Fitting technology options to farmer context in Mali

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AfricaRISING sites in Mali
On-farm trials of options

- Maize
- Sorghum
- Soya
- Cowpea

Falconnier 2015
Analysis of on-farm trials
Analysis of on-farm trials

ΔGM = 334 USD/year/ha

Average Sorghum yield on clay soils
Average soybean yield on clay soils after cotton
Niches for developing new systems

CEREAL LEGUME INTERCROPPING: Maize-cowpea

Gravelly soils

Sandy soils

Clay soils

After cotton or maize

CROP DIVERSIFICATION: Replacement of sorghum by soya

After sorghum or millet

CROP DIVERSIFICATION: Replacement of sorghum by cowpea

Falconnier 2015
TLU > 21.4

- NO → actives > 9.5
  - NO → croppedland > 5.8
    - NO → LRE
    - YES → TLU > 2.2
      - NO → MRE
      - YES → draft tools > 2
        - NO → HRE
        - YES → HRE – LH

- YES → actives > 9.5
  - YES → croppedland > 5.8
    - YES → HRE
    - NO → HRE – LH
Farm-scale explorations: Trade-off analysis

HRE and HRE-LH farms – replacement of maize by maize-cowpea intercrop
MRE farms – replacement of sorghum by soya
LRE farms – replacement of sorghum by cowpea

Falconnier 2015
• Many scenarios, using limited data, to quickly explore options
• Input data:
  • Household survey at district level for yields, input costs (AfricaRISING baselines), market survey for crop prices
  • Rapid characterization of population of 109 farm households in 3 villages (crop areas, livestock and equipment), plus detailed characterization of 19 farms based on types
  • Calculated income from crops and food self-sufficiency for each farm in several scenarios
• Yields
  • 50\textsuperscript{th} percentile (median) yields [MARBES]
  • 90\textsuperscript{th} percentile (best farmer practice) yields [MARBES]
  • Experimental potential yields [ICRISAT/IER]

• Prices
  • Averaged market prices from monthly market survey in 2014-2015

• Calculated income and food self-sufficiency
• Current crop allocation
• Optimized crop allocation
  • Maximize gross margins
  • Meet household calorie requirements with staple grains
  • Maize area < twice cotton area (fertilizer availability constraint)
• Crop area expansion
<table>
<thead>
<tr>
<th>Yield Scenario</th>
<th>≥80% food self-sufficient</th>
<th>≥100% food self-sufficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>91%</td>
<td>79%</td>
</tr>
<tr>
<td>Best farmer</td>
<td>99%</td>
<td>99%</td>
</tr>
<tr>
<td>Potential</td>
<td>99%</td>
<td>99%</td>
</tr>
</tbody>
</table>

- Median yields: most farms self-sufficient
- All other scenarios: all but one farm is self-sufficient
Results: Gross Margins

- $1.25/person/day poverty level
- $1225 mean yearly income from gold mining

Bar chart showing gross margin from crops per active household member across different farms. The chart includes marks for median, best farmer, and potential. The horizontal lines represent $1.25/person/day poverty level and $1225 mean yearly income from gold mining.
Results: Gross Margins

- $1.25/person/day poverty level
- $1225 mean yearly income from gold mining

Gross margin from crops (USD) per active household member

Median

Best farmer

Potential

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$1.25/person/day poverty level

$1225 mean yearly income from gold mining
• “Rapid prototyping” of farm designs to explore potential

• Estimating cost-benefit of a new technology should be a first step not a last step

• Staple crop improvement research should target food-insecure households

• Livestock and off-farm income sources are important for improving livelihoods
Typologies for Targeting and Scaling

• Simple indicators allow researchers to place farmers within types
• Important to target a diverse group of farmers for testing technologies
• Farmer evaluations can aid in analysis of variability and in targeting technologies to types
• Ex-post typologies based on initial adoption can be useful for scaling
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Africa Research in Sustainable Intensification for the Next Generation
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