Evaluating Mozambique's Agricultural Investment Plan

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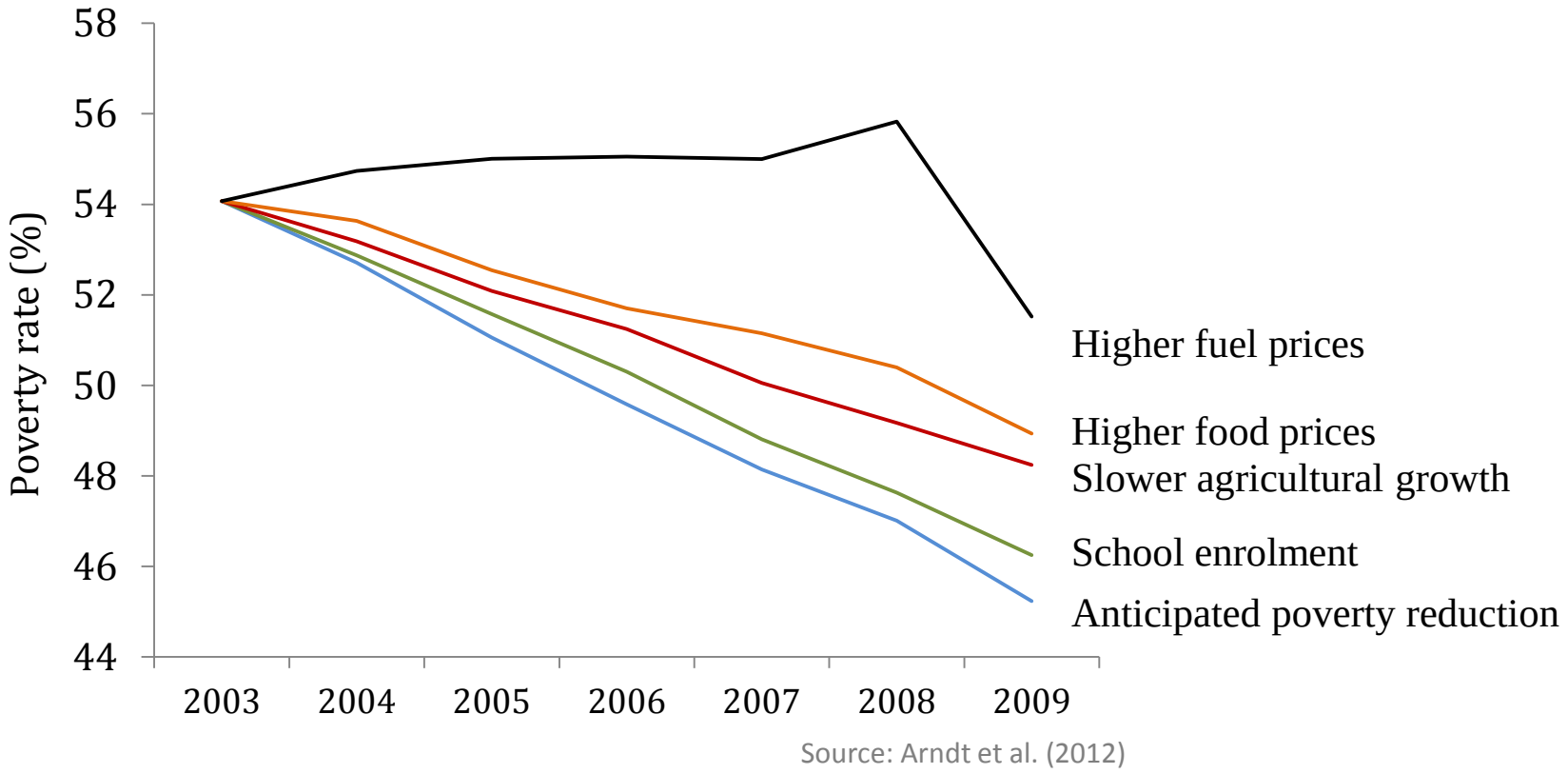
Agriculture and Poverty Reduction

