

# Role of Policy Change in Adoption of Improved Varieties in sub-Saharan Africa

June 28, 2016

Latha Nagarajan (IFDC)  
Anwar Naseem (Rutgers)  
Carl Pray (Rutgers)

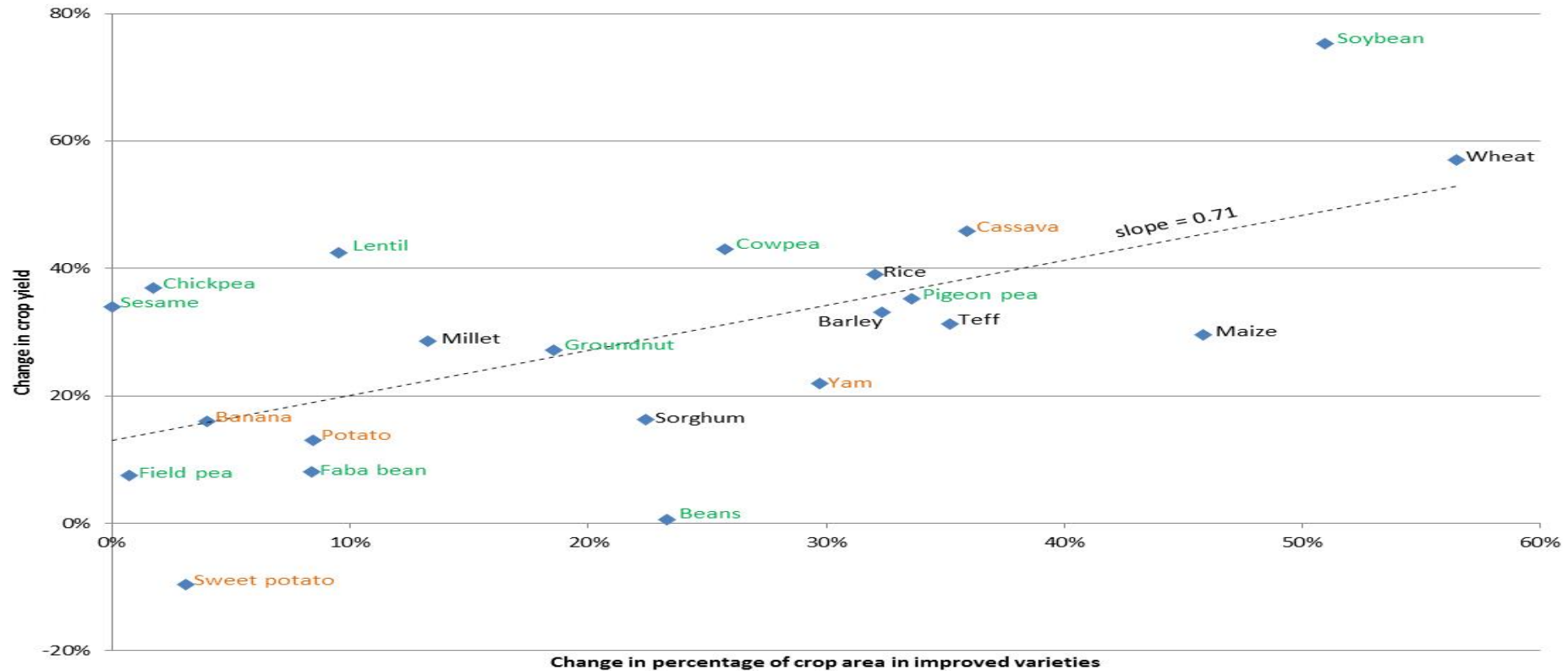
# Productivity impacts of improved varieties

- The use of improved seeds is associated with higher productivity (Evenson and Gollin, 2003; Fuglie and Marder, 2016)
- Percentage yield or TFP impact from adoption of improved varieties

Crop	SSA	India
Maize	45%	65%
Millet	38%	45%
Rice	24%	33-65%
Sorghum	34%	37-40%

Source: Evenson (2003)

