

Toward a Holistic Sustainable Intensification Strategy in Sub-Saharan Africa

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Panelist remarks

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make it happen”

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Objectives:

1. To explore options for sustainably raising inorganic fertilizer use
2. To consider the role of input subsidy programs (ISPs) in an effective / comprehensive program of sustainable productivity growth?
 - What would such a holistic program look like?
 - How to achieve it?

Three sections:

1. To understand the socio-political context of FSPs
 - Why has technical analysis had such limited impact?
2. Evidence on “smart” subsidy programs
3. Given that FSPs will continue, how to raise their benefits?

Section 1: socio-political context

1. How did we get from 1995 to 2015?
 - over \$1.05 billion per year in 7 countries alone?

Expenditures of Input Subsidy Programs

Country	Annual Program Cost (USD million)	% of Ag Budget
Malawi	152 to 275	47 to 71%
Tanzania	92 to 135	39 to 46%
Zambia	101 to 135	21 to 40%
Senegal	36 to 42	26 to 31%
Ghana	53 to 112	20 to 31%
Nigeria	108 to 190??	?? (officially 26%)
Kenya	22 to 81	9 to 26%

I. How did we get to where we are now in 2015?

1. Budget constraint relaxed
 - HIPC / shift from conditionality to budget support
2. Multi-party democracies / populist ag policies
3. “Malawi miracle”
 - NYT David and Goliath story
 - Effective PR by the advocates
4. Rise in global food prices since 2007
5. Shift in WB position – support for “smart” subsidy programs
 - WB and other basket donors financed many African countries with the biggest FSPs

Perceptions of FSPs among international researchers

1. There is a role for ISPs in most SSA countries: true or false?

1. There is a role for ISPs in most SSA countries:
true: 69%

2. Do you feel that ISPs in most SSA countries need:

A: no changes to design

B: small tweaks

C: major reforms/improvements

D: should be discontinued

2. Do you feel that ISPs in most SSA countries need:

A: no changes to design: **0%**

B: small tweaks: **4%**

C: major reforms/improvements: **81%**

D: should be discontinued: **15%**

3. What should be the primary rationale for input subsidy programs:
- A: Increasing food supplies / food self-sufficiency
 - B: Poverty reduction
 - C: Dynamic economic growth
 - D: Others

3. What should be the primary rationale for input subsidy programs:
- A: Increasing food supplies / self-sufficiency: **27%**
 - B: Poverty reduction: **12%**
 - C: Dynamic economic growth: **38%**
 - D: Other: **23%**

4. Do you feel that ISPs in SSA should be:

A: Scaled up?

B: Are at about the right level of expenditure

C: Should be downsized

4. Do you feel that ISPs in SSA should be:

A: Scaled up? **8%**

B: Are at about the right level of expenditure: **0%**

C: Should be downsized: **92%**

Summary of evidence:

Conclusion #1:

- Highly variable achievement of targeting criteria: often not superior to random targeting

Summary of evidence:

Conclusion #2:

- Crowding out of commercial distribution:
 - Of the total quantity of fertilizers distributed through FSPs, the increase in national fertilizer was between 40-70% of this
 - In two cases, Nigeria and areas of Zambia where private firms did not operate, evidence of “crowding in”

- FSPs will contribute more to additional fertilizer use if targeted:
 1. To households that are not already purchasing fertilizer and using at relatively high intensity
 - Relatively poor households
 - Female-headed households
 2. where private sector presence is low
 3. where $AP_{\text{fert}} > P_{\text{fert}}$ for most farmers

Summary of evidence:

Conclusion #3:

- Significant effects on food production

Summary of evidence:

Conclusion #4:

- Small / transitory effects on hh incomes
 - Effects tend to decay after farmers graduate

Summary of evidence:

Conclusion #5:

- Little effect on food price levels
 - Malawi
 - Zambia
 - Nigeria

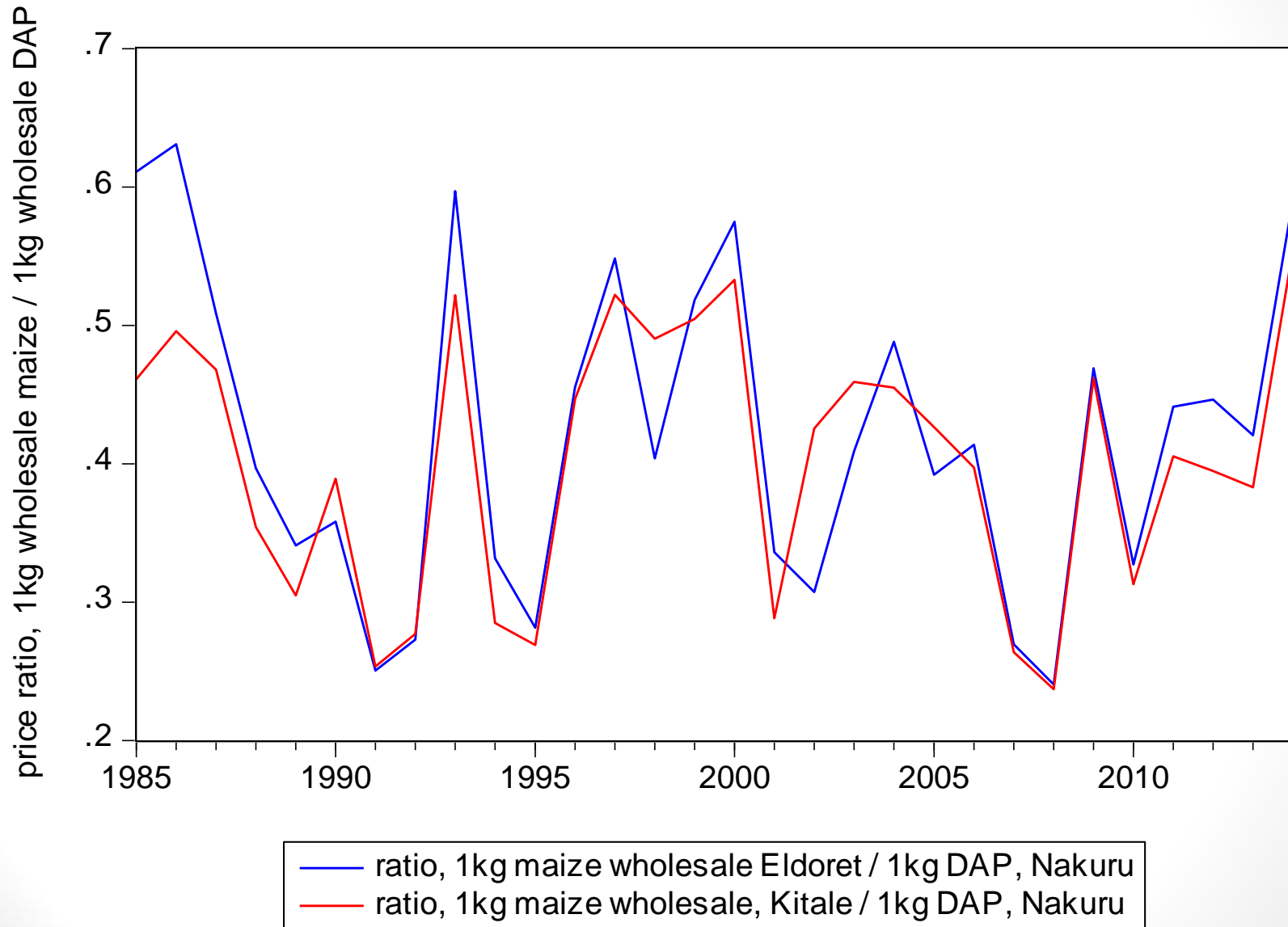
Summary of evidence:

1. Highly variable achievement of targeting criteria: often not superior to random targeting
2. Crowding out -- a problem
3. Significant effects on food production
4. Small / transitory effects on hh incomes
5. Little effect on food prices

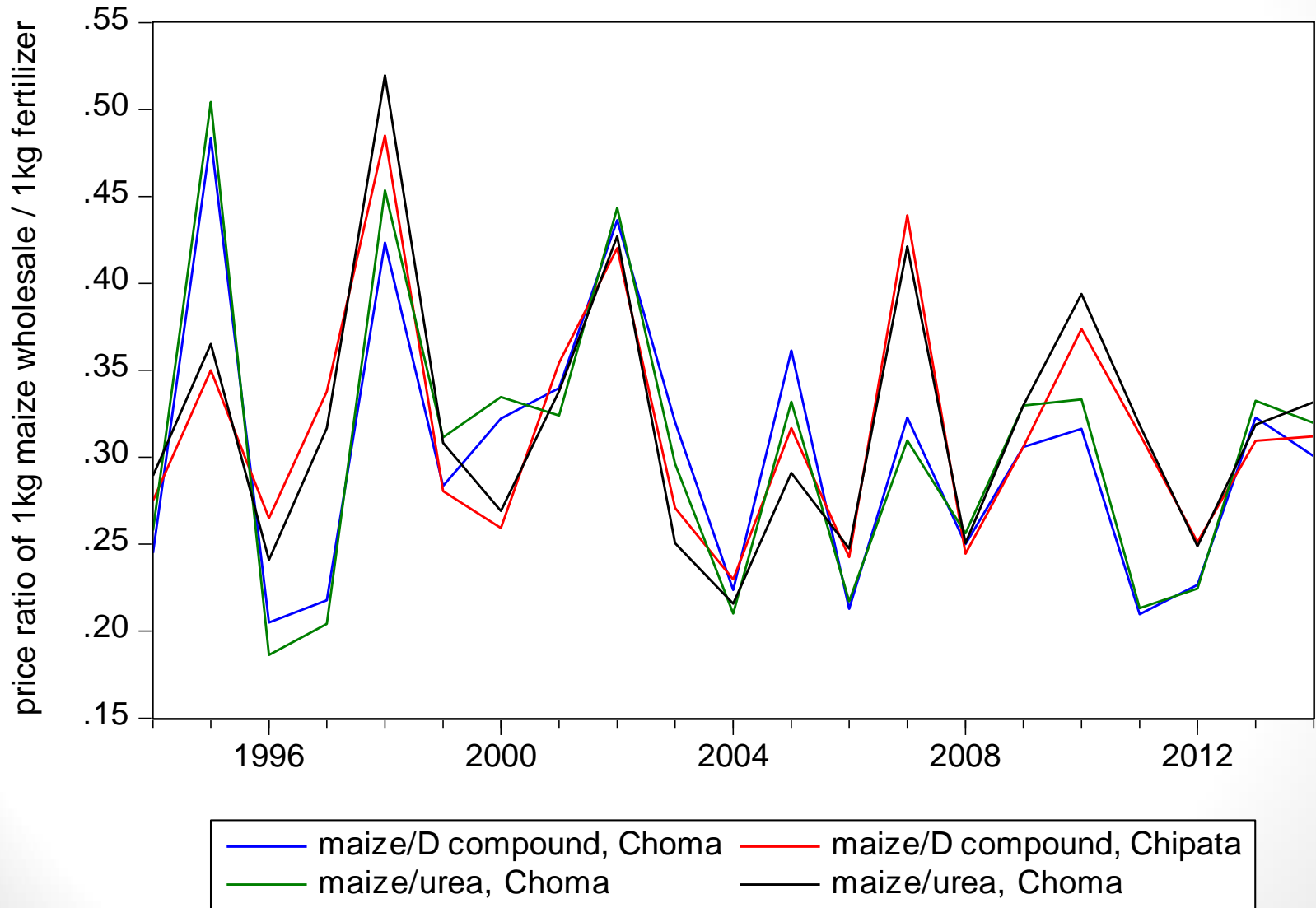
Section 3: What to do?