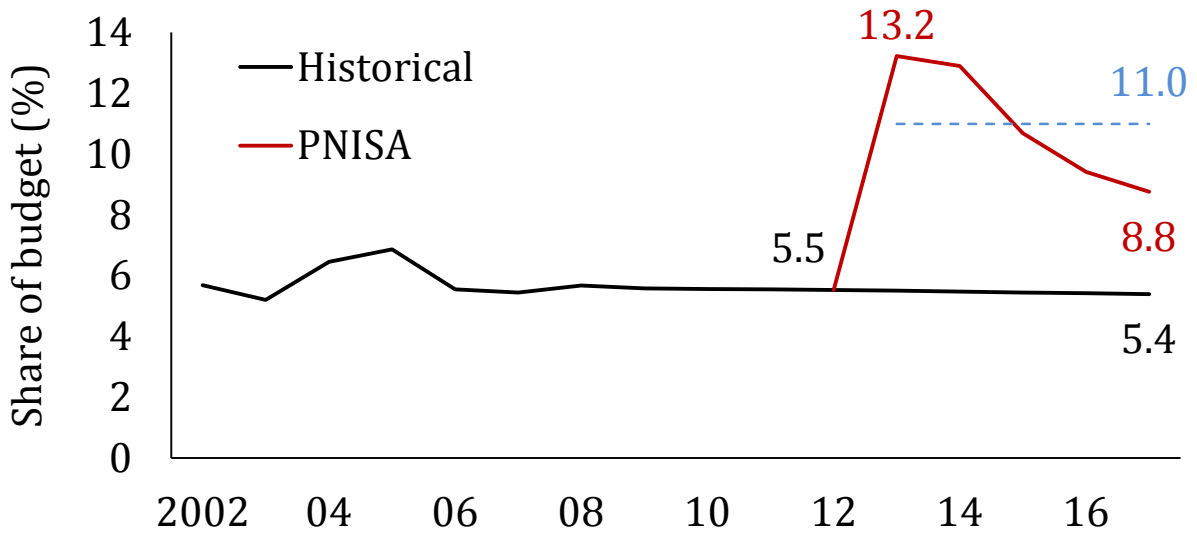
- Poverty persisted despite rapid economic growth
  - Mainly due to external shocks, but also slower agricultural growth



Source: Arndt et al. (2012)

PNISA (1)

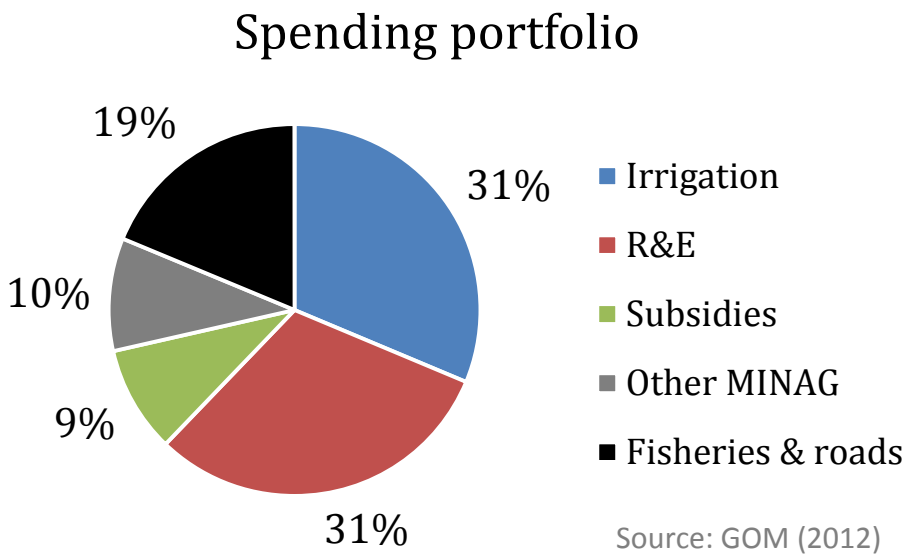
- Ambitious agricultural investment plan for 2013-2017
- Doubles share of agricultural spending in the budget
  - From a baseline that continues 2002-2012 spending growth