# Growth in adoption of IV is associate with yield growth



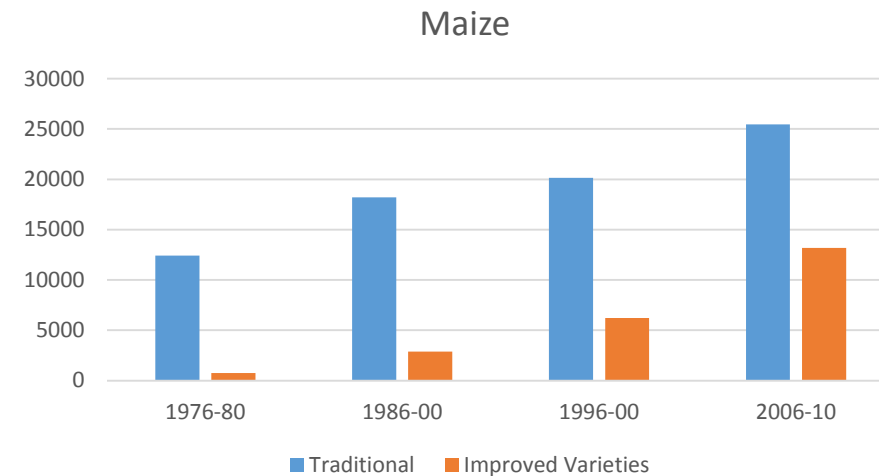
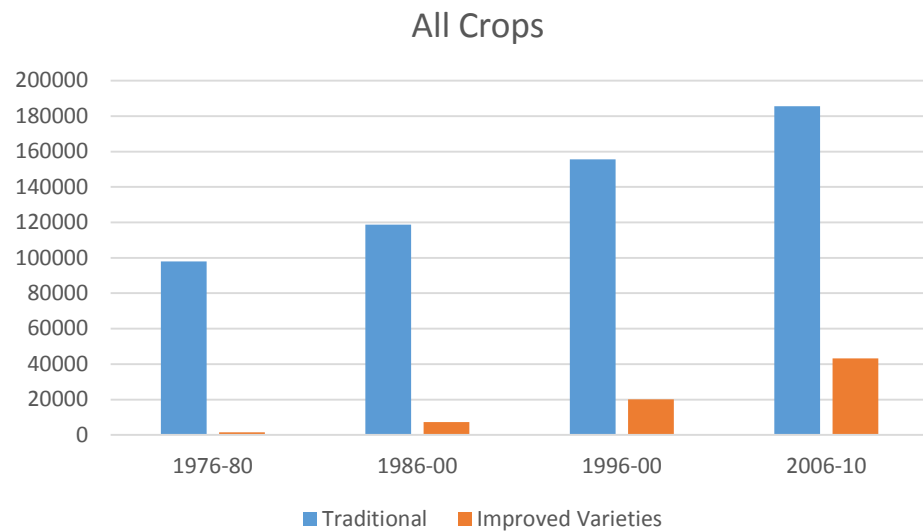
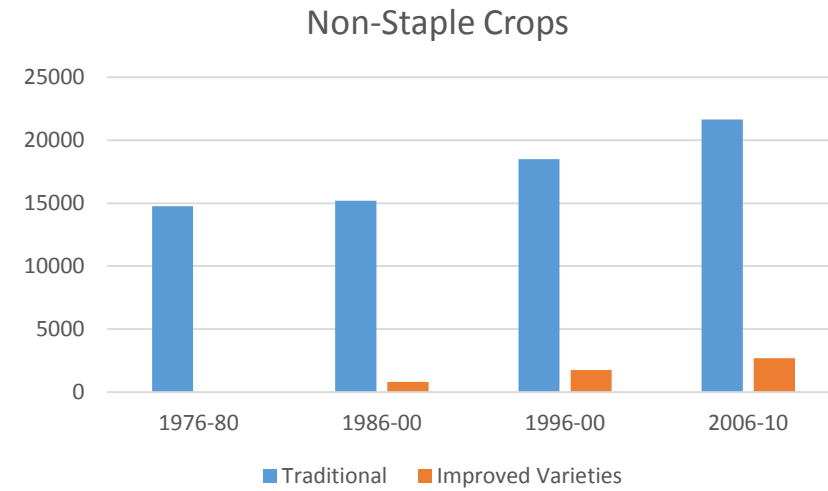
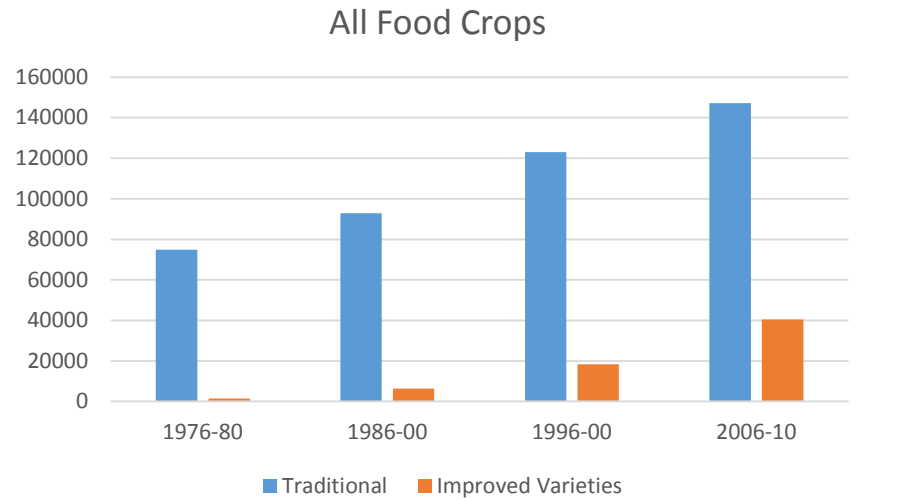
Source: Fuglie and Marder (2015)

