

Possibility of Rice Green Revolution in Sub-Saharan Africa

TICAD V CARD Side Event

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Commonly Asked Question

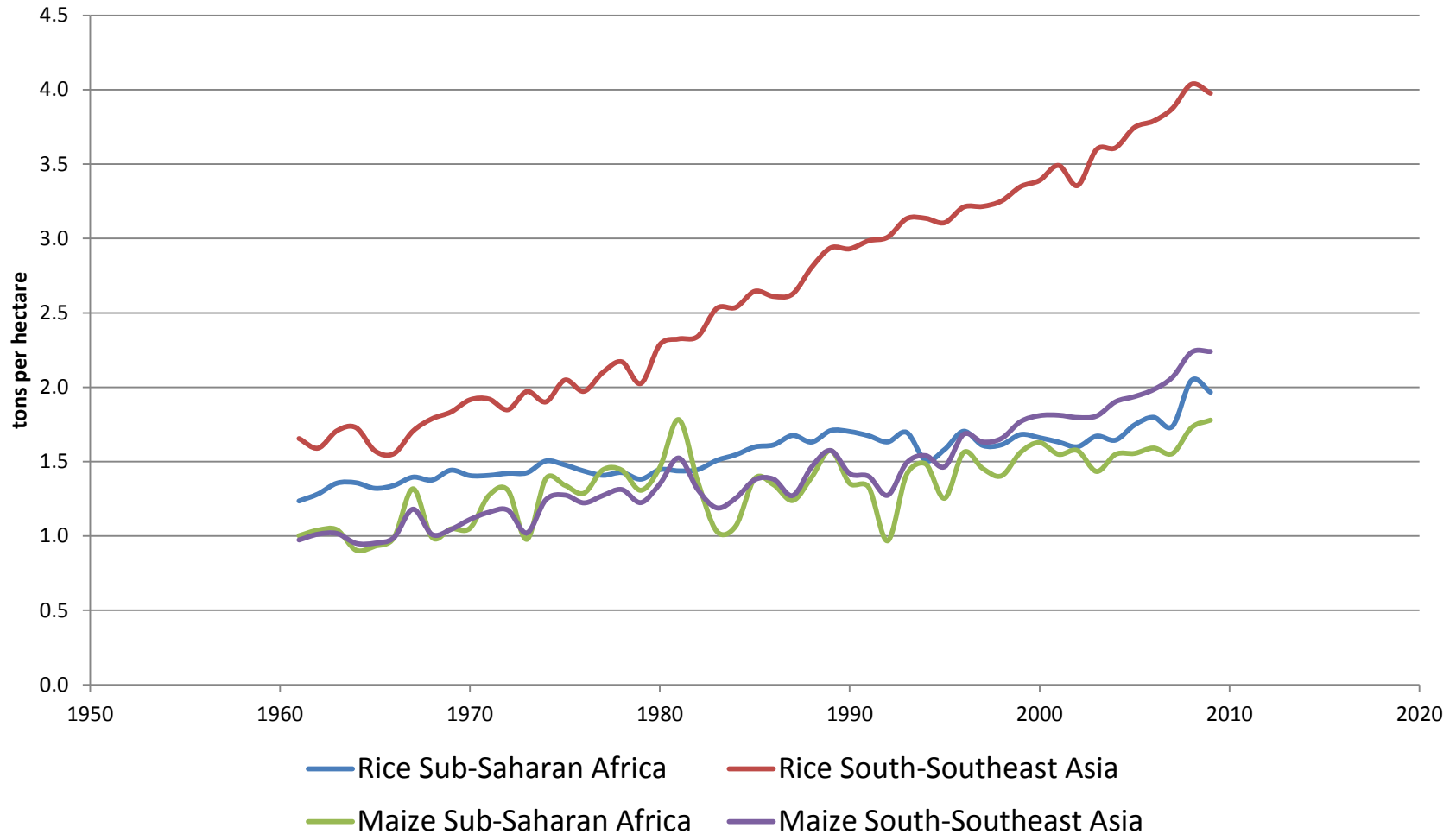
Why hasn't Green Revolution taken place in SSA?

What is the Rice Green Revolution in Asia?

- Development and diffusion of a series of short-statured (semi-dwarf), fertilizer-responsive, high-yielding modern varieties (MVs) in irrigated and favorable rainfed areas in Asia.

Continuous and impressive growth in rice yield in Asia, but not maize yield

Rice and Maize Yields



Source: FAOSTAT (2011)

Fundamental Hypothesis

- *Asian Rice Green Revolution technology can be directly transferable to sub-Saharan Africa.*
- In fact, rice Green Revolution has been taking place in a number of irrigated areas in SSA.
- This is in sharp contrast to other grains, such as maize, sorghum, and millet.

