Effects of NAIVS on private sector fertilizer & seed supply chains: Implications for post-NAIVS strategies for smallholder maize & rice productivity

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GISAIA/Tanzania project

- Guiding Investments in Sustainable Agricultural Intensification in Africa
  - Funded by BMGF
  - Collaborative research between MSU or Purdue and local universities in 7 African countries

- GISAIA/Tanzania
  - Collaborative research & policy outreach by MSU & SUA faculty
  - MSU Ag Policy Advisor (Dr. David Nyange) embedded in DPP/MAFC to provide demand driven policy analysis, capacity building and policy coordination
Outline

- Motivation
- Objectives
- Methods/Data
- Qualitative & Quantitative Results
  - Evidence of gains made under NAIVS
  - Conditions under which gains made will continue post-NAIVS
- Remaining & Emerging Challenges Post-NAIVS
Motivation: Origin/Goal of NAIVS

- International Food Price Crisis 2007/08
- Smallholder maize/rice yields were far below potential yields in Tanzania
- One reason for low yields:
  - Very limited physical access to fertilizer in many villages
  - Limited smallholder experience with (knowledge of) use of fertilizer & improved seed for maize/rice
  - Seasonal credit constraints for many smallholders at planting
Motivation: Design of NAIVS

- **Improve physical access** to fertilizer & improved seed (for maize/rice)
  - Govt role: distribute input vouchers to pre-specified areas, using targeting criteria
  - Private sector role: import, wholesale, retail fertilizer and seed to areas

- **Reduce credit constraint of smallholders**
  - Smallholders: pay 50% of input cost
  - Private sector supply chain: NAIVS guarantees a substantially larger demand for inputs
Motivation: Design of NAIVS(2)

- **Provide low-risk learning opportunity & experience**
  - Smallholders → experiment with fertilizer/improved seed use on maize/rice
  - Private sector importers, wholesalers, agro-dealers → enable them to make investments and assess demand for commercially-priced inputs
Motivation: Existing assessments of NAIVS performance

- Studies on household-level impacts of voucher receipt
  - World Bank Public Expenditure Review
  - REPOA
  - AGRA soil health node (Mwaijande)

- Studies that assess NAIVS implementation
  - World Bank Public Expenditure Review
  - Mikocheni/SUA (Aloyce, Gabagambi, Hella)
  - AGRA soil health node (Mwaijande)
  - SUA (Malinza & Chingonikaya)
Motivation: Knowledge gaps

#1) How has NAIVS affected private sector fertilizer and seed supply chains??

- DEMAND SIDE:
  - Has farmer opportunity to experiment created new demand for commercially-priced inputs (where, why)??

- SUPPLY SIDE:
  - Have investments in supply chain resulted in sustainable input access (where, why)??

- Policy implications of sustaining the gains made & continuing / emerging challenges to smallholder maize/rice productivity??
Motivation: Research gap(s)

#2a) Where is use of fertilizer (improved seed) on maize (rice) profitable at present?
#2b) How does profitability of use of fertilizer and improved seed vary by:

- Agro-zone
- Soil characteristics
- Market access (and range of price scenarios)
- Household use of complementary inputs, crop/soil management practices

Policy implications related to maximizing smallholder yield potential...??
Methods & Data

- Qualitative & Quantitative

  - In 2014, we revisited village leaders & agro-dealers in 4 districts (Njombe, Mbeya DC, Ulanga, Arumeru)
  - We also interviewed DAICOs, hubs, seed and fertilizer importers

- Zonally-representative household-level data on household cropping and input use/access
  - Ag Census 2007/09
% of rural households using improved inputs by zone or region in 2007/08

<table>
<thead>
<tr>
<th>Agro-Zone or region</th>
<th>% of Maize growers that apply input to maize:</th>
<th>% of Paddy growers applying input to paddy:</th>
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<tbody>
<tr>
<td></td>
<td>Improved seed</td>
<td>Inorganic fertilizer</td>
</tr>
<tr>
<td>Southwest</td>
<td>17.0</td>
<td>21.1</td>
</tr>
<tr>
<td>North</td>
<td>46.3</td>
<td>16.5</td>
</tr>
<tr>
<td>Morogoro</td>
<td>35.0</td>
<td>4.4</td>
</tr>
<tr>
<td>West</td>
<td>27.8</td>
<td>4.2</td>
</tr>
<tr>
<td>Lake</td>
<td>21.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Dry</td>
<td>25.1</td>
<td>5.1</td>
</tr>
<tr>
<td>Coast</td>
<td>15.2</td>
<td>24.3</td>
</tr>
<tr>
<td>National</td>
<td>23.3</td>
<td>14.3</td>
</tr>
</tbody>
</table>

Source: Agricultural Census 2007/08
NAIVS increased smallholder experience with ag inputs (learning)

<table>
<thead>
<tr>
<th>Voucher receipient type</th>
<th>% of voucher recipients that had <strong>not</strong> used input previously on maize or rice:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Improved seed</td>
</tr>
<tr>
<td>Voucher beneficiaries in year 2008/09</td>
<td>51%</td>
</tr>
<tr>
<td>New voucher beneficiaries in year 2009/10</td>
<td>58%</td>
</tr>
<tr>
<td>New voucher beneficiaries in year 2010/11</td>
<td>85%</td>
</tr>
</tbody>
</table>

