The Role of Agriculture Looking Forward

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Structure of Presentation

I. Traditional considerations

II. Two long run concerns
   A. Natural resource revenues and Dutch disease
   B. Climate change

III. Mozambique in a world that mitigates

IV. Conclusions
Traditional Considerations for Agriculture

A. Production potential and technology (supply)
B. Population and income (demand)
C. International/regional trade (prices)
D. Employment and welfare (social)
Mozambique – Supply Side

• High potential
  – Quantity of arable land
  – Rainfall
  – Irrigation potential
  – Reasonable soils

• But, low productivity
  – Essentially all figures point this direction
  – Little productivity improvement, at least until recently

• Not that many other places in the world with this level of unrealized potential.
Traditional Considerations for Agriculture

A. Production potential and technology (supply)
B. Population and income (demand)
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Population Projections (UN Medium Variant)
Observations - Population

• Nearly half of global population growth to 2050 will occur in Africa.
• Sub-Saharan Africa will account for more than 20% of global population by 2050.
• Africa is not “small” in population terms and is set to become much more important.
• Mozambican population is projected to grow more rapidly than the rest of Africa (going from 25 million today to 60 million in 2050).
Per Capita GDP Growth by Decade

Source: World Development Indicators
# Mozambique - Food Shares

<table>
<thead>
<tr>
<th>Quintile</th>
<th>Foods</th>
<th>Non Food</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>64.4%</td>
<td>36.4%</td>
</tr>
<tr>
<td>2</td>
<td>67.8%</td>
<td>32.5%</td>
</tr>
<tr>
<td>3</td>
<td>67.5%</td>
<td>32.7%</td>
</tr>
<tr>
<td>4</td>
<td>64.6%</td>
<td>35.7%</td>
</tr>
<tr>
<td>5</td>
<td>47.2%</td>
<td>52.8%</td>
</tr>
</tbody>
</table>

Source: IOF 2008-09.
Traditional Considerations for Agriculture

A. Production potential and technology (supply)
B. Population and income (demand)
C. International/regional trade (prices)
D. Employment and welfare (social)
World Markets
Producer Prices for Agriculture

Source: USDA
Traditional Considerations for Agriculture

A. Production potential and technology (supply)
B. Population and income (demand)
C. International/regional trade (prices)
D. Employment and welfare (social)
Social – Principal Occupation by Sector

Source: Jones and Tarp, 2013
Summary – Mozambican Agriculture

• Strong supply potential (largely unrealized)
• Rapid demand growth for food
• Generally favorable international price environment
• Potential for large social gains from agricultural growth

By traditional indicators, good reasons to push agricultural development looking forward.
Concern 1: Natural Resource Revenues
Natural Resources and Development

• International experience is mixed

• Principal issues:
  – Unequal distribution of benefits
  – Conflict
  – Loss of international competitiveness (Dutch disease)
Essential Challenge for Developing Countries with Resources

• Convert natural capital below the ground,
  – Gas
  – Coal
  – Etc.,

• Into physical and human capital above the ground.
  – Road
  – Rail
  – Ports
  – Schools
  – Water and sanitation infrastructure, etc.

• Easy to say but hard to do!
Convert Natural Resource Capital

Schematic geology of natural gas resources

- Conventional non-associated gas
- Coalbed methane
- Conventional associated gas
- Seal
- Sandstone
- Tight sand gas
- Gas-rich shale
- Oil
Into Physical Capital
And Human Capital
But consumption is tempting
Natural Resource Revenues

Resources require major investments in order to realize value.

- Coal
  - Rail transport
- Natural gas
  - LNG trains
- Hydropower
  - Dams and transmission
Coal: Exports Constrained by Transport Capacity
Natural Gas: Investment in LNG Trains

![Graph showing investment in LNG Trains from 2018 to 2033.