- FSPs are likely to continue – how can they be made more effective.
 - Targeting differently

Maize/fertilizer price ratios, Kenya, 1985-2014

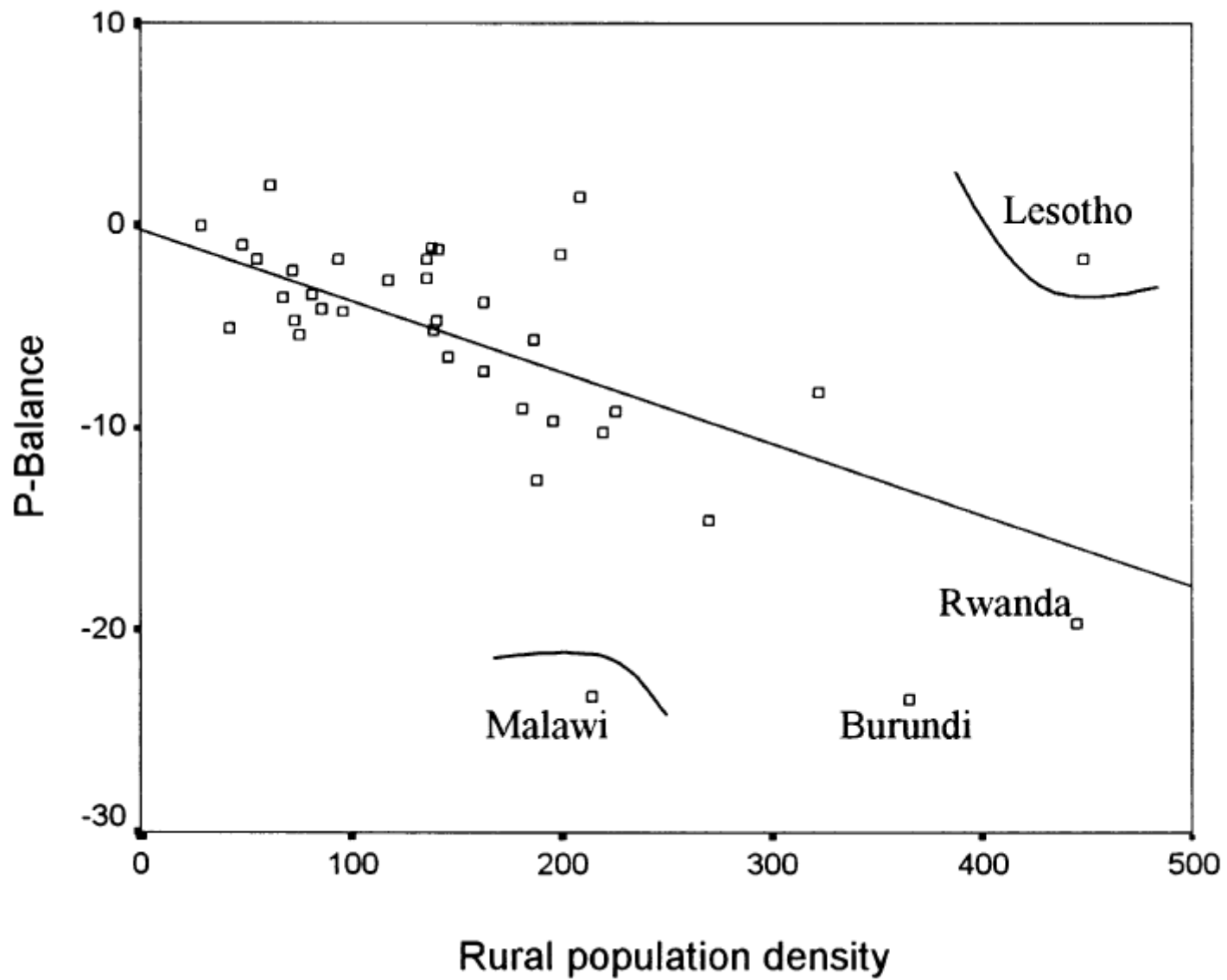


Maize/fertilizer price ratios, Zambia, 1994-2014



Five conclusions:

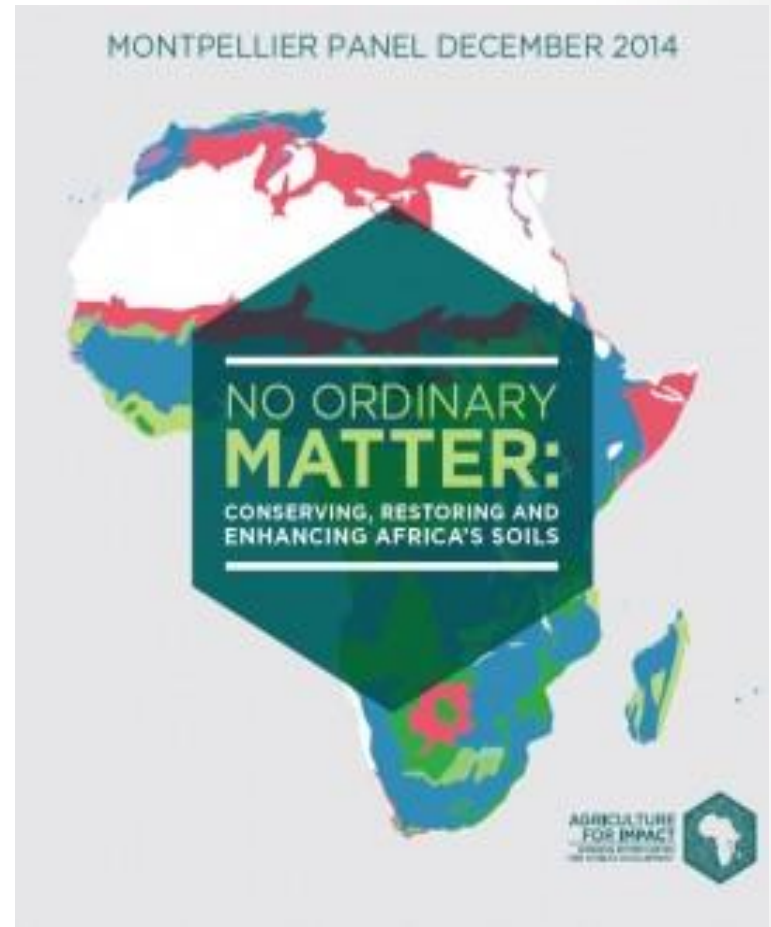
1. Population growth leading to land scarcity → smaller farm sizes for most rural people
2. Fallows slowly being eliminated in areas of high population density
3. Continuous cultivation with limited nutrient recycling → “soil mining”



