Role of Agricultural Research and Development in the MDGs – Post 2015 in Sub-Saharan Africa

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1. Introduction

Two major question in our literature review :

- The extent to which the Millennium Development Goals (MDGs) have been achieved and avenues for future orientation to achieve Sustainable Development Goals (SDGs)

- Another question is what is the expected role of Research and Development in reducing extreme poverty – one of both MDGs and SDGs targets.

2. Introduction

o   The aim of this article is to call upon more reflection on the questions raised above   as we try to understand further what would be the role of research and Development (R&D) in post 2015 –MDGs in Sub Saharan Africa.

o   The focus in this paper is on Agricultural Research and Development (Ag R&D) to assess the economic and poverty impacts of Ag R&D in the Sub Saharan African Countries.
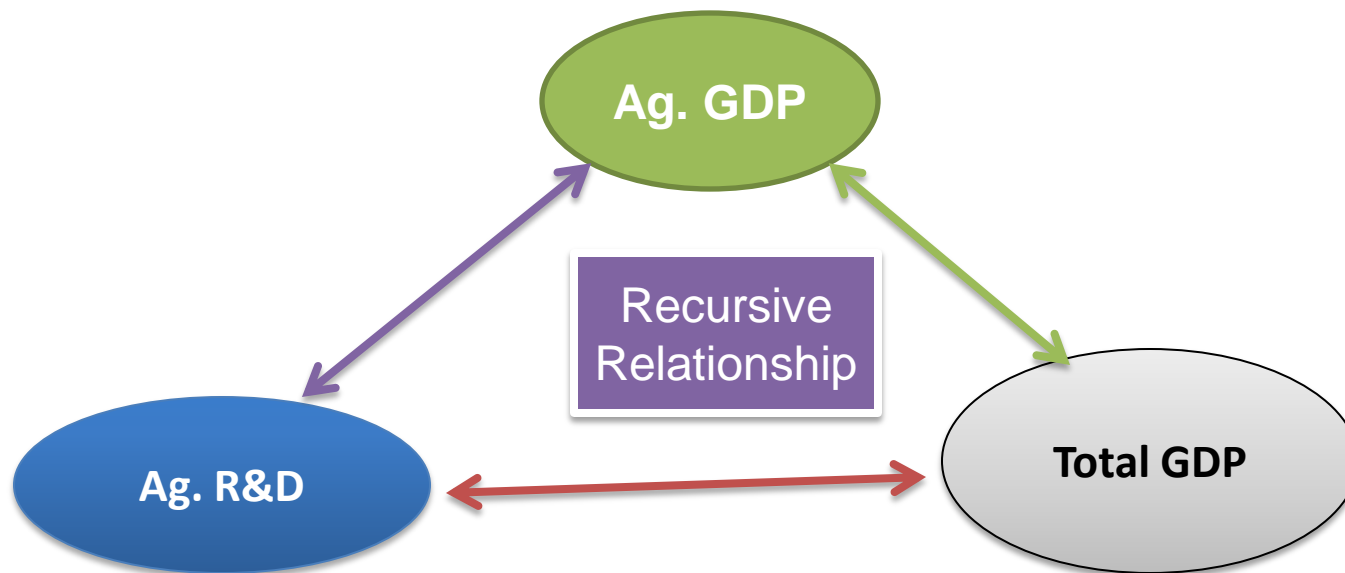
3. Research Methods and Materials

- Data used for this paper were obtained from secondary sources. These includes: ASTI led by IFPRI, CGIAR research program on policies, institutions, and markets; the FAOSTAT, others.

- Data collected is mostly regarding public spending in Ag R&D, Agricultural GDP, Total GDP for SSA countries.

3. Research Methods and Materials

- The analysis used both descriptive and inferential procedures.

- A recursive simultaneous equations system was estimated to test the expected relationships.

