DIGITAL ECONOMY AND ECONOMIC TRANSFORMATION: AGRICULTURE IN EAST AFRICA

Presentation by

Dr. Maximiliano Mendez-Parra
Senior Research Fellow
International Economic Development Group
Overseas Development Institute (ODI)
United Kingdom of Great Britain and Northern Ireland
Digital Economy and Economic Transformation: Agriculture in East Africa

Dr Max Mendez-Parra
The digital economy in Africa

- Limits of traditional manufacturing/agriculture development challenge structural change (re-shoring, automation, etc.).
- Increasing servicification of manufacturing/agriculture.
- Anecdotal evidence suggests that services content in manufacturing and agriculture going up in most African countries (ODI, 2018)
- Knowledge-based services (e.g. Fintech) have been particularly dynamic.
- African companies have developed innovative technological solutions for the provision of services (e.g. M-Pesa)
- The digital economy is changing production, consumption and trade processes in all sectors, affecting value chains. This changes the way to approach the critical economic transformation of Africa.
- Current research on the use of mobile platforms in agriculture in East Africa is showing how is changing production
Persistent digital divide in access and use

Regional share of the number of industrial robots shipped globally in 2015 (%)

Use of internet in Kenyan manufacturing

Source: Data from International Federation of Robotics (2016).

Impact of internet penetration

Average impact of doubling of internet penetration on manufacturing labour productivity (%)

- Low-income countries: 3.3%
- Middle-income countries: 11.3%
Momentum in the AgriTech space

- Global food demand is expected to increase by anywhere between 59% and 98% by 2050 as the world population reaches an estimated 9.7 billion.
- Changing modus operandi: Ag-servificiation a reality (increased content of services in Ag)
- How can this be disruptive?
  - Disruption is not a linear process and can affect different actors in a value chain differently, from farmers and women to logistic providers to multinational organisations
  - Important to understand what is disruptive, to who and how?
AgriTech Types

Source: Krishnan, Banga and Mendez-Parra (2019)
3Cs: Adoption of AgriTech

Types of AgriTech:
- Ag Biotech & Biochem Data Connected Agriculture
- Robotics and Automation Innovative food and farming
- Mid-stream technologies

AgriTech Characteristics:
- Cost
- Complexity
- Capability

Source: Krishnan, Banga and Mendez-Parra (2019)
Sliding scale of disruption

Source: Krishnan, Banga and Mendez-Parra (2019)
Four ideal types of disruption

Source: Krishnan, Banga and Mendez-Parra (2019)
<table>
<thead>
<tr>
<th>Disruption type</th>
<th>AgriTech categorisation</th>
<th>East African user experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radical</td>
<td>Farm robotics through driverless farm tractors (e.g. Hello Tractor IBM/John Deere); Blockchains (e.g. Twiga Foods)</td>
<td>About 85% of users reported difficulty in uptake but were optimistic about the possible increase in productivity</td>
</tr>
<tr>
<td>Architectural</td>
<td>STARS in Kenya; and Makerere’s AI lab-driven automated visual diagnostics</td>
<td>70% of users interviewed claimed an improvement in productivity from real-time information</td>
</tr>
<tr>
<td>Incremental</td>
<td>VODP (Vegetable Oil Development Project) with SAP Uganda, E-Granary full value chain</td>
<td>Vertically Integrated chains, with higher trust</td>
</tr>
<tr>
<td>Frugal</td>
<td>SMS and USSD-based apps, such as N-Frnds Rwanda, PAD Kenya</td>
<td>Approximately 75% users claimed improved knowledge accumulation, better yields</td>
</tr>
</tbody>
</table>

Source: Krishnan, Banga and Parra (2019)
Sampling

• Sampling so far: 825 producers (437 PP; 388 NP)
• Crops: Maize, Coffee, Soybean
• Regions: Kyotera, Masaka, Mubende, Kalangana, Lira
• Data collection: Mixed method (Phase 1: 65 interviews, Phase 2: survey, Phase 3: Follow-up)

Source: https://www.nationsonline.org/oneworld/map/uganda-administrative-map.htm
Who adopt it?: Capabilities and Knowledge