Five conclusions:

1. Population growth leading to land scarcity → smaller farm sizes for most rural people
2. Fallows slowly being eliminated in areas of high population density
3. Continuous cultivation with limited nutrient recycling leading to “soil mining”
- 4. Soil degradation**

- Soil and land degradation a huge concern
 - Major conclusion of Montpellier Panel report
 - Extent of already damaged land:
 - 65% of arable land
 - 30% of grazing land
 - 20% of forests
 - Burden disproportionately carried by smallholders



Five conclusions

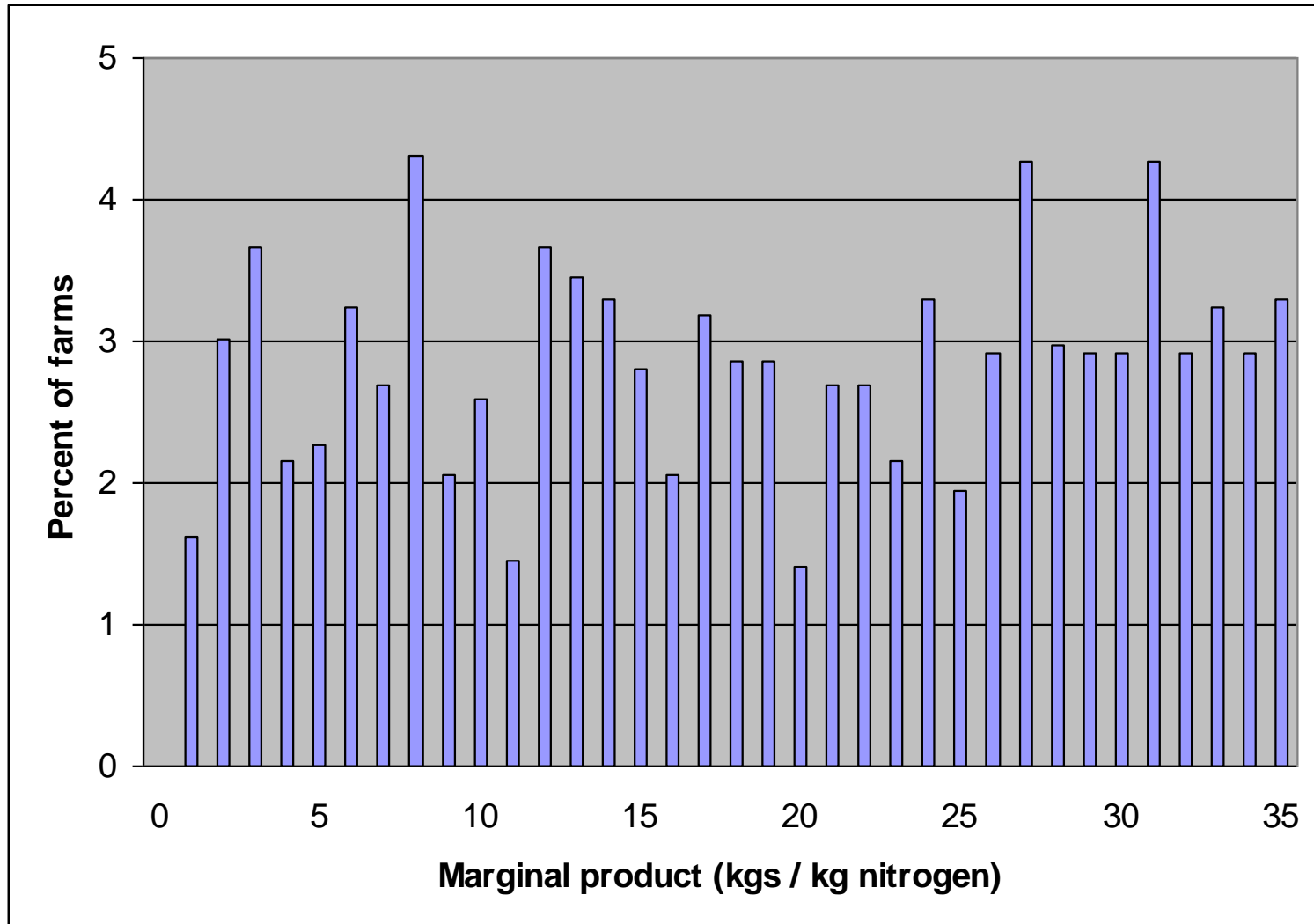
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3. Continuous cultivation with limited nutrient recycling → “soil mining”
4. Soil degradation
- 5. Evidence of low and declining crop response rates to inorganic fertilizer application**

Review of maize-fertilizer response rates on farmer-managed fields

Study	country	Agronomic response rate (kgs maize per kg N)
Morris et al (2007)	W/E/S Africa	10-14
Sheahan et al (2013)	Kenya	14-21
Marenya and Barrett (2009)	Kenya	17.6
Liverpool-Tasie (2015)	Nigeria	8.0
Burke (2012)	Zambia	9.6
Snapp et al (2013)	Malawi	7.1 to 11.0
Holden and Lunduka (2011)	Malawi	11.3
Pan and Christiaensen (2012)	Tanzania	8.5 to 25.5
Minten et al (2013)	Ethiopia	11.7

Highly variable crop response rates – even among farmers in same areas in same seasons

Variation in farmers' efficiency of fertilizer use on maize, Agroecological Zone IIa, Zambia



Note: Zone IIa is a relatively high-potential zone suitable for intensive maize production; mean national NUE = 9.6 kgs maize per kg nitrogen (Burke, 2012).

