Food security in crisis: Resilience of farming systems in postconflict Burundi

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Introduction

• Burundi among the poorest countries in Africa
  – Population of 9 million
  – Poverty headcount: 68%
  – GNI per capita PPP: 300 US$
  – Life expectancy at birth: 50 years
  – Child mortality under 5: 63/1000 births
  – HDI ranking 166 out of 169

• 90% of people work in agriculture
• Civil conflict since 1993
• Highly vulnerable to changes in the farming environment
Expected increase in population density

- Eastern Africa
- Burundi
Agriculture, food insecurity, vulnerability

- Small-scale, subsistence oriented family farms
- 85% of the cultivated area under food crops
- Farming strategy
  - On-farm diversification: mixed cropping
  - Self-reliance: no/limited access to food markets
  - Shortage of agricultural land: demographic pressure
  - Lack of income earning opportunities in agriculture and non-farm – limited push diversification
- Poor and decreasing performance:
  - Per capita food production 2005 was 45% of the 1993 level
Vulnerability and resilience

• Threats in Burundi:
  - Cyclical ethnic violence
  - Malthusian checks??
  - Households in war-hit zones: including displacement
  - Underperforming agriculture: low incentives to invest
  - Climatic change??

• Conflicts:
  - Cause food insecurity, depress (food) production and income from cash crops and livestock
  - Poverty, hunger, food insecurity, unequal income/land distribution generate anger, hopelessness...fertile ground for grievance and conflict
Aim of the study

- Study the possible impact of civil war and demography on the agricultural production
  - Analyse dynamics in farming practices
  - Assess socio-economic and food security situation
  - Interrelationship between conflict and change in food security
• Sample taken from:
  - all villages (communes)
  - 8 random hills (collines) per village
  - 4 households random chosen per hill

• Total 468 households in 1996 and 640 households in 2007

• 116 same collines in 1996 and 2007
Methodology

• 116 collines visited in 1996 - 2007

• Output:
  • Difficult to assess agricultural production:
    - Multitude of fields and plots
    - Large diversity in crops
    - Mixed cropping patterns
    - Limited surplus sales – household consumption

→ Sum of food output expressed in Kcal
→ Banana production in kg (‘semi-cash’ crop)
→ Coffee production in kg (cash crop)
Model

- Poverty trap?
  - Erosion of assets due to conflict
  - Low returns to assets – absence of alternatives and entry barriers

\[ dY = dA' R + A' dr + A' d\varepsilon^R + d\varepsilon^T + d\varepsilon^M \]

- Comparative data analysis at colline level
- Frontiers estimated with Data Envelopment Analysis
  - Calculate the Malmquist index for TFP change
  - Changes in efficiency levels between the two time periods
Some descriptives
2007 data

<table>
<thead>
<tr>
<th></th>
<th>Mean (std. dev)</th>
<th>Ngozi (n=360)</th>
<th>Muyinga (n=280)</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age head of household (years)</td>
<td>41 (12.7)</td>
<td>42</td>
<td>40</td>
<td>Ns</td>
</tr>
<tr>
<td>Household size (nb)</td>
<td>5.2 (2.4)</td>
<td>5.8</td>
<td>5.6</td>
<td>Ns</td>
</tr>
<tr>
<td>Farm size (m²)</td>
<td>11,248 (16,462)</td>
<td>9,919</td>
<td>12,952</td>
<td>**</td>
</tr>
<tr>
<td>Farm size excl. &gt; 3.7 ha (m²)</td>
<td>8,346 (8,013)</td>
<td>7,639</td>
<td>9,269</td>
<td>***</td>
</tr>
<tr>
<td>Total number of plots on hill (nb)</td>
<td>8.4 (4.7)</td>
<td>8.2</td>
<td>8.8</td>
<td>*</td>
</tr>
<tr>
<td>% food production (%)</td>
<td>76</td>
<td>73</td>
<td>80</td>
<td>***</td>
</tr>
<tr>
<td>Households coffee in 2007 (%)</td>
<td>58</td>
<td>61</td>
<td>55</td>
<td>Ns</td>
</tr>
<tr>
<td>Households banana in 2007 (%)</td>
<td>95</td>
<td>95</td>
<td>97</td>
<td>Ns</td>
</tr>
<tr>
<td>Households with cattle (%)</td>
<td>12</td>
<td>18</td>
<td>4.5</td>
<td>Ns</td>
</tr>
</tbody>
</table>
Small farm sizes & unequal distribution
<table>
<thead>
<tr>
<th></th>
<th>1996 data (n=116)</th>
<th>2007 data (n=160)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household size (nb)</td>
<td>6.3</td>
<td>5.7</td>
</tr>
<tr>
<td>Involvement in paid jobs (0 to 1:yes)</td>
<td>0.12</td>
<td>0.37</td>
</tr>
<tr>
<td>Number of coffee trees (nb)</td>
<td>365</td>
<td>233</td>
</tr>
<tr>
<td>Production food crops per person (kcal/day/person)</td>
<td>4,342</td>
<td>1,494</td>
</tr>
<tr>
<td>Production bananas (kg/year)</td>
<td>6,042</td>
<td>3,882</td>
</tr>
<tr>
<td>Coffee production (kg/year)</td>
<td>598</td>
<td>441</td>
</tr>
<tr>
<td>Number of plots (nb)</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Farm size (m²)</td>
<td>11,235</td>
<td>11,054</td>
</tr>
<tr>
<td>Cattle (nb)</td>
<td>0.76</td>
<td>0.73</td>
</tr>
<tr>
<td>Total expenditure (US$ value 2007)</td>
<td>122</td>
<td>181</td>
</tr>
</tbody>
</table>
VRS efficiency levels 1996 and 2007
Decrease in TFP mainly due to worsening technical change

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Malmquist index</td>
<td>0.65 (0.43)</td>
</tr>
<tr>
<td>Efficiency change</td>
<td>1.34 (1.04)</td>
</tr>
<tr>
<td>Technical change</td>
<td>0.52 (0.15)</td>
</tr>
<tr>
<td>Scale change</td>
<td>1.03 (0.27)</td>
</tr>
<tr>
<td>Efficiency score VRS 1996</td>
<td>0.69 (0.25)</td>
</tr>
<tr>
<td>Efficiency score VRS 2007</td>
<td>0.76 (0.22)</td>
</tr>
</tbody>
</table>
Determinants of MI quartiles

- Dependent variable: Quartile Malmquist index
- Model: ordered logit
- Results:
  - Probability of scoring in the highest MI Q:
    - Smaller households
    - Female head of household
    - Having a regular paid job
    - Lower on-farm diversity (herfindahl index)
    - Farm size – U shape
    - Lower efficiency scores in 1996 (improving most)
    - Location in Ngozi Province
Conclusion

• Continued impoverishment
• High levels food insecurity
• Lower capacity to produce and purchase
  • asset loss and lower returns
• Low resilience levels of farming systems to shocks
  • Conflict
  • Climate change?