<table>
<thead>
<tr>
<th>Variables</th>
<th>NP</th>
<th>PP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implicit capabilities index (average)</td>
<td>0.411 (0.014)</td>
<td>0.336*** (0.023)</td>
</tr>
<tr>
<td>ICT index (average)</td>
<td>0.324</td>
<td>0.419***</td>
</tr>
<tr>
<td>Explicit learning (%)</td>
<td>38.03 (1.031)</td>
<td>73.61*** (1.273)</td>
</tr>
</tbody>
</table>

*Mean value is significantly different from NP at 10% level
** Mean value is significantly different from NP at 5% level
*** Mean value are significantly different from NP at 1% level

Implicit or ex-ante capabilities (Lall 1993): assets or stocks of capital are implicit capabilities required by resource poor actors to participate in markets (Booysen et al., 2008). Scoones (1998)- Physical capital and productive capital

ICT capabilities index: based on access, use and skills (ITU indicators)

Explicit: Imitation, direct transfer, spillover

Source: Krishnan, Banga and Parra (forthcoming)
Willingness to pay

### Willingness to Pay

<table>
<thead>
<tr>
<th>Ranking of services</th>
<th>PP (% access and preference)</th>
<th>NP (% access and preference)</th>
</tr>
</thead>
<tbody>
<tr>
<td>working capital loans</td>
<td>92</td>
<td>73</td>
</tr>
<tr>
<td>Price</td>
<td>86</td>
<td>65</td>
</tr>
<tr>
<td>Weather</td>
<td>76</td>
<td>23</td>
</tr>
<tr>
<td>pest and diseases information</td>
<td>81</td>
<td>65</td>
</tr>
<tr>
<td>training in GAPs</td>
<td>76</td>
<td>70</td>
</tr>
<tr>
<td>training in chemical and fertilizer use</td>
<td>69</td>
<td>65</td>
</tr>
<tr>
<td>satellite imagery</td>
<td>48</td>
<td>18</td>
</tr>
<tr>
<td>sprayer services</td>
<td>41</td>
<td>44</td>
</tr>
<tr>
<td>transportation services</td>
<td>41</td>
<td>23</td>
</tr>
<tr>
<td>health and safety</td>
<td>39</td>
<td>12</td>
</tr>
<tr>
<td>soil testing</td>
<td>37</td>
<td>35</td>
</tr>
<tr>
<td>crop insurance</td>
<td>36</td>
<td>8</td>
</tr>
<tr>
<td>tractor services</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>water testing</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Laws (regional)</td>
<td>7</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: Krishnan, Banga and Parra (forthcoming)
### 6 pathways to transformation

<table>
<thead>
<tr>
<th>Pathway</th>
<th>PP</th>
<th>NP</th>
<th>Disruption type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Productivity (average O/I)</td>
<td>1.3**</td>
<td>1.01</td>
<td>Incremental</td>
</tr>
<tr>
<td>Value addition (%)</td>
<td>25***</td>
<td>6</td>
<td>Architectural</td>
</tr>
<tr>
<td>Diversification (%)</td>
<td>54</td>
<td>51</td>
<td>None</td>
</tr>
<tr>
<td>Formalisation of jobs (%)(^a)</td>
<td>95***</td>
<td>49</td>
<td>Architectural</td>
</tr>
<tr>
<td>Gender participation (%)</td>
<td>43</td>
<td>41</td>
<td>None</td>
</tr>
<tr>
<td>Value distribution (YOY%)</td>
<td>12***</td>
<td>-2</td>
<td></td>
</tr>
</tbody>
</table>

*Mean value is significantly different from NP at 10% level
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***Mean value are significantly different from NP at 1% level

\(^a\): does not account for enforcement of commercial contracts or access to government subsidies

**Disruption type: equal weighted**
- Quartiles of cost, complexity and capabilities
- Substituting more processes versus complementing

Source: Krishnan, Banga and Parra (forthcoming)
Challenges

Low social capital or e-trust
  Corruption
  Information asymmetry
  Re-intermediation with power asymmetries
New forms of knowledge
  ICT – tough to grasp
  Transference of skills/ job neutral skills supporting diversification
Value proposition
  Information: prices and news on surroundings ( but with infrastructural gaps!)
  Community support
Governance
  Vertical integration or dis/re intermediation
  Regional trade?

Source: Krishnan, Banga and Parra (forthcoming)