African farming systems in densely settled areas commonly display 4 forms of unsustainable land intensification

1. Soil mining
2. Inadequate recycling of organic matter
→ loss of SOC
3. Demise of fallows
4. Limited profitability of using fertilizer at full market prices

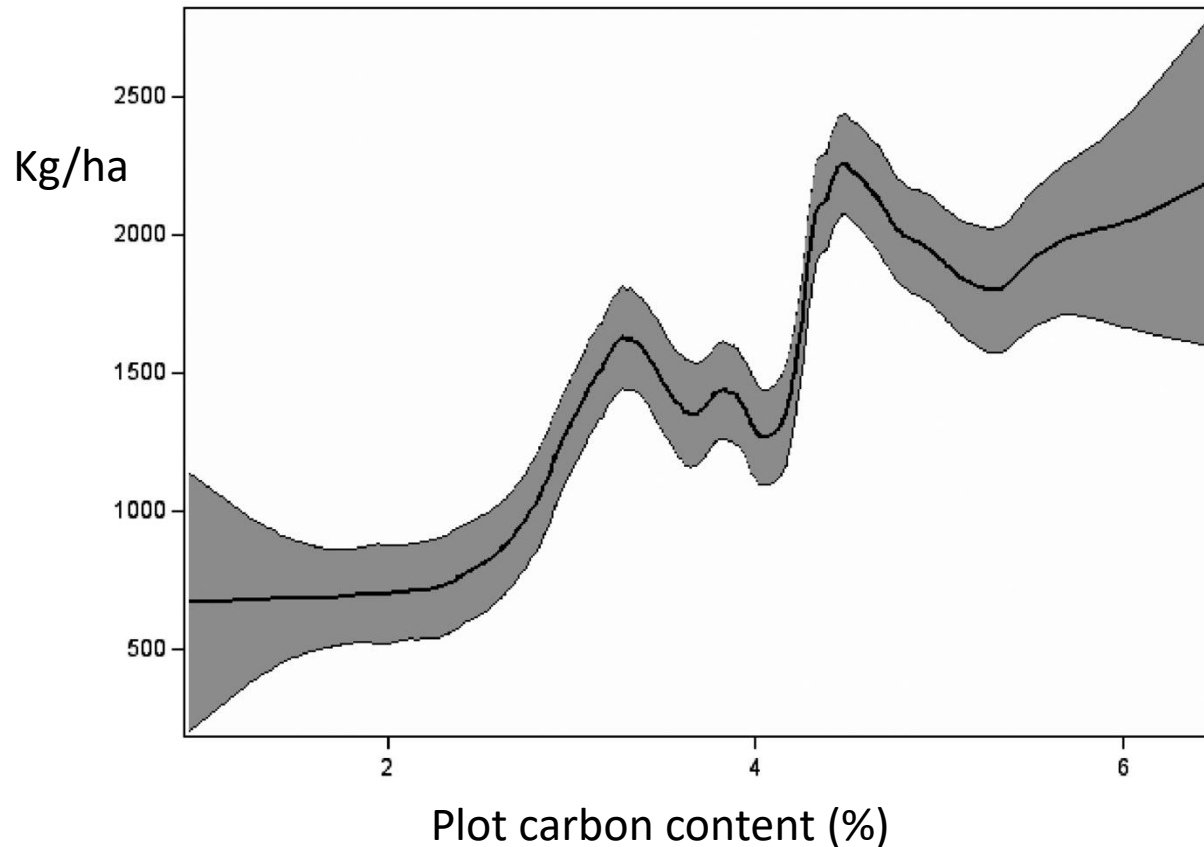
Factors depressing NUE of inorganic fertilizer use:

1. Low soil organic matter

- significant decline in SOM over past 20 years in Malawi (Mpeketula and Snapp)

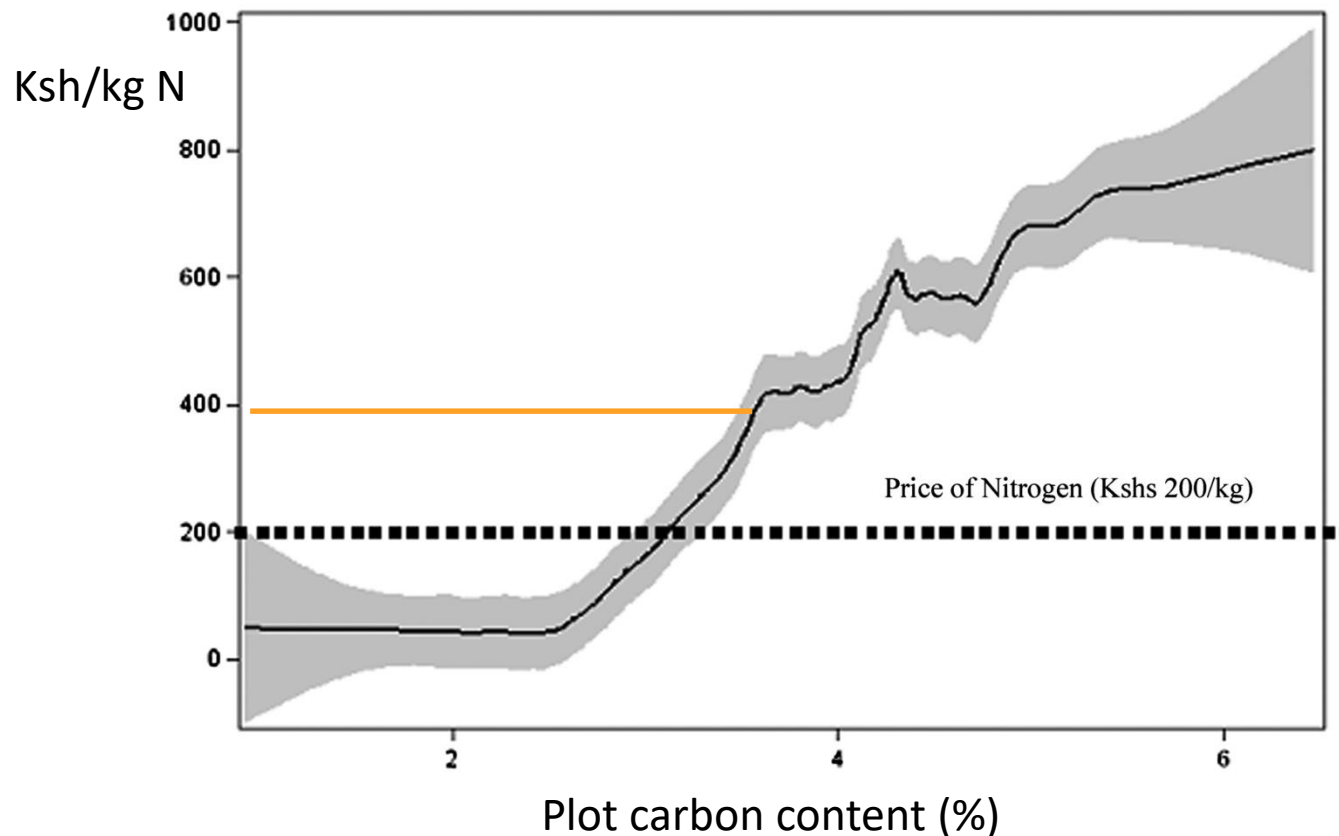
Fertilizer response rates in degraded areas

