The Potential Economic Impact of Guinea-Race Sorghum Hybrids in Mali: A Comparison of Research and Development Paradigms

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Motivation

• Sorghum is a major food staple
• Low average yield growth rate (0.49%)
• Guinea race hybrids for high yield increase and preferred traits (grain et panicles)
• Two research and diffusion approaches
• Compare potential returns to investment
# Context

<table>
<thead>
<tr>
<th>Previous approach (FPB-S)</th>
<th>Current approach (PPB-F)</th>
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</thead>
<tbody>
<tr>
<td>• Initially, exotic introductions, purification of superior landraces</td>
<td>• Farmer participatory selection, on-farm trials</td>
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<td>• Later, successful improved varieties</td>
<td>• Improved varieties and first hybrids largely based on Guinea landraces</td>
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<tr>
<td>• State-managed, centralized seed supply</td>
<td>• Linkage to local farmer associations, decentralized</td>
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</tbody>
</table>
Context

- Rattunde et al. (2013) found that individual Guinea-race sorghum hybrids yielded 17 to 47% over the local check, with the top three hybrids averaging 30% based on farmer field trials.
Methods

• Census of 58 villages and 2430 farm families to inventory sorghum varieties

• Economic surplus model
  – Ex ante
  – Limitation: parameters constant

• @Risk to introduce variability in parameters
  – Triangular distributions
Assumptions

• Closed economy for sorghum in Mali - augmented economic surplus model

• Triangular distributions of parameter values based on literature and expert opinion
Temporal distribution of costs and benefits

Benefits path when adoption begins immediately after variety release with 10 years of R&D

Total lags of 10 and 15 years

Benefits path with lag of 5 additional years before adoption begins and constraints to adoption that reduce adoption ceiling
% of sorghum area by type of variety

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<thead>
<tr>
<th></th>
<th>(% of total sorghum area)</th>
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<tbody>
<tr>
<td></td>
<td>2009</td>
</tr>
<tr>
<td>hybrids</td>
<td>1.21</td>
</tr>
<tr>
<td>improved varieties</td>
<td>18.5</td>
</tr>
<tr>
<td>local varieties</td>
<td>80.3</td>
</tr>
<tr>
<td>all sorghum varieties</td>
<td>100</td>
</tr>
</tbody>
</table>
Comparison of NPV for Scenario PPB-F and FPB-S
Factors influencing variation in NPV

PPB-F

FPB-S
Comparison of IRR for Scenario PPB-F and FPB-S
Conclusions

• PPB-F on sorghum hybrids in Mali is a sound investment: NPV and IRR are superior

• Total surplus variability depends more on yield advantages and price elasticity of supply in either paradigm
Implications

• To continue large-scale diffusion of hybrids throughout the Sudan Savanna
  – continued support for a decentralized farmer-managed seed system
  – close research collaboration
  – enlarge the network of farmer unions engaged in seed production and dissemination
  – encourage exchange and coordination among the growing number of seed producers