# Comparison of improved variety adoption across regions

Region	Area (million ha)	Estimated number of variety release (1965-1998)	Share improved variety area	Total genetic improvement contribution to yield growth (%/yr)
Latin America	57	3146	0.51	0.66
Asia	337	2229	0.83	0.88
SS Africa	92	1157	0.23	0.28

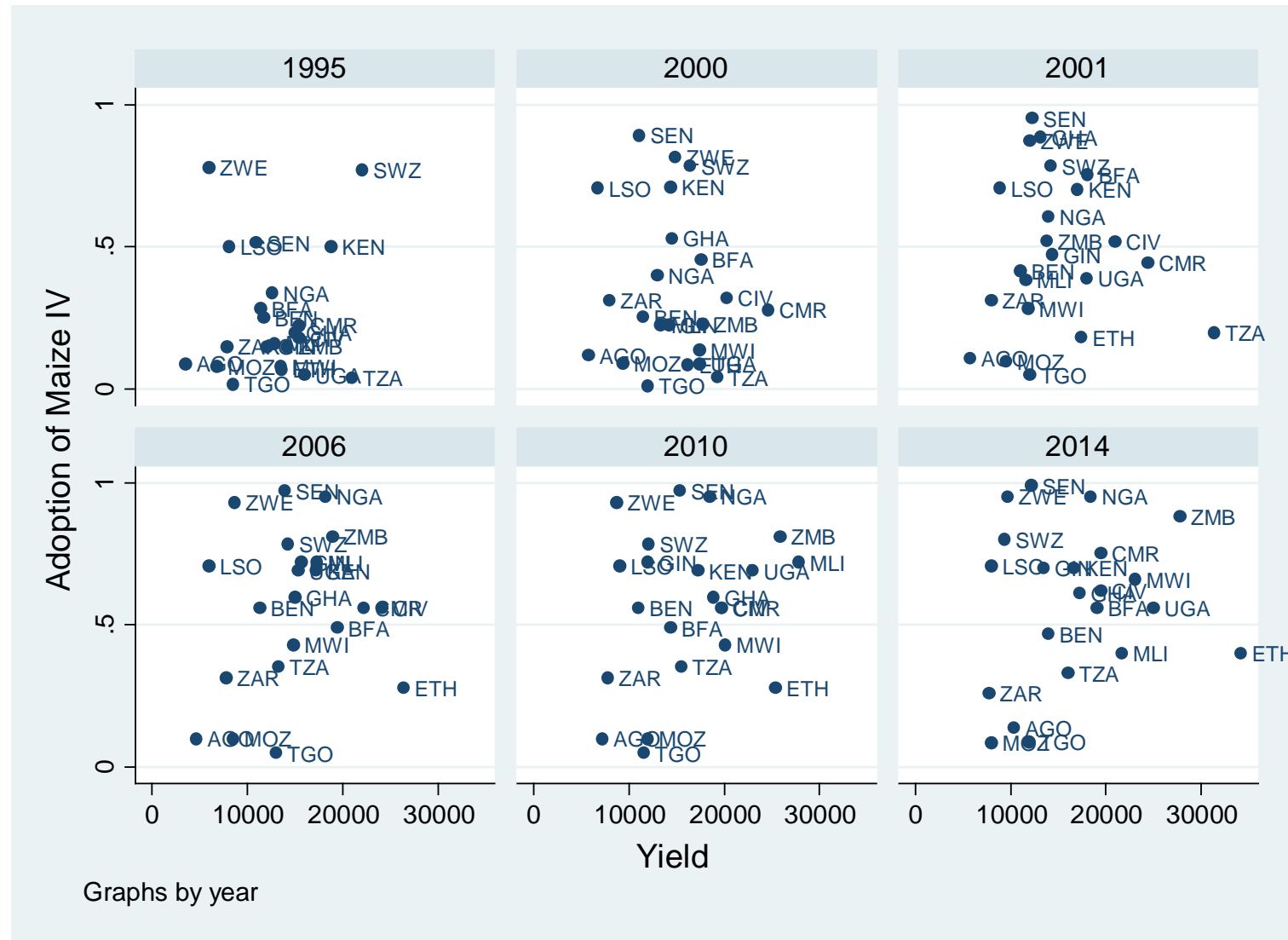
Source: Renkow and Byerlee (2010)