Maize yields as a function of plot soil carbon content



Fertilizer response rates in degraded areas

Estimated marginal value product of nitrogen fertilizer conditional on plot soil carbon content



Factors depressing NUE of inorganic fertilizer use:

1. Low soil organic matter

- significant decline in SOM over past 20 years in Malawi (Mpeketula and Snapp)

2. Acidification

From Larson and Oldham,
Mississippi State University Extension Service, 2008.

4.3

5.3

Source: Burke, 2012

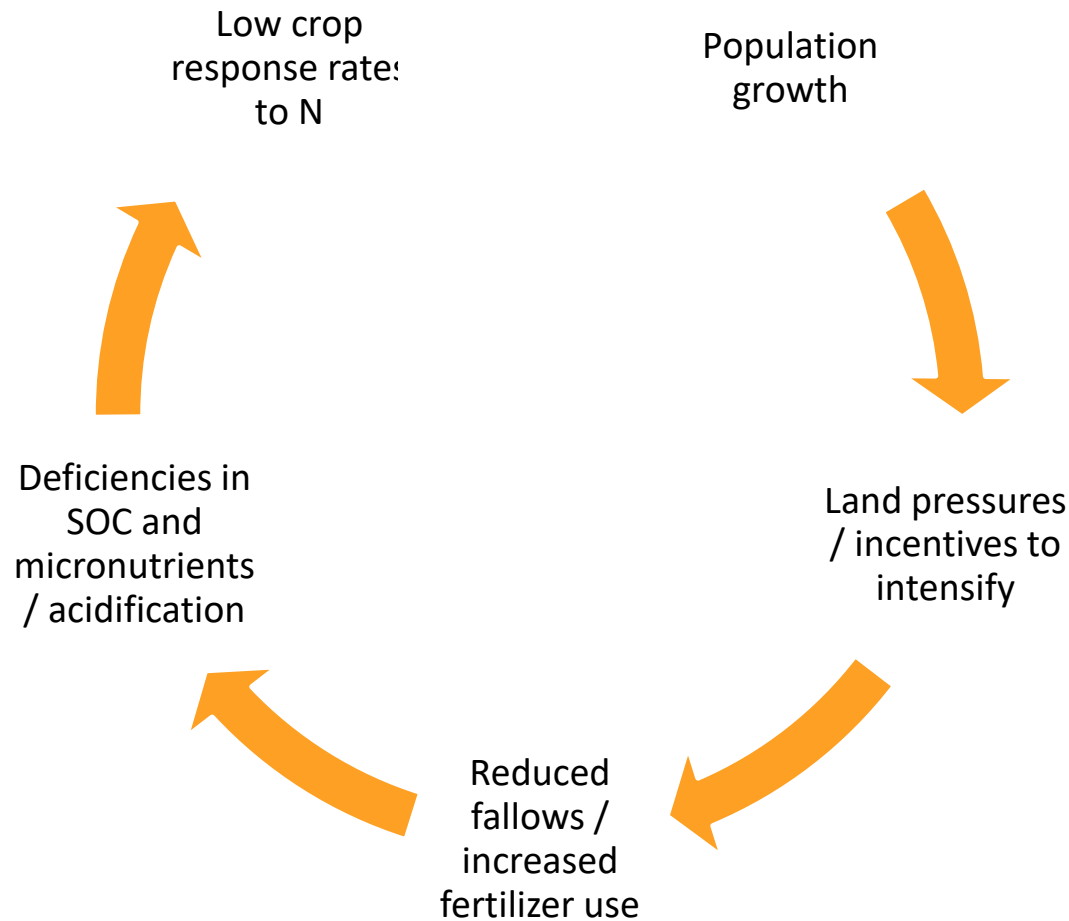


Photo courtesy of Dingi Banda,
Lusaka Province, Zambia

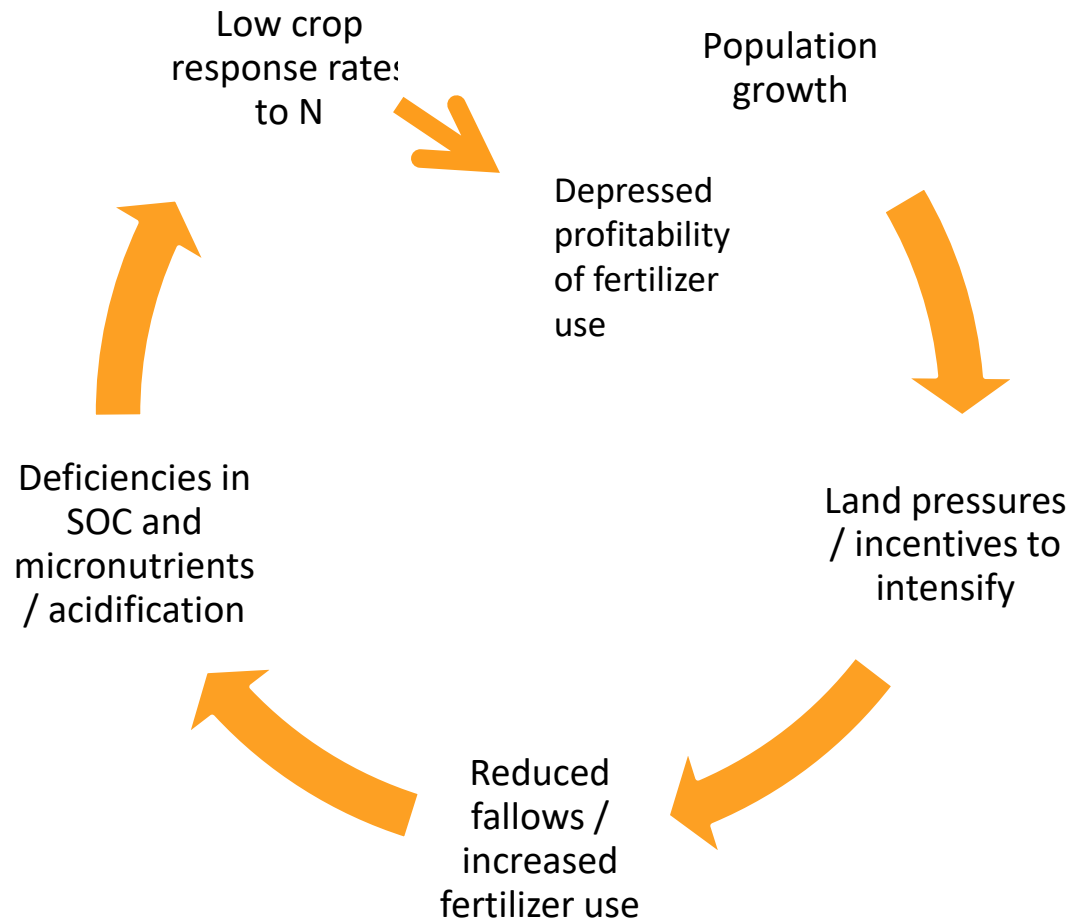
Factors depressing NUE of inorganic fertilizer use:

1. Low soil organic matter
 - significant decline in SOM over past 20 years in Malawi (Mpeketula and Snapp)
2. Acidification
- 3. Micro-nutrient deficiencies**

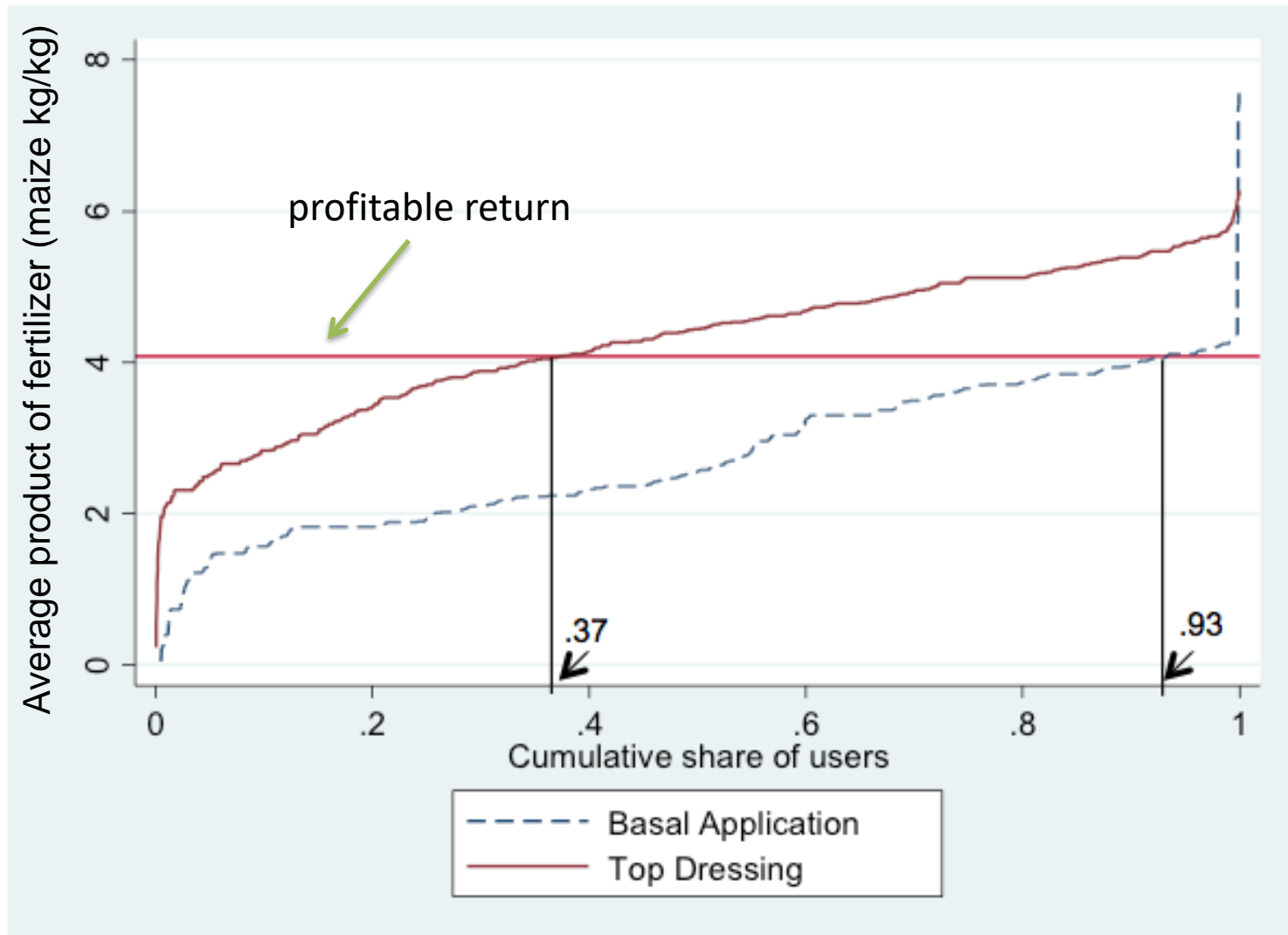
Everyone agrees that inorganic fertilizer use must go up – why isn't it happening?