Recursive relationship between Ag. R&D, Ag.GDP, and Total GDP

3. Research Methods and Materials

$$AgGdP = x'_{1i}\beta_1 + \beta_2 AgR\&D + u_{1i} \qquad (1)$$

$$GDP = x'_{2i}\beta_2 + \delta_1 AgGDP_1 + u_{2i} \qquad (2)$$

$$AgR\&D = x'_{3i}\beta_3 + \delta_2 AgGDP_{t-1} + \alpha GDP_{t-1} + u_{3i} \qquad (3)$$

Where Ag. GDP , GDP, and Ag. GDP: endogenous variables (parameters to be estimated);

x_i : vector of conditioning variables for the ith individual SSA country

u_i : captures all unobservable factors that affect the dependent variables

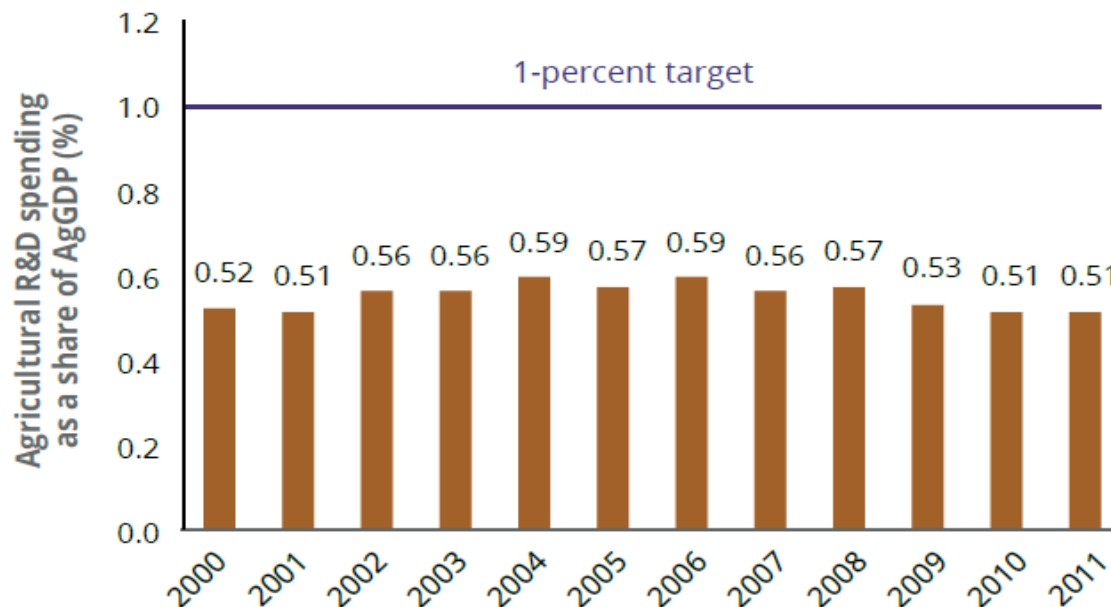# 4. Public Spending in Agricultural R&D in SSA

- AgR&D can be measured by:

  - The weight given to Ag. R&D in the budgeting process

  - The total agriculture spending on R&D as % of Agricultural Gross Domestic Product