# Adoption of IV: Trends in SSA

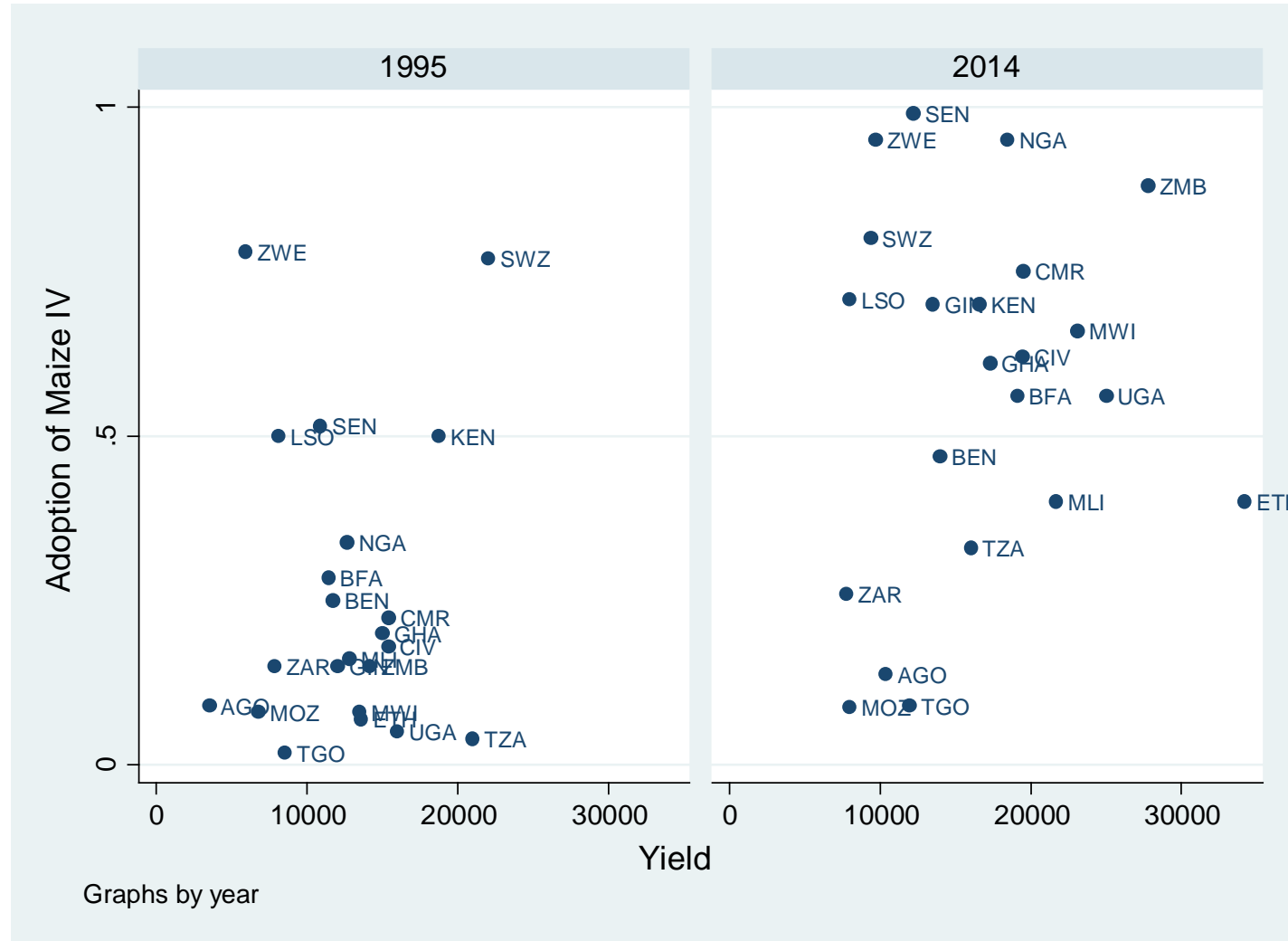


Source: Fuglie and Marder (2015)