“Asian” Rice Green Revolution in Senegal River Valley

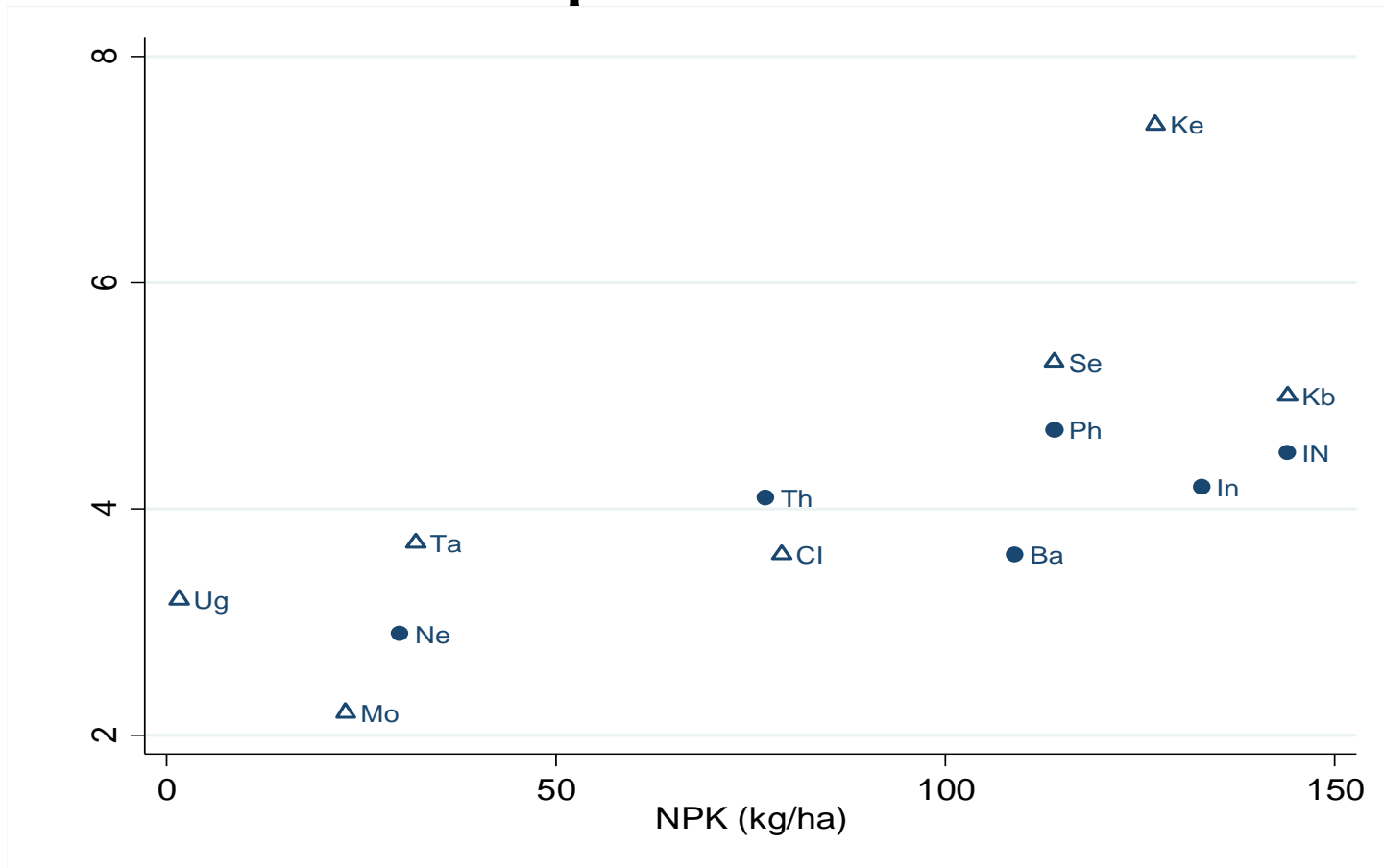


Another Major Rice Green Revolution in Mwea in Kenya

- Basmati varieties are most popular accounting for 80% of areas (see left)
- IRRI-type varieties (BW 196, IR 2793, IR 190-90, ITA 310) are extremely high-yielding (see right)



After all, as far as irrigated areas are concerned, productivity of rice farming in SSA is comparable to that in Asia



Supplementary but more Important Hypothesis

- *Asian Rice Green Revolution technology can be transferred even to rainfed areas in SSA.*

Table 1. Paddy yields and production practices in Mozambique

	Chokwe irrigation scheme	Rainfed areas in central region		
		Bottom 1/3	Middle 1/3	Top 1/3
Yield per ha (tons)	2.1	0.3	0.8	2.2
Use of MVs (%)	92	0.0	0.0.	3.0
Fertilizer use (%)	52	0.0	0.0	0.0
Plot with bund (%)	100	52	41	43
Animal use (%)	48	0	2	5
Tractor use (%)	55	2	5	2
No. of sample households	176	66	66	65



Rice farmers and a tall local variety in Mozambique

Low yield (1 ton/ha) importantly due to lack of weed and water control



Assessment of Mozambique

- Rainfed areas: Very low yield, average being 1.1 tons/ha. No MVs, no fertilizer, and little use of draft animals and tractors leading to the absence of leveling and firmly built bunds.
- Irrigated areas: Very low yield importantly because of poor irrigation facilities and the use of old MVs developed in the 1960s and 70s.

