priority intervention options for the cultivar group which have applicability across major production zones. Please rank them by order of importance (1 = highest importance).

1. Improved processing; development of better high-value products (reasons: high yield potential, consumer preference, high Brix)

2. Value chain development: Increase production and link farmers with urban processors, and development of rural processing facilities, product differentiation/diversification (quality, packaging, ...), improved transport and marketing opportunities (now it is second-priority after Grand Nain)

3. Increased use of GR (screen of ABB types for East Africa) for productivity and Foc and BXW resistance, including selection of better clonal variants, and GMOs for BXW and Foc

4. Access to high-yielding, disease-free good planting material

5. Improved field management (disease - Foc, BXW, BBrMV, irrigation, desuckering, weeding, ...) and extension (mindset has to be changed)

6. Improved labour use efficiency, both in production and processing

7. Explore new production areas