Everyone agrees that inorganic fertilizer use must go up – why isn't it happening?



Cumulative distribution of average product of fertilizer used in Zambia (2004,2008)



Source: Burke, 2012

Factors affecting N use efficiency

1. Soil organic carbon
 2. Acidification (pH) – mainly affects basal
 3. Micronutrients
 4. Soil moisture – N response on irrigated > rainfed fields
 5. Timing of fertilizer application
 6. Timely and sufficient weeding
 7. Rotation of crops on a given plot
 8. Contours / ridging to prevent erosion on sloped fields
- → Fixation with N
 - → ISPs need to be part of a more holistic approach so that N can get sufficiently high crop response

**Focus on making inputs profitable →
effective demand**

Profitable use (main drivers):

- ❑ output price
- ❑ input prices
- ❑ crop response rates

Elements of a holistic strategy:

1. R&D (national ag research systems)
2. Extension programs / soil testing
3. Programs to help farmers restore soil quality
4. Conservation agricultural practices
5. Physical infrastructure
6. Reducing costs in input supply chains
7. More appropriate fertilizer use recommendations

Oft-asked policy question:

- Given that ISPs will continue, what concrete guidance can be identified to improve their effectiveness?
- We identify 3 proposals:
 1. Holistic approach that regards ISP as one component of an integrated sustainable intensification campaign
 2. Target poor farmers to achieve more equitable development impacts
 3. Redouble political will to reduce corruption

Proposal 1: Raise public investment in agronomic research and extension programs to enable farmers to use fertilizer more efficiently

**Proposal 2: Reconsider
targeting guidelines to achieve
more equitable development
impacts**

FISP fertiliser received (2010/11 crop season) and expected maize sales, 2011, by farm size category

Total area cultivated (maize + all other crops)	Number of farms	% of farms	% of farmers receiving FISP fertilizer	kg of FISP fertilizer received per farm household	% of farmers expecting to sell maize	Expected maize sales (kg/farm household)
	(A)	(B)	(C)	(D)	(E)	(F)
0-0.99 ha	616,867	41.9%				
1-1.99 ha	489,937	33.3%				
2-4.99 ha	315,459	21.4%				
5-9.99 ha	42,332	2.9%				
10-20 ha	6,626	0.5%				
Total	1,471,221	100%				

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2-4.99 ha	315,459	21.4%	45.1%			
5-9.99 ha	42,332	2.9%	58.5%			
10-20 ha	6,626	0.5%	52.6%			
Total	1,471,221	100%	28.6%			

FISP fertiliser received (2010/11 crop season) and expected maize sales, 2011, by farm size category

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0-0.99 ha	616,867	41.9%	14.3%	24.1		
1-1.99 ha	489,937	33.3%	30.6%	69.3		
2-4.99 ha	315,459	21.4%	45.1%	139.7		
5-9.99 ha	42,332	2.9%	58.5%	309.7		
10-20 ha	6,626	0.5%	52.6%	345.6		
Total	1,471,221	100%	28.6%	77.1		

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Total	1,471,221	100%	28.6%	77.1		

Proposal 3: greater political will for ensuring that the subsidies go to the intended beneficiaries

- Currently 1/3 of state resources for ISPs are diverted (Malawi and Zambia), more in other cases (pre-2011 Nigeria)

Ranking of Alternative Investments: Meta-Study Evidence from Asia and Africa

	The Economist	IFPRI study
Policies		
Infrastructure investment		
Agricultural R&D		
Agricultural extension services		
Credit subsidies		
Fertilizer subsidies		
Irrigation		

Ranking with respect to *agricultural growth*: Evidence from Asia

	The Economist	IFPRI
Policies	1	
Infrastructure investment	3	1
Agricultural R&D	2	2
Agricultural extension services	5	
Credit subsidies	7	3
Fertilizer subsidies	6	4
Irrigation	4	5

Ranking with respect to *poverty reduction*: Evidence from Asia

	The Economist	IFPRI
Policies	1	
Infrastructure investment	2	1
Agricultural R&D	3	2
Agricultural extension services	4	3
Credit subsidies	7	4
Fertilizer subsidies	5	6
Irrigation	5	5

Conclusions

1. ISPs are a powerful tool to quickly raise food production....
2. But if they account for too large a share of agricultural spending, they can crowd out other public investments required for sustainable development
3. Spending a large share of the ag budget on ISPs may not be the most effective way to promote the welfare of its citizens, but it is a highly demonstrable way to do so.

Conclusions

4. ISPs would be more effective if adequate resources were allocated to complementary public investments
5. More balanced public expenditure patterns could more effectively promote national policy objectives
6. There are concrete steps for improving ISP effectiveness – related to
 - governance and political commitment to target effectively and reduce diversion
 - More holistic approach to sustainable intensification

III. Why are policy makers not more interested in the research evidence?

1. Mistrust of foreign technical assistance
 - USA / EU countries heavily subsidize...why shouldn't we?
2. Local policy analysts can be accused of being “unpatriotic”
 - Self-censorship?

Bottom line for this symposium:

- Limited incentive *so far* for governments to agree to governance reforms
 - Very different ag policy environment between 1995 and 2015
- Where will the impetus for governance reform come from?
 1. Well educated local polity
 2. Promote mainstream debate
 3. Strengthen African policy analysis units / civil society



Thank you

Survey data vs. researcher-managed trials

Reasons why researcher-managed trials tend to show 2-3 times higher NUE than in farmer-managed survey data:

1. trials often non-randomly select farmers known to extension agents, often “master farmer” types
2. Trials often instruct farmers to follow strict protocols that most farmers cannot adhere to on their own plots
3. “observer effect”
4. Trials often entail throwing out observations in which the plot incurred damage due to insects, disease, monkeys, flooding, etc