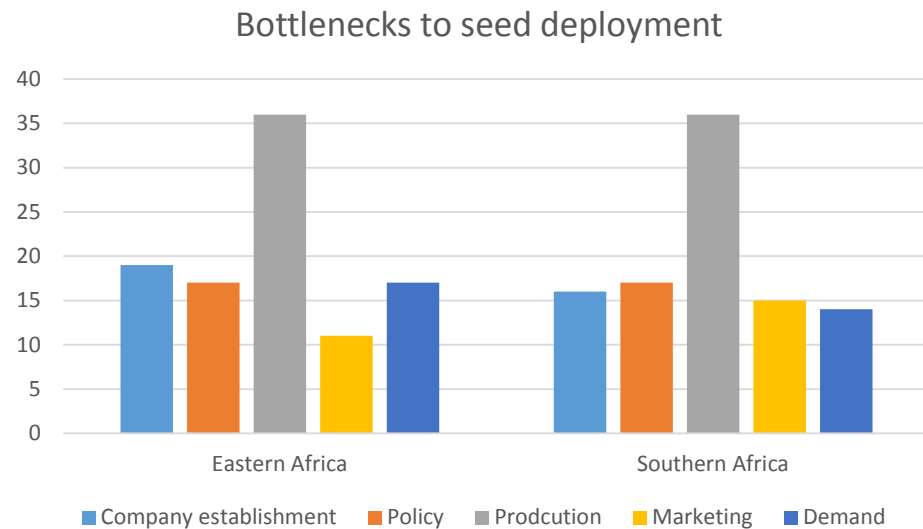
# Maize IV adoption and yield I



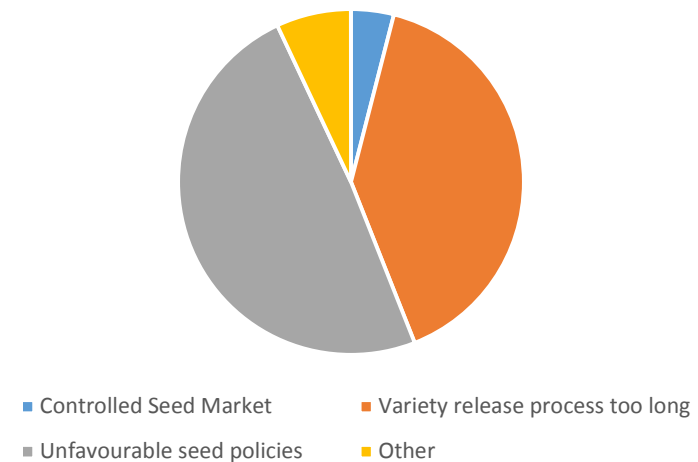
# Maize IV adoption and yield II



# Constraints to adoption of IV



Seed Policy Related Bottlenecks



Source: Langyintuo et al (2008);  
Survey of 103 seed providers in SSA



# Policy change and adoption of IV

- Policy changes have led to greater private sector participation in seed markets of SSA
- Greater private sector involvement has led to adoption of improved varieties
  - Pathways
    - Own variety dissemination
    - Getting public varieties dissemination, especially when no public mechanisms exists (without: Zambia, Tanzania; with: Kenya, Ethiopia, Mozambique, Ghana).
    - Competition

# Policy changes

- Liberalization
  - Allowing private sector seed production
    - MNC entry
    - Privatization of parastatal (with some exceptions)
    - Private sector seed sales to farmers
  - Access to public cultivars
- Seed Laws; Plant Breeders Rights, Harmonization
- Improved business environment
- Subsidies; free distribution of seeds

# Impact of policy changes: Increase in private firms

Country	Number of private seed companies		
	2002	2007	2012
Ethiopia	0	8	13
Ghana	-	-	10
Kenya	31	60	104
Malawi	2	5	11
Nigeria	-	-	32
Rwanda	0	1	5
Tanzania	-	-	66
Uganda	-	-	23
Zambia	-	-	16
Total			332

Source: AGRA, 2013; World Bank.

