IS SMALL STILL BEAUTIFUL? REVIEW OF THE INVERSE FARM SIZE-EFFICIENCY RELATIONSHIP IN AFRICA

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Introduction

• Based on experiences from Asia, a smallholder-led growth strategy has been widely accepted as the pathway for achieving economic transformation and mass poverty reduction in Africa.

• Since smallholders also constitute the majority of farms in Africa, it is generally accepted that a smallholder-led strategy also holds the best prospects for economic development in Africa.
Doubts on the viability of a smallholder-led growth strategy in Africa???

1. Mounting POPULATION pressure and shrinking FARM SIZES

2. Signs of UNSUSTAINABLE forms of agricultural intensification

3. Changing FARM STRUCTURE-- rising proportion of land among medium-scale farms

4. Youth BULGE and limited NON-FARM
Total rural population projections

Source: UN Pop Council, 2013
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3. Changing FARM STRUCTURE—rising proportion of land among medium-scale farms
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Agricultural intensification -- Kenya

Figure 4: Net crop income per hectare cultivated

![Graph showing net crop income per hectare cultivated against population density]

- **Actual** (solid line)
- **Simulated** (dashed line)
Doubts on the viability of a smallholder-led growth strategy in Africa???

1. Mounting POPULATION pressure and shrinking FARM SIZES

2. Signs of UNSUSTAINABLE forms of agricultural intensification

   • As Harris and Orr (2013) ask, are most farms becoming, or have many already become, “too small” to generate meaningful production surpluses and participate in broad-based inclusive agricultural growth processes given existing on-shelf production

3. Changing FARM STRUCTURE-- rising proportion of land among
Doubts on the viability of a smallholder-led growth strategy in Africa???

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# Changing farm structure

Table 2: Changes in farm structure among small- and medium-scale farmers in Zambia (2009 - 2012)

<table>
<thead>
<tr>
<th>Landholding size Category</th>
<th>Number of farms</th>
<th>2001*</th>
<th>2009</th>
<th>2012</th>
<th>% change (2001-2012)</th>
<th>% of total farmland 2009</th>
<th>% of total farmland 2012</th>
<th>Share of landholding cultivated (2012)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 2 ha</td>
<td></td>
<td>638,118</td>
<td>916,787</td>
<td>748,771</td>
<td>17.3%</td>
<td>24.1%</td>
<td>16.2%</td>
<td>91.2%</td>
</tr>
<tr>
<td>2 – 5 ha</td>
<td></td>
<td>159,039</td>
<td>366,628</td>
<td>418,544</td>
<td>163.2%</td>
<td>33.8%</td>
<td>31.7%</td>
<td>66.4%</td>
</tr>
<tr>
<td>5 – 10 ha</td>
<td></td>
<td>20,832</td>
<td>110,436</td>
<td>165,129</td>
<td>692.6%</td>
<td>20.3%</td>
<td>25.0%</td>
<td>49.5%</td>
</tr>
<tr>
<td>10 – 20 ha</td>
<td></td>
<td>2,352</td>
<td>35,898</td>
<td>53,454</td>
<td>2272.7%</td>
<td>12.3%</td>
<td>15.0%</td>
<td>36.7%</td>
</tr>
<tr>
<td>20 – 100 ha</td>
<td></td>
<td>–</td>
<td>9,030</td>
<td>13,839</td>
<td>53.3%**</td>
<td>9.5%</td>
<td>12.0%</td>
<td>10.9%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>820,341</td>
<td>1,438,779</td>
<td>1,399,737</td>
<td>70.6%</td>
<td>100.0%</td>
<td>100.0%</td>
<td></td>
</tr>
</tbody>
</table>

Doubts on the viability of a smallholder-led growth strategy in Africa???

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Looming employment challenge in SSA

Age pyramid: rural SSA, 2015

62% < 25 years old
Motivation

• Renewed interest in the Inverse Farm Size-Efficiency Relationship (IR) among development economists

• Guiding land allocation policies for inclusive growth:
  • Are prevailing land policies promoting national goals of agricultural productivity, food security and poverty reduction?
Tests of the IR hypothesis take on even greater policy importance in light of recent studies questioning the viability and even the objectives of promoting small-scale agriculture in Africa
Contribution [I]

- Explore the IR hypothesis over a much wider range of farm sizes - a statistically representative sample of farms between 1 and 100 hectares
  - Inform current policy discussions about how governments should allocate unutilized/underutilized land in order to achieve national equity and productivity goals
  - Unutilized/underutilized land is being claimed and transferred at a very rapid pace in some countries
Contribution [II]

- Number of studies have conventionally measured productivity as yield and or net value of crop production per unit area of land.
- Our study is based on a wider set of productivity measures:
  - Net value of total crop production per unit of area planted (land productivity)
  - Net value of crop production per adult labor unit (labor productivity)
  - Cost of production per metric ton of maize produced (cost effectiveness)
Contribution [III]

• Account for both variable and fixed costs when computing the cost of production.
  • Most of the prior studies typically ignored fixed and labor costs
  • Led to overstated productivity of farms with high fixed and labor costs
Data sources