Source: W.Bank/REPOA household survey 2010/11
NAIVS facilitated private sector ag input supply chain investment

- Infrastructure / participation
  - Many new Agro-dealers (new businesses, shops)
  - New warehouses (Njombe)

- Human capacity
  - Training of agro-dealers by CNFA and by importers
  - We will soon present results of training effects on AD technical knowledge
NAIVS facilitated private sector ag input supply chain investment(2)

- Institutional development of exchange relationships
  - Importers → wholesaler/hubs → Agro-dealers
  - Financing arrangements (trade credit)
  - Repeated transactions builds trust

- Experiential learning
  - Low-risk opportunity to learn about input demand in general in a given area**
  - Case of Agro-dealer in Ulanga
Results: Conditions for continued smallholder demand & supply

- Depends on profitability of fertilizer and improved seed use

- Value Cost Ratio (VCR) = 
  \[
  \frac{(\text{Maize-fertilizer response rate} \times \text{Maize price/kg})}{\text{Fertilizer price/kg}}
  \]

- 1) **Learning effects among smallholders**
  - Maize or Rice-fertilizer response rate, output price, input prices
  - Profitable in some areas, not profitable in others
Results: Conditions for continued smallholder demand & supply (2)

2) Output price
   - Market access: road infrastructure to village
   - Market access: trader/wholesaler behavior
   - Access to storage
     - Ability to wait for higher price (easier with rice)

3) Access to cash/finance for inputs
   - Growing high-value crops
   - Livestock
   - High-return non-farm earnings
Post-NAIVS strategies to improve smallholder maize/rice productivity

- No NAIVS for 2014/15, and it will likely not return in 2015/16
- MAFC considering an Agricultural Credit Subsidy Program (ACSP)
- However, there are many challenges other than the price of fertilizer or credit
  - Unpredictable maize/rice trade policy
  - Poor market access for many villages
  - Need to improve assurance of seed quality
  - Many other factors that affect smallholder maize/rice yields apart from fertilizer use
Remaining challenges to increase smallholder maize/rice productivity

#1a) Unpredictable GOT trade/marketing policy → unpredictable output market environment for maize

- Case 1-A: Surplus maize in Ruvuma not marketed..?
  - No traders showed up
  - Due to poor market access only, or also lag effect of maize export ban..??

POLICY IMPLICATION: Programs with goal of increasing production must also reduce output market constraints
Remaining challenges to increase smallholder maize/rice productivity

#1b) Unpredictable GOT trade/marketing policy → unpredictable market environment for rice output

- Case 1-B: Unpredictable, *ad hoc* removal of rice import tariffs
  - Changing ‘rules of the game’ unpredictably creates HUGE losses in short-term
  - Creates environment not conducive to:
    - future investment in input & output distribution
    - Maintain smallholder demand for inputs

POLICY IMPLICATION: **GoT must maintain stable, predictable, and rules-based trade & marketing policy**
Remaining challenges to increase smallholder maize/rice productivity

#2) Poor market access in many villages → use of improved inputs on maize may not be profitable

- Case 2-A: Marketing surplus maize in Mbeya and Mbozi (contrasting cases)
- POLICY IMPLICATION: Urgent need for increased investment in rural roads
- Benefits of better roads for smallholders:
  - lower input prices
  - higher output prices via better access all year
  - Input use more likely profitable
Remaining challenges to increase smallholder maize/rice productivity

#3) Cost of fertilizer at rural retail level

- 60-70% rural DAP price is external
- Yet 30% of the cost is domestic; Tanzanian port & transport rates higher than in Kenya
- DAP price comparison (IFDC, 2012):
  - **Kenya**: $US 40 per 50 kg (Nairobi)
    - internal transport $0.07/km
  - **Tanzania**: $US 48 per 50 kg (Mbeya)
    - internal transport $0.11/km

**POLICY IMPLICATION**: Investments in port (more berths) & railways & rural roads can significantly lower rural retail input prices
Remaining challenges to increase smallholder maize/rice productivity

#4) Assurance of maize seed quality
- Germination rates not good in some areas
- Fertilizer response rate is function use of good seed, among many other factors
- Need for research to understand effectiveness of current regulatory regime

#5) Potential lack of smallholder understanding of importance of improved seed
- POLICY IMPLICATION: Need for public/private extension efforts targeted to benefits of seed
#6) There are many determinants of maize/rice yield – not simply fertilizer rate

- Existing studies demonstrate that grain-fertilizer response rates vary by use complementary inputs & practices
- On-going research on how grain-fertilizer response rates vary by:
  - Appropriate fertilizer by area.zone
  - Timing of fertilizer application
  - Dosage
  - Use improved seed
  - Timely weeding
Remaining challenges to increase smallholder maize/rice productivity

#6) There are many determinants of maize/rice yield – not simply fertilizer rate

POLICY IMPLICATION: Urgent need for more holistic public and private approach to helping smallholders increase maize/rice yield

- Fertilizer & seed importers/companies have taken initiative to train agro-dealers & extension agents
- Need for GoT initiative to ensure that public extension system has appropriate messages for farmers (by zone) and sufficient resources
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