- **2018 to 2019:** 2 Comboios
- **2020:** 4 Comboios
- **2021:** 6 Comboios
- **2022:** 8 Comboios
- **2023:** 10 Comboios
- **2024:** 12 Comboios
- **2025:** 14 Comboios
- **2026:** 16 Comboios
- **2027:** 18 Comboios
- **2028:** 20 Comboios
- **2029:** 22 Comboios
- **2030:** 24 Comboios
- **2031:** 26 Comboios
- **2032:** 28 Comboios
- **2033:** 30 Comboios

Legend:
- Blue: 2 Comboios
- Red: 4 Comboios
- Green: 6 Comboios

*Note: TBtu represents trillion British thermal units.*
Government Revenue

• Enormous uncertainties:
  – Quantity of reserves, particularly for gas
  – Costs of extraction
  – Pace of investment
  – Prices received

• Regular government revenues from resources:
  – Unlikely to be very substantial before about 2025
  – Ramp up quickly
  – Potentially large, 5-6 billion USD/year before 2030 is possible
Example: Gas Price Uncertainty and Government Revenue from Gas

NOT a forecast. Numbers are meant to illustrate the implications of gas price uncertainty. Many other factors can also substantially alter likely revenue trajectories.
Summary – Natural Resources

• Despite the uncertainties, significant and regular natural resource revenues can be expected in about 10 years.

• Assume:
  – GDP growth of 7% over the next 10 years
  – Government spending at 33% of GDP in about 2025
  – Natural resource government revenues of 5 billion USD in about 2025

• Then, natural resource revenues would be about 40% of government spending in 2025
Implications for Agriculture

• The resource boom does not undermine and likely supports the case for investment in agriculture:
  – Large investment needs
  – Distributed benefits
  – Strong potential for productivity gains to maintain competitiveness
Concern 2: Climate Change

Draws from recently published work with James Thurlow and others.
Mozambique - Changes in GDP with globally unconstrained emissions

Change in total value-added (2046-2050)

Deviation from baseline, 2046-2050
Net Present Value of GDP Losses

Cumulative change in total value-added
(5% discount rate applied, units in billions of 2007 USD)

Source: Arndt and Thurlow, 2014.
Implications

• Under unconstrained emissions:
  – Climate change shocks are negative for the large majority of future possible climates.
  – Climate change shocks become progressively more negative with time.
  – Large impacts are associated with big increases in the frequency and severity of flooding events.
  – But, the growth effects in agriculture and elsewhere are small on a per year basis, particularly in the next two decades.

• Solid reasons for investing into agriculture. Research into heat resistant varieties is particularly important.
What about global mitigation?
Recent events

• Agreement between the United States and China:
  – USA to reduce greenhouse gas emissions to 26-28% below 2005 levels by 2025 (with steeper reductions thereafter).
  – China to halt emissions growth before 2030 (with absolute declines thereafter).

• We will see. Nevertheless, prospects for real progress on global emissions are brighter, perhaps than ever before.
Effects of Global Mitigation Policy: Mozambique

Change in total value-added (GDP)

- Unconstrained Emissions
- L1 Stabilization (with UE prices)

Average deviation from baseline, 2046-2050
World Oil Producer Prices
(Unconstrained emissions versus L1S)
Effects of Global Mitigation Policy: Mozambique

Change in total value-added (GDP)

- Unconstrained Emissions
- L1 Stabilization (with UE prices)
- L1 Stabilization (with L1S prices)

Average deviation from baseline, 2046-2050
World Natural Gas Producer Prices (Unconstrained emissions versus L1S)
Principal Likely “World” Price Effects of Serious Global Mitigation Policy

<table>
<thead>
<tr>
<th>Product</th>
<th>Effect</th>
<th>Implication for Mozambique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil</td>
<td>Reduce</td>
<td>Good</td>
</tr>
<tr>
<td>Coal</td>
<td>Reduce</td>
<td>Bad</td>
</tr>
<tr>
<td>Natural gas</td>
<td>Increase then reduce</td>
<td>Good then bad</td>
</tr>
<tr>
<td>Hydro electricity</td>
<td>Increase</td>
<td>Good</td>
</tr>
<tr>
<td>Agriculture</td>
<td>Increase</td>
<td>?</td>
</tr>
</tbody>
</table>
Conclusions 1

• Solid reasons to invest in agriculture based on traditional considerations
  – supply potential,
  – demand growth,
  – world prices, and
  – social objectives
Conclusions 2

• Our two concerns,
  – Natural resource boom and
  – Climate change,
generally reinforce the desirability of a vibrant and productive agricultural sector.

• Converting natural resource capital below the ground into agricultural investment above the ground makes a lot of sense.
Future Research: Some Thoughts on Mitigation

• Whether Mozambique joins a global mitigation regime or not, the world price effects of global mitigation are likely to have substantial implications for Mozambique.

• Once Mozambique attains middle income status (perhaps in 10-15 years), pressure to join a global regime (if it exists) is likely to increase.

• Overall, global mitigation is likely to impose some costs but also offer a series of strategic opportunities, particularly in agriculture.