# Private firms engaged in maize seed production and marketing

<b>COUNTRIES</b>	<b>1997</b>	<b>2007/08</b>	<b>2014/15</b>
DRC	NA	NA	NA
Ethiopia	2	7	2(4)
Kenya	3	12	14(5)
<b>Tanzania</b>	2	14	18
Uganda	1	7	9
<b>EAST</b>	<b>8</b>	<b>40</b>	<b>53</b>
Angola	2	4	2
Lesotho	2	2	4
Malawi	2	5	13
<b>Mozambique</b>	1	14	16
Swaziland	0	3	3
<b>Zambia</b>	2	6	14
Zimbabwe	5	11	15
<b>SOUTH</b>	<b>14</b>	<b>45</b>	<b>67</b>
Benin	0	0	1(4)
<b>Burkina Faso</b>	0	0	2(4)
Cameroon	NA	NA	NA
<b>CIV</b>	NA	NA	2
Ghana	0(1)	0(1)	8
<b>Guinea</b>	NA	NA	NA
Mali	0	2	2(2)
<b>Nigeria</b>	3	8	14
Senegal	0	0	1
Togo	NA	NA	NA
<b>WEST</b>	<b>3</b>	<b>10</b>	<b>30</b>

Sources: AGRA/DTMA/Rusike/Hassan/Langytuo, TASA/Authors) Figures in Brackets indicate farmer associations/parastatal

# What policy indicators might be associated with adoption?

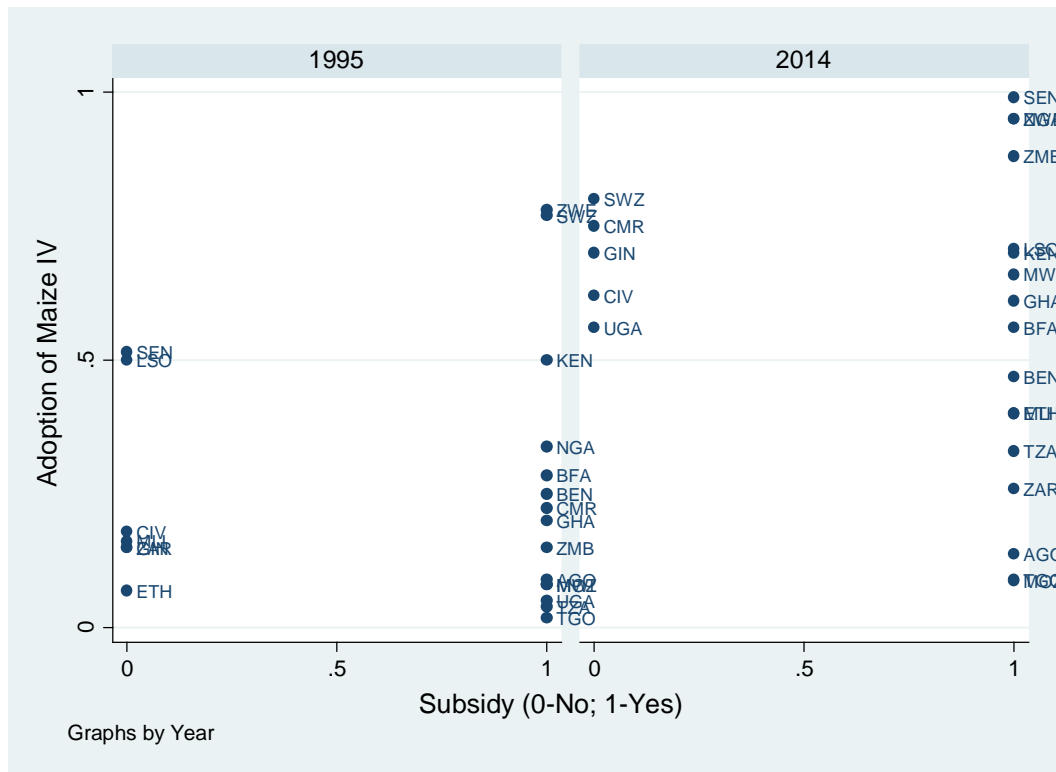
- Seed law/regulation
- Subsidy
- Expenditure on agriculture (total outlays, R&D)
- Good governance