Source: World Bank (2010); Benin et al. (2013); GOM (2012)

PNISA (2)

- Diversifies investments relative to historical spending
  - Focus for MINAG on irrigation, R&E and subsidized inputs
- Strategic research questions:
  - Is the increase in spending enough to achieve growth and poverty goals?
  - Can outcomes be improved by altering the investment portfolio?



Source: GOM (2012)

Ex Ante Impact Evaluation

- Sector-wide evaluations are challenging
  - Limited historical data (no data for new interventions)
  - Past performance ≠ future performance (program design changes, improved implementation, etc.)
- We adopt a "hybrid" approach (Pauw and Thurlow 2013)
  - Mozambican data whenever possible
  - Farm-level impact estimates from other countries
- Foreign programs
  - Small-scale irrigation program in Mali (Dillon 2011)
  - Research and extension system in Uganda (Benin et al. 2011)
  - Farm input subsidies from Malawi (Ricker-Gilbert et al. 2011)

Stage 1: Impacts on Productivity

- Outcomes from current spending:
  - E.g., number of households receiving extension services

$$\text{Investment outcome} = \text{Spending level} / \text{Unit cost}$$

- Intervention coverage:
  - E.g., share all households receiving extension

$$\text{Extension coverage} = \text{Outcome} / \text{Farm households}$$
$$\text{Input subsidy coverage} = \text{Outcome} / \text{Crop land area}$$
$$\text{Irrigation coverage} = (\text{Outcome} + \text{Past coverage}) / \text{Crop land area}$$

- Productivity change:

$$\text{Change in TFP} = \text{Base} + \sum \text{Impact coefficient} \cdot \text{Change in coverage}$$