- There is a guidance from NEPAD that SSA countries low and middle-income countries need to increase their spending on Ag. R&D by 5% per year and allocate at least 1% of their GDP for the public Ag. R&D during 2015-2025.
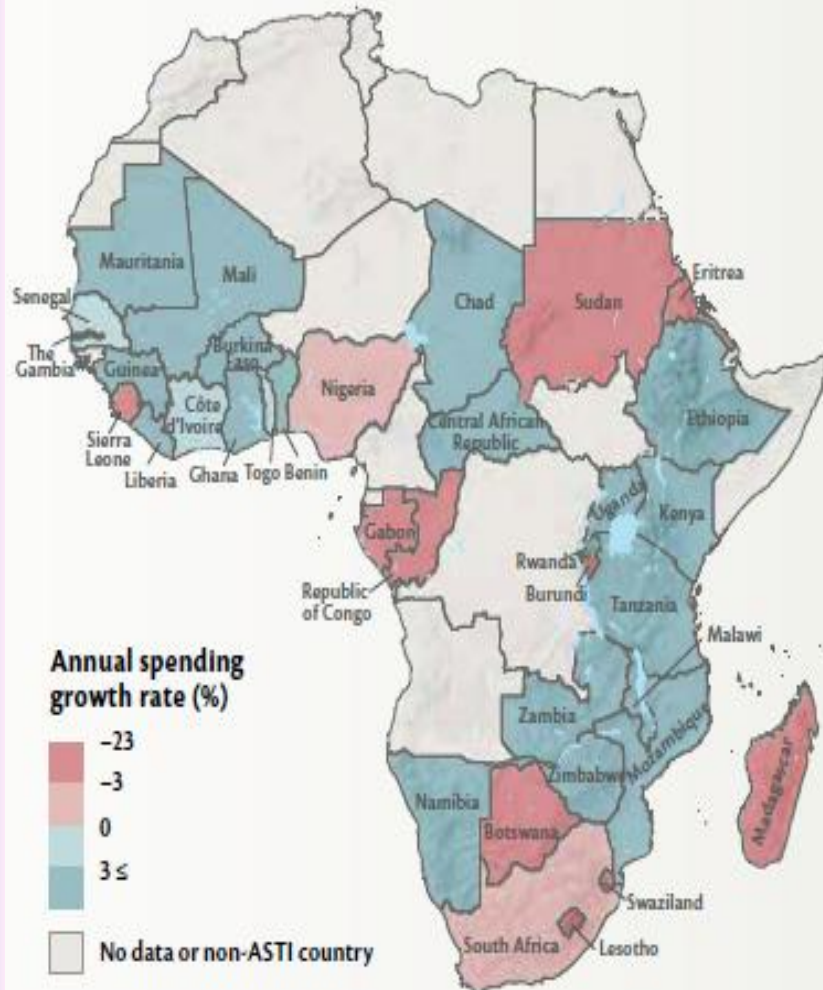
4. Public Spending in Agricultural R&D in SSA

o Estimates from IFPRI (2014) show that overall investment levels in most countries are still well below the levels required to sustain agricultural R&D needs.

o For instance, in 2011, SSA as whole invested 0.51percentage of Ag.GDP on average.

o Only 10 countries met the investment target of 1% of the total Ag.GDP set by NEPAD. These include: Mauritius, Namibia, Botswana, South Africa, Swaziland, Uganda, Kenya, Cape Verbe, Malawi, and Gambia.
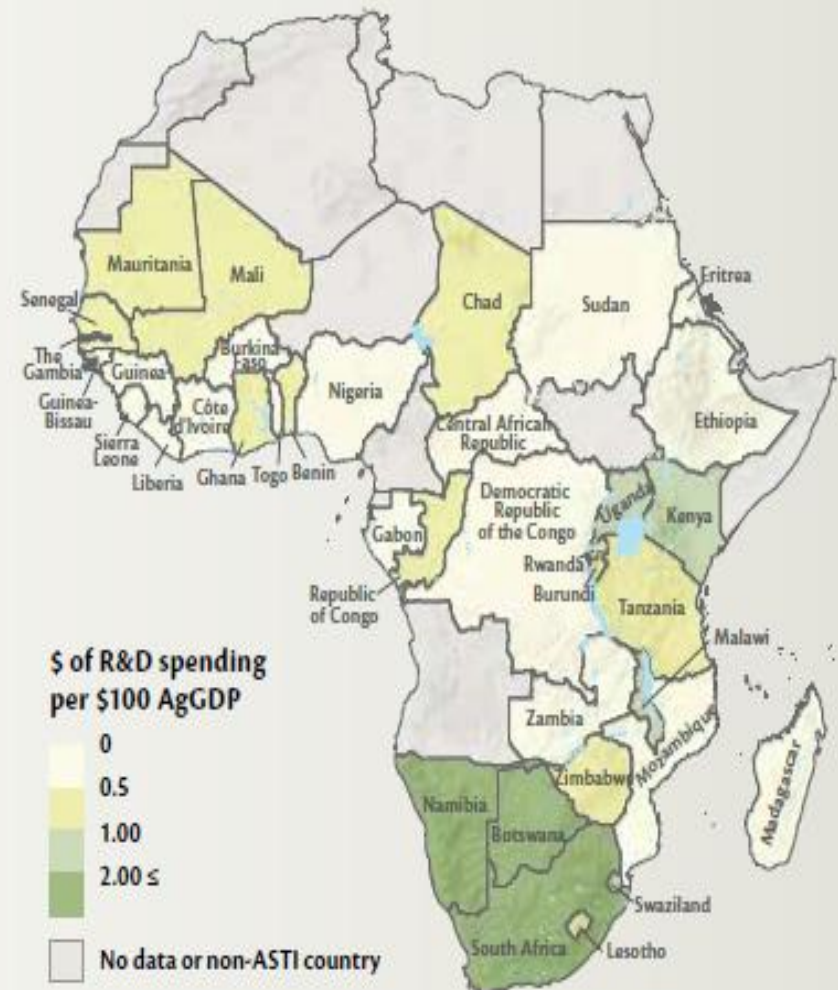
4.Public Spending in Agricultural R&D in SSA