The importance of bund

No bund → lack of water → weed growth



The importance of leveling and straight-row transplanting to avoid uneven growth / facilitate weeding



Table 2. Rice yield, the use of modern inputs and improved production practices by region and irrigation status in Tanzania

	Morogoro		Mbeya		Shinyanga	
	Rain-fed	Irrigated	Rain-fed	Irrigated	Rain-fed	Irrigated
Paddy yield (t/ha)	2.0	3.8	1.6	3.5	1.7	4.6
Modern inputs use						
Share of MVs (%)	17.8	87.5	0.0	2.1	1.9	13.1
Chemical fertilizer use (kg/ha)	11.7	40.4	10.7	31.7	0.9	0.0
Share of bunded plot (%)	8.2	84.8	16.3	89.6	95.3	100.0
Share of leveled plot (%)	22.0	69.6	38.5	78.1	87.6	100.0
Share of straight row transplanting plot	4.4	47.8	3.8	22.9	6.4	0.0
No. of sample households	182	46	104	96	234	10

Assessment of Tanzania

- Rainfed areas: Yields range from 1.6 tons/ha to 2.0 tons/ha, which are much higher than in Mozambique. This can be explained by some adoption of MVs, some fertilizer use, and the adoption of some improved production practices.
- Irrigated areas: Yields are high and comparable to Asian average of 4 tons/ha. A combination of improved seeds, improved production practices, and the availability of irrigation results in “mini” Green Revolution.

Table 3. Rice yields (ton/ha) according to the cultivation practices adopted in 2008-2009 in Uganda

	All	Bugiri	Mayuge	Bukedea	Pallisa
4 practices	4.13	4.47	2.89	1.22	0.37
3 practices	3.20	4.15	1.89	---	1.54
2 practices	2.25	3.07	2.00	3.95	2.26
1 practice	1.81	2.30	1.91	1.89	1.38
Non-adopters	1.33	---	0.79 ^b	1.42	0.66 ^c
Fertilizer use	7.55 ^c	7.55 ^d	---	---	---
Adoption of MVs (%)	19.6	43.8	40.0	5.0	1.6
No. of sample households	300	75	75	75	75

The adoption of 4 practices means bunding, leveling, proper timing of transplanting, and straight-row planting.

Assessment of Uganda

- Bugiri, participatory training program with simple irrigation: High yields particularly when improved production practices are adopted.
- Mayuge, participatory training program with no irrigation, i.e., rainfed: Yields are lower but with adoption of improved production practices, yields reach 2 tons/ha.
- Bukeda and Pallisa, rainfed areas with no training: Low adoption rates of improved practices and their unclear yield effects.
- The results strongly indicate the importance of extension activities and farmer training.

Table 4. Technology adoption, paddy yield, labor inputs, and factor share of labor in Northern Ghana

	No adoption	Partial adoption				Full adoption
		Modern inputs only ^a	At least modern inputs	Modern inputs, bunding, & leveling	At least modern inputs, bunding & leveling	
No. of households (%)	63 (11.6)	78 (14.3)	349 (64.0)	37 (6.8)	84 (15.4)	47 (8.6)
Yield (ton/ha)	1.46	1.70	1.95	1.98	2.33	2.59
Labor (days/ha)	102	152	187	204	238	264
Factor share of labor (%)	61.5	62.6	54.6	52.8	49.5	47.6

Modern inputs refer to the adoption of MVs and chemical fertilizer application.

Assessment of Central region of Ghana, which is completely rainfed

- Clear effects of improved production practices on yields.
- Improved technologies are labor-using but share of labor cost does not increase because yield effect is larger.
- As in the case of Uganda, we observe clear effects of rice production and management training programs on the improvement of production efficiency.

A Summary

- Rice yield is much higher in Asia than in SSA (1.8 t/ha vs. 4.0 t/ha), suggesting the potential of transferring Asian rice technologies to SSA.
- But the yield difference is already very small in irrigated areas, indicating that Green Revolution has taken place in SSA.
- Yield and profitability of rice farming increase significantly even under rainfed conditions, if improved Asian-Type technologies are adopted, as shown in Uganda, Ghana, and Tanzania.
- Demonstration projects of improved rice production technologies and practices are found to be successful in Uganda and Ghana.

Policy Implications

1. Develop adaptive research capacity in SSA so as to facilitate the transfer of Asian rice Green Revolution technologies
2. Strengthen capacity building for dissemination of improved technologies
3. In particular, promote improved water management practices and accelerate irrigation investments

Thank you very much
for your attention