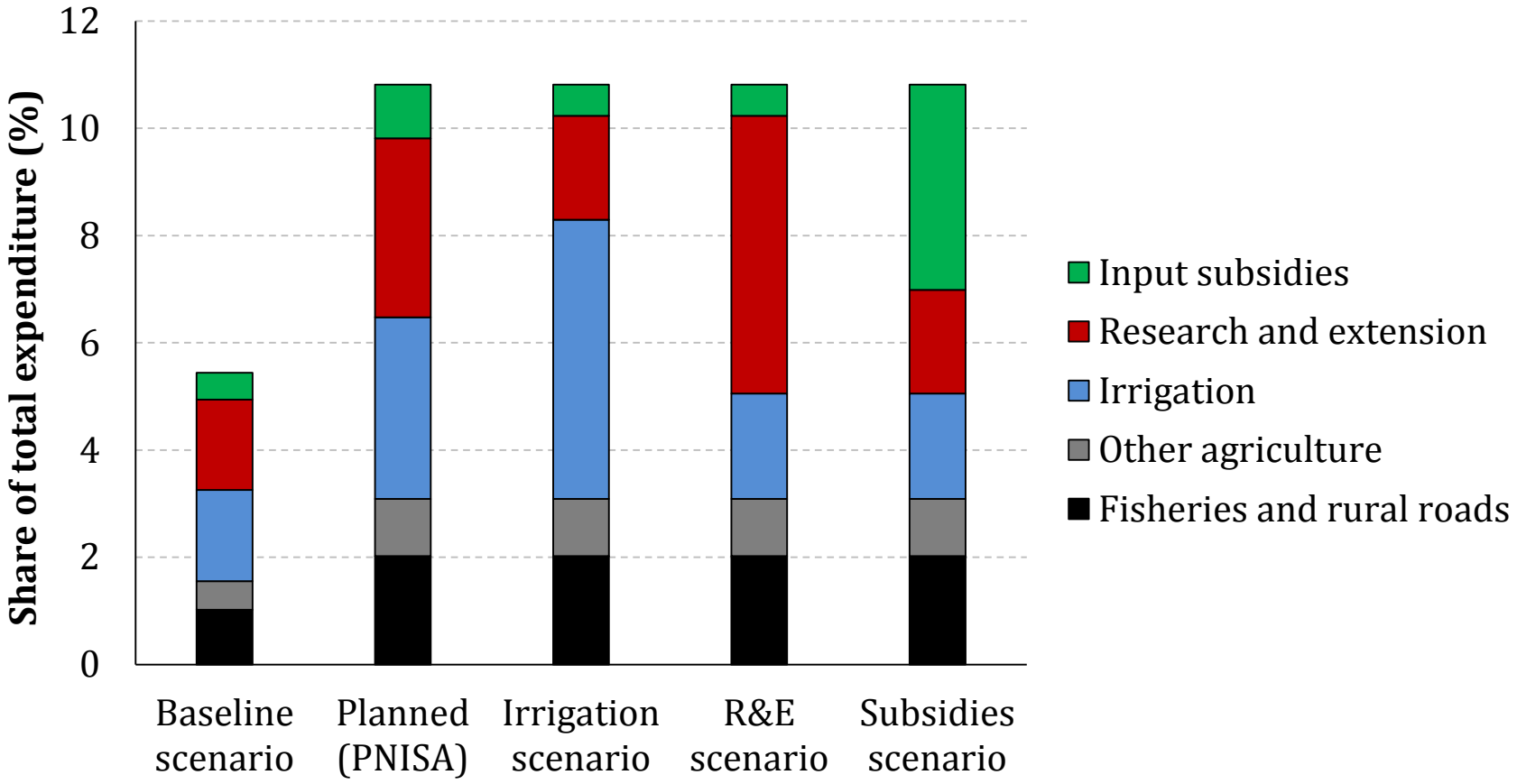
Stage 1: Parameter Estimates

	Intervention	National value		Source
Initial coverage rates	Irrigation	8.3%	of crop land	TIA 2008
	R&E	8.4%	of farmers	TIA 2008
	Inputs	5.2%	of crop land	TIA 2008
Unit costs	Irrigation	$2,287	per hectare	You et al. (2010)
	R&E	$231	per farmer	PNISA & Ext. Master Plan
	Inputs	$121	per hectare	Dorwood et al. (various)
Productivity gains	Irrigation	72.8%		Dillon (2011)
	R&E	67.0%		Benin et al. (2011)
	Inputs	54.7%		Ricker-Gilbert et al. (2011)