MAP 1 Change in public agriculture R&D spending levels, 2008–2011

MAP 2 Intensity of agriculture R&D spending, 2011

4.Public Spending in Agricultural R&D in SSA

Agriculture Spending in Developed Countries and SSA
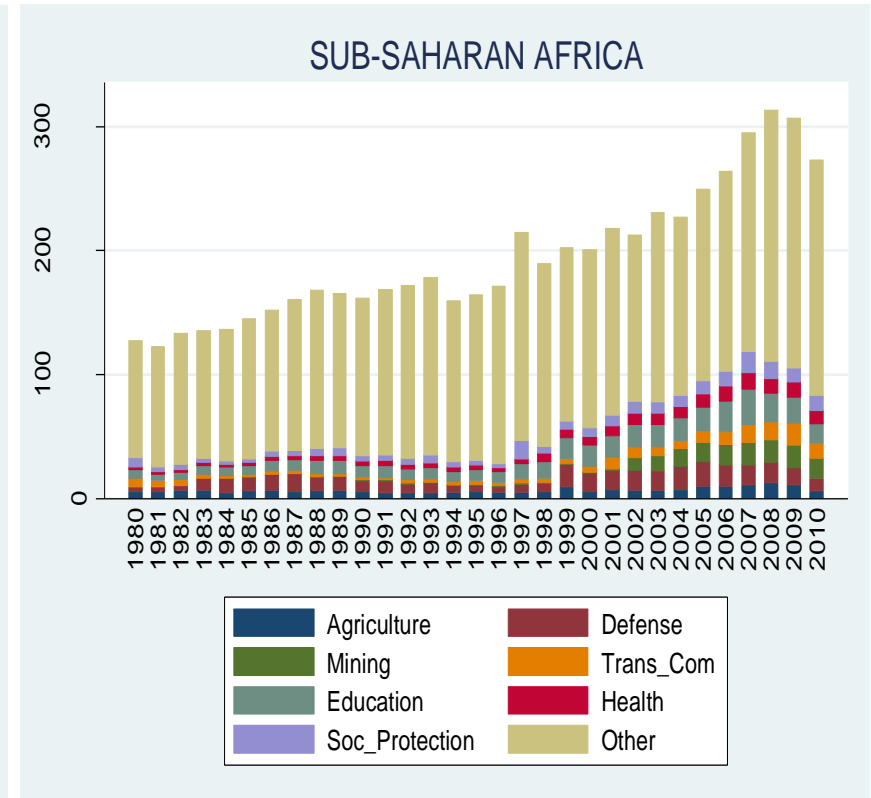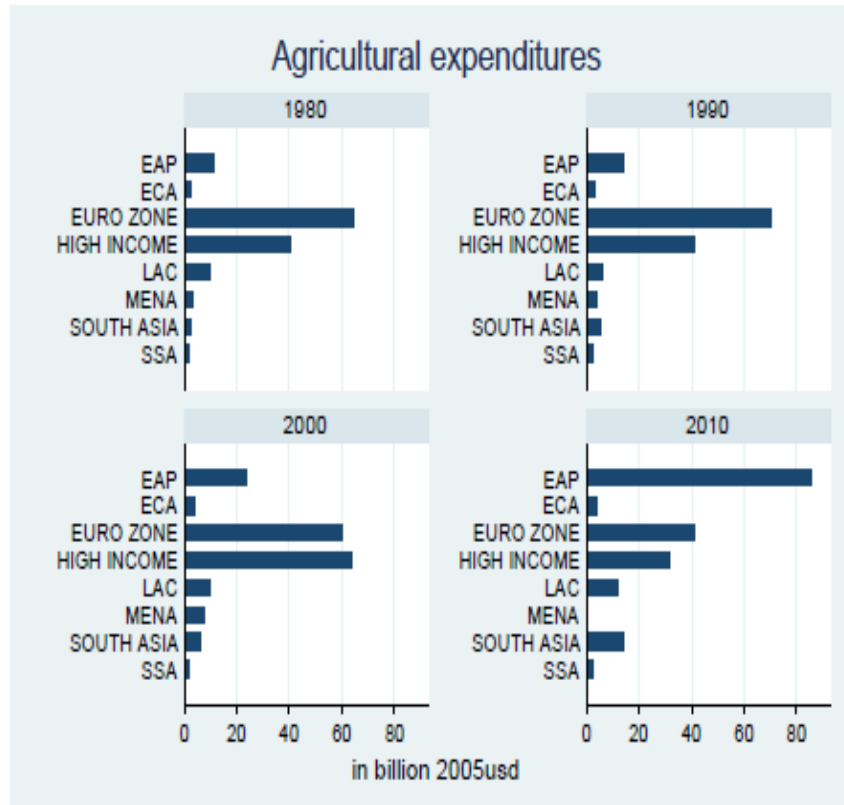
Economic and poverty impacts of Agricultural R&D in SSA