# Existence of Seed Laws/ regulations in SSA

<b>COUNTRIES</b>	<b>Seed Law/Legislation</b>
DRC	no
Ethiopia#	yes
Kenya#	yes
Tanzania#	yes
Uganda	yes
Angola	yes
Lesotho	yes
Malawi	yes
Mozambique#	yes
Swaziland	yes
Zambia#	yes
Zimbabwe#	yes
Benin	yes
Burkina Faso	yes
Cameroon	no
CIV	yes
Ghana	yes
Guinea	no
Mali	yes
Nigeria	yes
Senegal	yes
Togo	yes

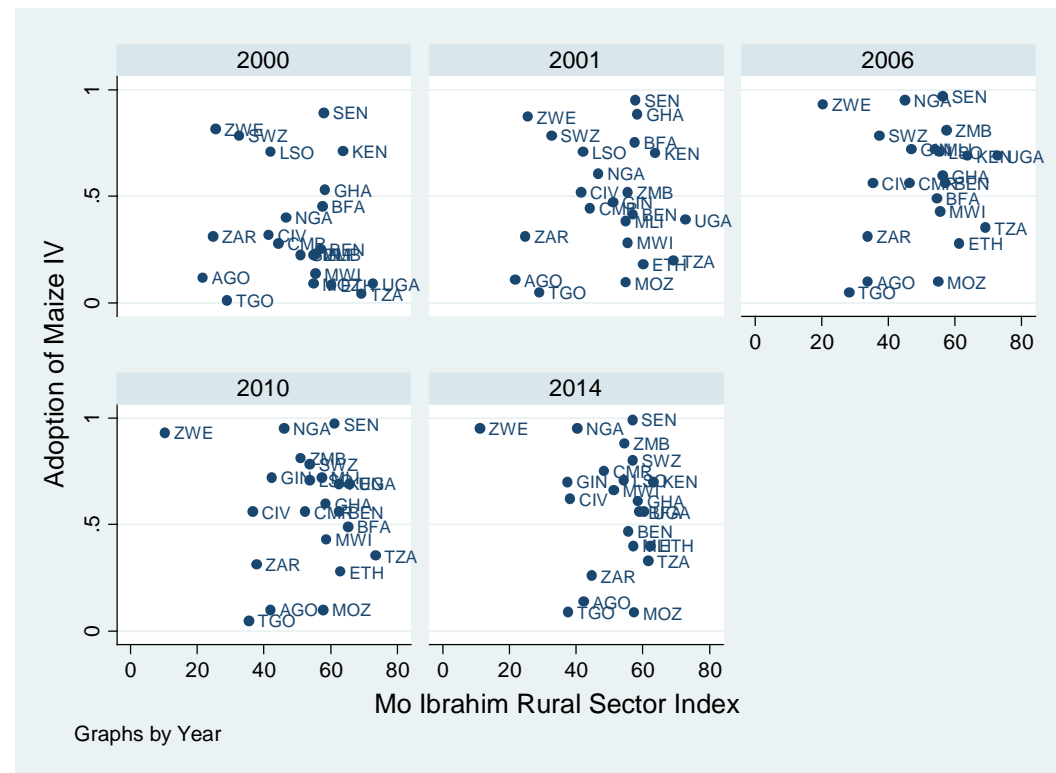
# indicates PVP existence; the regulations in the form of seed laws/act or decree or draft regulations for certification

# Maize IV adoption and subsidy



		Subsidy	No Subsidy
1995	N	15	7
	mean	0.257	0.246
	sd	0.182	0.182
	median	0.2	0.161
2014	N	17	5
	mean	0.54	0.686
	sd	0.302	0.097
	median	0.56	0.7