Stage 2: Economywide Model

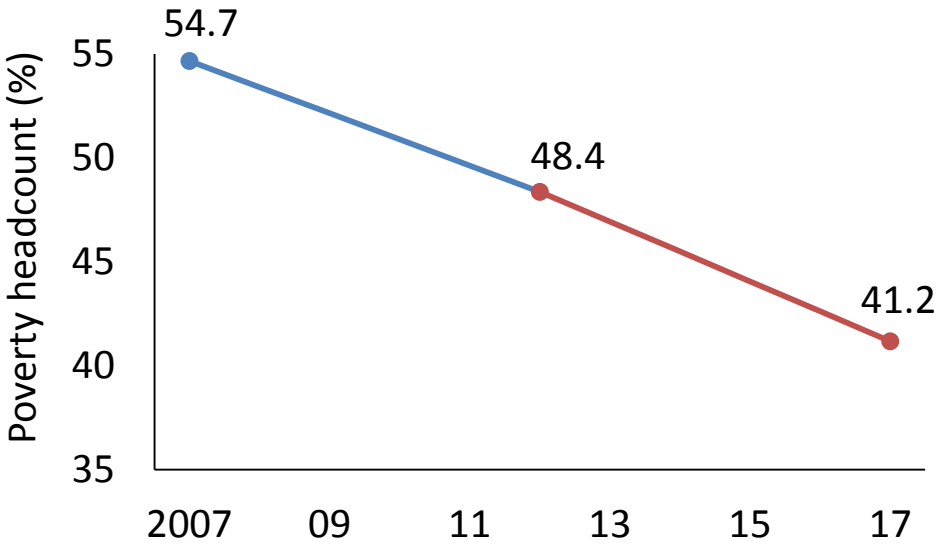
- Detailed economic structure (from a 2007 SAM):
  - 56 sectors (22 in agriculture) in 3 regions (north, center, south)
  - 10 regional household groups (rural/urban; expenditure quintiles)
- Factor markets
  - Land can be allocated across crops based on relative prices
  - Labor mobile across farm/nonfarm sectors, but not regions
  - New capital is mobile, but once invested, is fixed in place ("putty-clay")
- Government spending may crowd-out private investment
- Recursive dynamic
  - Previous period investment determines new capital available
  - Run over 2007-2017, but focus only on 2012-2017 period

Investment Scenarios



Baseline

- Continue historical trends (as in Arndt et al. 2012)
  - 2.5% population and labor supply growth
  - 1% annual land expansion
  - TFP growth favors non-agriculture
- Investment outcomes:
  - Irrigation (8% to 14%)
  - Extension (8% to 13%)
  - Inputs (5% to 7%)
- Development outcomes:
  - National GDP grows at 6.4%
  - Agriculture grows at 4%



PNISA's Impacts

	PNISA	Baseline	
Annual public spending per rural farm household	$153.4	$72.8	Doubling of public agricultural spending
GDP growth rate	7.6%	6.4%	
Agricultural growth rate	8.5%	4.0%	More than doubles agricultural growth
Poverty rate in 2017	35.2%	41.2%	
Increase in total GDP per dollar spent	$1.6		Positive return on investment (BCR)
People lifted above pov. line per $1000 spent	2.9		Doesn't target poor, but reduces poverty

Altering PNISA's Portfolio

Reallocating funds towards…

	PNISA	Irrigation	Extension	Subsidies
Annual public spending per rural farm household	$153.4	$153.4	$153.4	$153.4
GDP growth rate	7.6%	7.2%	7.8%	8.3%
Agricultural growth rate	**8.5%**	**7.2%**	**9.0%**	**11.1%**
Poverty rate in 2017	35.2%	38.2%	33.8%	32.7%
Increase in total GDP per dollar spent	$1.6	$1.1	$1.9	$2.6
People lifted above pov. line per $1000 spent	**2.9**	**1.5**	**3.6**	**4.1**

Altering Spending Efficiency

	PNISA	Irrigation	Extension	Subsidies
Increase in total GDP per dollar spent	$1.6	$1.1	$1.9	$2.6
20% more efficient	$1.9	**$1.3**	**$2.2**	$3.0
20% less efficient	$1.3	$0.9	**$1.5**	**$2.1**
People lifted above poverty line per $1000 spent	2.9	1.5	**3.6**	4.1
20% more efficient	3.3	1.8	**3.9**	4.7
20% less efficient	2.4	1.3	3.0	**3.6**

Conclusions

- PNISA exceeds plausible growth target
  - Not surprising given the large scale of the program ($153 per farmer)
  - AND we ignore spending on fisheries, rural roads, marketing etc.
- PNISA substantially reduces poverty
  - Almost meets 2014 poverty target of 42%
- Altering portfolio improves program outcomes
  - Irrigation generates lower returns than R&E and subsidies
  - Reprioritizing portfolio could reduce program costs without sacrificing program outcomes
- Improving efficiency is as important as raising spending levels in promoting growth