- Ending extreme poverty remains one of the 2015 development agenda for all regions.

- Since 1990, the number of extreme poor has fallen in all regions expect Sub-Saharan Africa, where population growth exceeded the rate of poverty reduction , increasing the number of extremely poor people from 287 million in 1990 to 415 million in 2011 (GMR, 2015).

5. Economic and poverty impacts of Agricultural R&D in SSA

FIGURE A.1 Poverty rates continue to fall, but progress is uneven

Legend:
- East Asia and Pacific
- Latin America and the Caribbean
- South Asia
- Europe and Central Asia
- Middle East and North Africa
- Sub-Saharan Africa
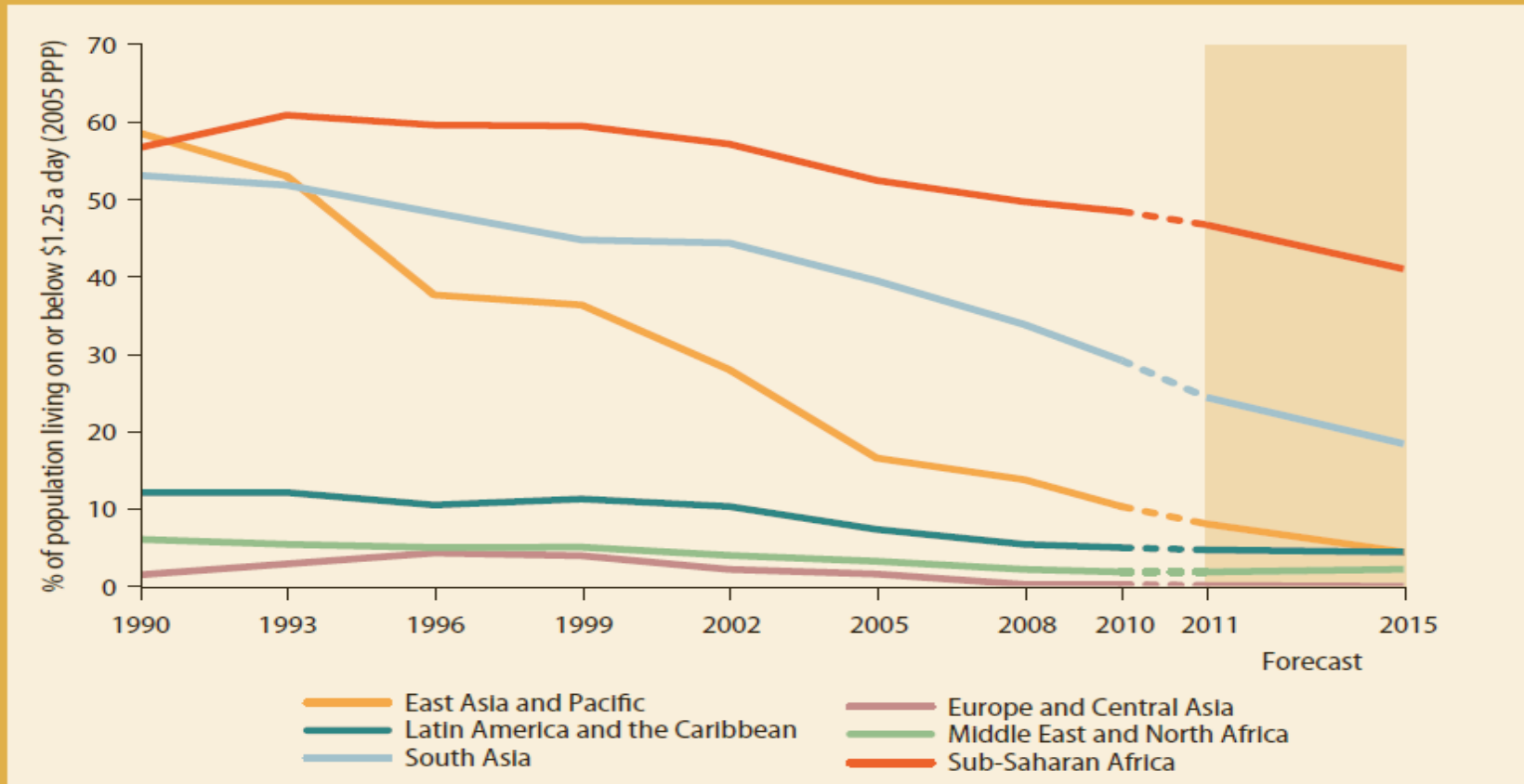
Source: World Bank, PovcalNet: an online poverty analysis tool, http://iresearch.worldbank.org/PovcalNet/index.htm.
Note: Regional poverty rates are measured at $1.25 (2005 PPP) a day, with forecasts to 2015 (to be updated).
Note: Surveys cover less than half of the population.

