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
- W.Bank/REPOA surveys of households,village leaders, agro-dealers (2011, 2012)
  - 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
  - NPS 2008/09, 2010/11, 2012/13

% of rural households using improved inputs by zone or region in 2007/08

Agro-Zone or region	% of Maize growers that apply input to maize:		% of Paddy growers applying input to paddy:	
	Improved seed	Inorganic fertilizer	Improved seed	Inorganic fertilizer
	---------- % of rural HHs ----------			
Southwest	17.0	21.1	4.2	5.6
North	46.3	16.5	42.3	22.9
Morogoro	35.0	4.4	7.7	4.3
West	27.8	4.2	3.6	9.1
Lake	21.9	0.9	14.7	13.4
Dry	25.1	5.1	3.8	0.1
Coast	15.2	24.3	5.3	16.4
National	23.3	14.3	5.7	7.9

Source: Agricultural Census 2007/08

NAIVS increased smallholder experience with ag inputs (learning)

	% of voucher recipients that had **not** used input previously on maize or rice:	
Voucher receipient type	Improved seed	Inorganic fertilizer
Voucher beneficiaries in year 2008/09	51%	60%
New voucher beneficiaries in year 2009/10	58%	69%
New voucher beneficiaries in year 2010/11	85%	72%
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) =

(Maize-fertilizer response rate*Maize price/kg) /
Fertilizer price/kg

- 1) <u>Learning effects among smallholders</u>
  - 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 environmen not conducive to:
    - future investment in input & output distribution
    - Maintain smallholder demand for inputs

POLICY IMPLICATION: <u>GoT must maintain stable, predictable, and rules-based trade & marketing policy</u>

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

Remaining challenges to increase smallholder maize/rice productivity

#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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