• **KENYA**
  - Data on about 300 smallholder (0-5ha) farm households came from Egerton University/Tegemeo Institute collected in 2010 in 5 counties in Western Kenya
  - A survey involving 200 medium scale (5-100ha) farmers in the same counties was collected in 2012

• **GHANA**
  - Data on 498 small and medium farms came from four districts in Southern Ghana

• **ZAMBIA**
  - Smallholder and medium-scale household surveys from 6 districts
Methods

- Descriptive analysis
- Econometric analysis

\[ y_i = \alpha + \beta \ln L_i + X' \gamma + \sum_{i=1}^{\delta_i} \delta_i + \varepsilon_i \]

- \( y_i \) is the measure of productivity
- \( L_i \) is Area planted in acres
- \( X' \) is a vector of covariates
- \( \Sigma_{i=1}^{3} \delta_i \) district dummies
- \( \varepsilon_i \) is the error term
Results
KENYA: Medium-scale farms productivity

Figure 2a: Value of crop production per hectare planted

- Gross value
- Net value

<table>
<thead>
<tr>
<th>Gross value</th>
<th>Net value</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>60</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
Figure 2b: Farm and crop income per hectare planted

- **Farm income**
- **Crop income**
KENYA: Smallholder farms productivity

Figure 3a: Value of crop production per day worked

- Gross value
- Net value
KENYA: Farm production cost

Figure 5a: Total crop production costs per hectare planted
KENYA: Farm production costs- components

Figure 6: Total crop production costs by components
KENYA: Labor costs - components

Figure 7: Labor costs by components
GHANA: Farm productivity

Net value of production on Landholdings in Acres

Net value of production on Area planted in Acres
GHANA: Farm productivity

Family labor productivity on Landholdings in Acres

Family labor productivity on Area planted in Acres
GHANA: Farm productivity

Cost of maize production on Landholdings in Acres

Cost of maize production on Area planted in Acres
ZAMBIA: Farm productivity & efficiency

**Net Value of Crop Production per Hectare**

**Net Value of Crop Production per Family Labor Day**

**Cost of Maize Production per Metric ton**

**Total Factor Productivity**
Policy implications
Nine (9) countries contain 90% of Africa’s unutilized potentially arable crop (PAC) land

<table>
<thead>
<tr>
<th>Country</th>
<th>Non-forested unutilized land (million ha)</th>
<th>Proportion</th>
<th>Cumulative Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRC</td>
<td>84.8</td>
<td>46.5%</td>
<td>46.5%</td>
</tr>
<tr>
<td>Angola</td>
<td>18.9</td>
<td>10.4%</td>
<td>56.9%</td>
</tr>
<tr>
<td>Congo</td>
<td>12.9</td>
<td>7.1%</td>
<td>63.9%</td>
</tr>
<tr>
<td>Zambia</td>
<td>10.8</td>
<td>5.9%</td>
<td>69.9%</td>
</tr>
<tr>
<td>Cameroon</td>
<td>10.5</td>
<td>5.7%</td>
<td>75.6%</td>
</tr>
<tr>
<td>Mozambique</td>
<td>9.0</td>
<td>4.9%</td>
<td>80.5%</td>
</tr>
<tr>
<td>CAR</td>
<td>7.1</td>
<td>3.9%</td>
<td>84.4%</td>
</tr>
<tr>
<td>Gabon</td>
<td>6.5</td>
<td>3.6%</td>
<td>88.0%</td>
</tr>
<tr>
<td>Sudan</td>
<td>5.8</td>
<td>3.2%</td>
<td>91.2%</td>
</tr>
<tr>
<td>Rest of Africa (n=45)</td>
<td></td>
<td>8.8%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
To which scale of farming should the remaining PAC be allocated?

<table>
<thead>
<tr>
<th></th>
<th>Large scale</th>
<th>Medium-scale (5-100 ha)</th>
<th>Small-scale (0-5 ha)</th>
<th>Total land controlled</th>
<th>Potentially available cropland remaining</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghana</td>
<td>3.08</td>
<td>4.21</td>
<td>5.08</td>
<td>= 12.37</td>
<td>3.56</td>
</tr>
<tr>
<td>Kenya</td>
<td>0.69</td>
<td>0.84</td>
<td>2.63</td>
<td>= 4.16</td>
<td>1.01</td>
</tr>
<tr>
<td>Zambia</td>
<td>2.11</td>
<td>2.47</td>
<td>2.09</td>
<td>= 6.67</td>
<td>3.35</td>
</tr>
</tbody>
</table>

Source: Jayne et al. 2014 (JIA)
Policy implications

1. Production efficiency, while relevant, should not be the ONLY factor in guiding agricultural and land policies
   - Which scale has the largest multiplier and employment effects?
   - Which scale has the highest marginal propensity to consume?

2. All depends on the government’s development objective:
   - Production for domestic food self sufficiency and export market?
   - Broad based growth for reduced food insecurity and poverty reduction?

3. In all, the changing farm structure is going to continue in the next 5-10 years
   - Drivers: political economy factors and market forces
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Conclusion

• Land policies will determine whether millions of rural Africans will make a decent livelihood
  • How supportive the land allocation and agricultural policies are to smallholders
  • African leaders may soon realize that political stability will depend on how the remaining land is distributed and the profitability of family farming
Acknowledgements