Regional poverty rates, Source (GMR, 2015).

5. Economic and poverty impacts of Agricultural R&D in SSA
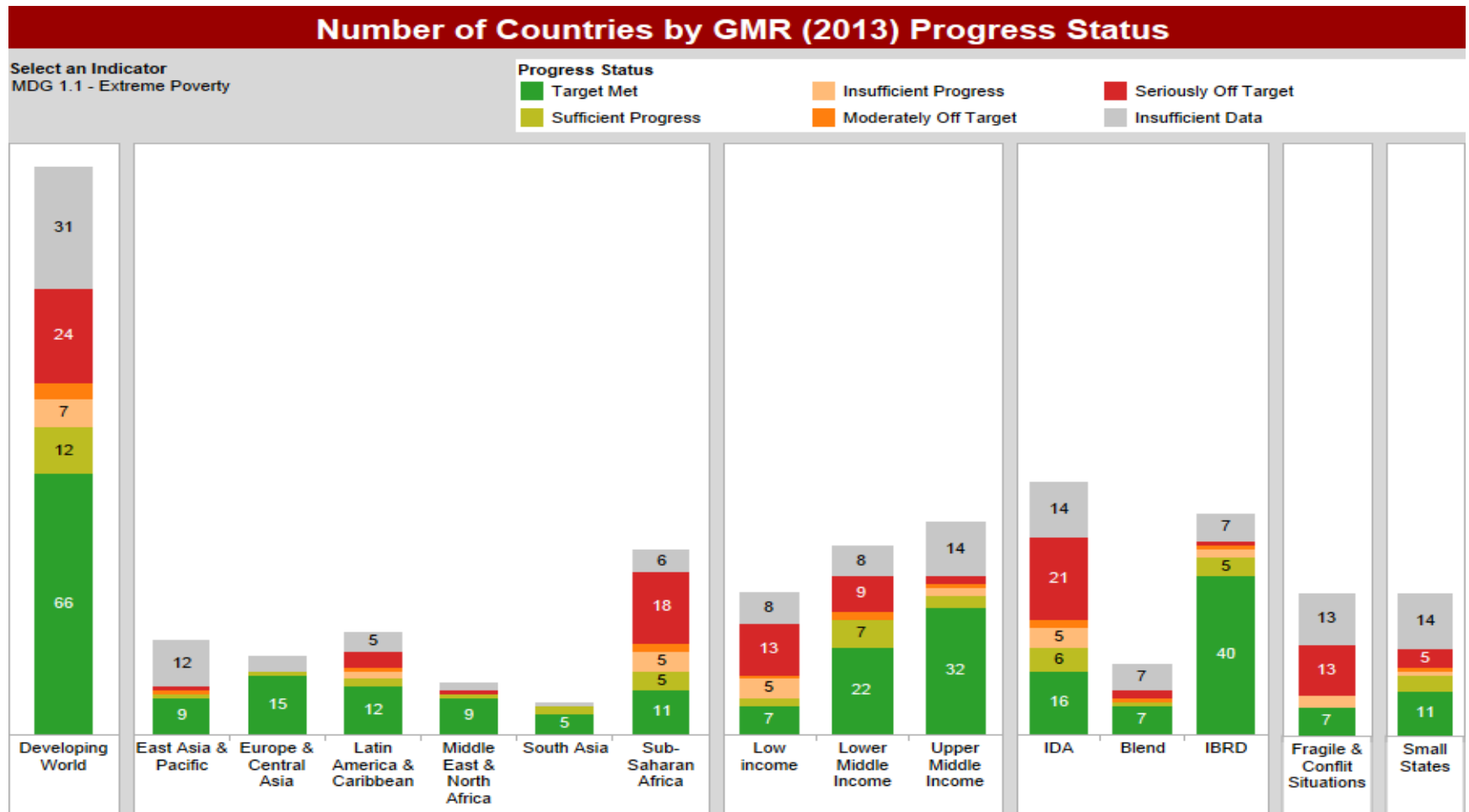
MDGs Progress status (GMR,2013)