# Maize IV adoption and Mo Ibrahim Rural Index





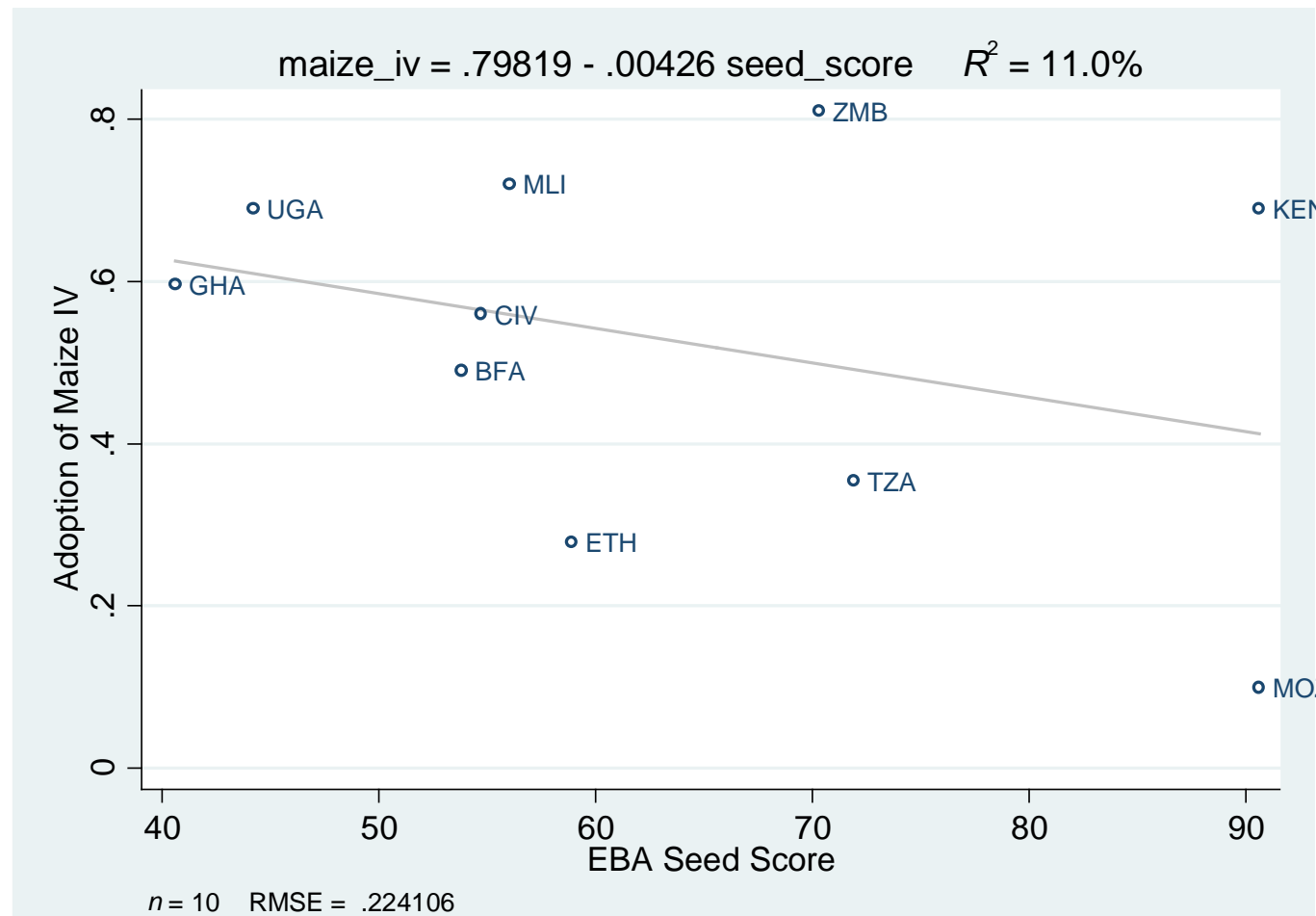
	Rural Sector Governance Improved	Rural Sector Governance Worsened
Adoption of Maize IV Increased	Senegal Ghana Burkina Faso Nigeria Cameroon Benin Zambia Malawi Mozambique Uganda Tanzania Togo	Zimbabwe Cote d'Ivoire Guinea Chad
Adoption of Maize IV Unchanged	DR Congo	
Adoption of Maize IV Decreased	Angola	Kenya

# Maize IV adoption and Agricultural Orientation Index

- FAO's AOI reflects the extent to which government expenditures on agriculture reflect (or not) the importance of agriculture in the overall economy



# Maize adoption and DBA Seed Score



# Multivariate analysis: Insights from rate of diffusion of improved varieties

- Fuglie and Marder (2015):
  - Estimate the rate of adoption of improved varieties (slope of the diffusion curve), as a function of
    - Number of improved varieties released
    - CG and National ag R&D
    - Education
    - Nominal rate of assistance
    - Road density
    - Health (HIV-AIDS)
    - Conflict

	Food	Cereal	Root Crop	Maize	Cassava
Slope of diffusion curve	.0424	.0479	.0115	.0415	.3326

# Ongoing / Future work

- Structural breaks due to specific policy events
- More accurate assessment of private participation in the market
  - Market share of seed production and sales
    - Private/Public
    - Industry structure
    - Presence of MNCs
- Better indicator for government / donor support and policy related to seed systems
  - EBA Seed Score, TASAI seed index
- Case studies (4 country, 4 input study)