5. Economic and poverty impacts of Agricultural R&D in SSA

o A lot of empirical research has documented the effects of Ag. R&D on productivity growth and poverty reduction in developing countries including SSA (e.g. Alene et al. 2009, Thritle et al., 2003).

o In SSA, despite low levels of investments, Ag. R&D reduces poverty by an annual rate of 0.8% (Alene and Coulibaly, 2009).

5. Economic and poverty impacts of Agricultural R&D in SSA

During the discussion of the post 2015 sustainable development agenda, the academics and scientists recommended:

- o the adoption of a science –based and action –oriented agenda,

- o integrating four interdependent dimensions of sustainable development (economic, social, environmental and governance)

Economic and poverty impacts of Agricultural R&D in SSA

- The Ag. R&D can reduce poverty in a number of different ways as already indicated such as:

    - A direct raise of income or home consumption,
    - The effects of agricultural technology adoption,
    - Lowering food prices,
    - Increased employment and wage effects in agriculture and other sectors of economic activity through production, consumption, and savings

5. Economic and poverty impacts of Agricultural R&D in SSA (Cont'd)

For SSA, a 1% increase in yield is likely to reduce the number of people living in under $1 per day by about 2.1 millions. The increase of crop yield is also a result of the uptake of improved technologies by farmers- effect of R&D

Region	% in $1 Poverty	Number in $1 poverty, Millions	Reduction in $1 per day poverty, millions	Cost per person ($)
East Asia	15.32	278.32	1.34	179
South Asia	39.99	522.00	2.51	179
Sub-Saharan Africa	46.30	290.87	2.09	144
Middle East and North Africa	7.32	20.85	0.12	NA
Latin America	15.57	78.16	0.08	11.397
East Europe and Central Asia	5.14	23.98	0.12	NA
Total	24.27	1244.18	6.24	NA

Source: Thirtle et al. 2003

Economic and poverty impacts of Agricultural R&D in SSA (Cont'd)

- Preliminary results

```
. regress aggdp expensesinagrrd,robust

Linear regression                           Number of obs =       36
                                            F(  1,    34) =    46.92
                                            Prob > F      =   0.0000
                                            R-squared     =   0.8695
                                            Root MSE      =   5.6417

─────────────────────────────────────────────────────────────────────────
                         Robust
        aggdp      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
─────────────────────────────────────────────────────────────────────────
expensesinagrrd   .4521961   .0660128    6.85   0.000     .318042    .5863503
        _cons    -1.594281   .8144183   -1.96   0.059   -3.249378    .0608164
─────────────────────────────────────────────────────────────────────────
```

Economic and poverty impacts of Agricultural R&D in SSA (Cont'd)

```
. regress gdpbillionusd aggdp,robust


Linear regression                              Number of obs =      47
                                               F(  1,    45) = 228.00
                                               Prob > F      = 0.0000
                                               R-squared     = 0.5752
                                               Root MSE      = 54.272
```

gdpbillion~d	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
aggdp	4.594432	.3042762	15.10	0.000	3.981588	5.207275
_cons	9.292868	6.886196	1.35	0.184	-4.576642	23.16238

Economic and poverty impacts of Agricultural R&D in SSA (Cont'd)

```
. predict aggdp1
(option xb assumed; fitted values)
(11 missing values generated)

. regress gdpbillionusd aggdp1,robust

Linear regression                                   Number of obs =       36
                                                    F(  1,    34) =   35.42
                                                    Prob > F      =   0.0000
                                                    R-squared     =   0.8614
                                                    Root MSE      =   25.644
```

gdpbillion~d	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
aggdp1	4.390102	.7376921	5.95	0.000	2.890931	5.889272
_cons	.5985654	3.191145	0.19	0.852	-5.886621	7.083752

Economic and poverty impacts of Agricultural R&D in SSA (Cont'd)

```
. reg3 (aggdp = expensesinagrrd) (gdpbillionusd = aggdp) (expensesinagrrd = lagagdp laggdp)

Three-stage least-squares regression
```

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
aggdp	36	1	5.881988	0.8498	240.78	0.0000
gdpbillion~d	36	1	9.55588	0.9796	1732.73	0.0000
expensesin~d	36	2	11.36293	0.8682	238.85	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
aggdp						
expensesinagrrd	.5202536	.0335277	15.52	0.000	.4545405	.5859667
_cons	-2.638547	1.104853	-2.39	0.017	-4.80402	-.4730751
gdpbillionusd						
aggdp	4.370183	.1049866	41.63	0.000	4.164413	4.575953
_cons	.7050135	1.688578	0.42	0.676	-2.604539	4.014566
expensesinagrrd						
lagagdp	.947445	.0857141	11.05	0.000	.7794484	1.115442
laggdp	.2576729	.0211208	12.20	0.000	.216277	.2990688
_cons	4.938342	2.010062	2.46	0.014	.9986928	8.877991

```
Endogenous variables:  aggdp gdpbillionusd expensesinagrrd
Exogenous variables:    lagagdp laggdp
```

Some Challenges of Ag R&D in SSA

1. **Limited funding and investment:** Research agendas with high donor funding help to achieve short term research targets that are not necessarily customized to national or regional research and development priorities.

2. **Lack of coordinated research priority setting:** no adequate mechanisms from which both policy makers and researchers identify R&D priorities.

3. **Lack of sufficient research capacities:** in terms of qualified researchers, required research facilities, opportunistic research, high turnover of researchers due to unattractive remuneration package and benefits,

Some Challenges of Ag R&D in SSA (Cont'd)

Table : National Agricultural Research Institutes

Category /Country	Government	Higher education	Non-profit	Total
Small NARSs				
Guinea-Bissau	1	-	-	1
Liberia	1	2	1	4
Mauritania	4	3	1	8
Swaziland	1	1	-	2
Medium Sized NARSs				
Congo, Republic	12	2	2	16
Mali	2	2	-	4
Mauritius	10	2	1	13
Rwanda	1	6	-	7
Large NARSs				
Ethiopia	8	8	-	18
Kenya	6	29	2	37
Sudan	4	28	-	32
Tanzania	6	5	3	14

Source : IFPRI (2014).

Concluding remarks

o The paper adds a vote to the role of R&D in reducing poverty and support the SDGs.

o The importance given to R&D will translate into economic impacts and reduce poverty.

o If Sustainable Development Goals are to be achieved post 2015- R&D needs the right place in public and private investments in the SSA.