Challenges and opportunities to boost the rice sector in sub-Saharan Africa

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Africa Rice Center

6th CARD General Meeting on 18-19 Nov 2015

Content

- Recent rice production & NRDS targeted production in 2018
- Harvested area, yield and consumption
- Yield gap and its causes
- Yield growth rate and its associated factors
- Conclusions
- (Innovations)

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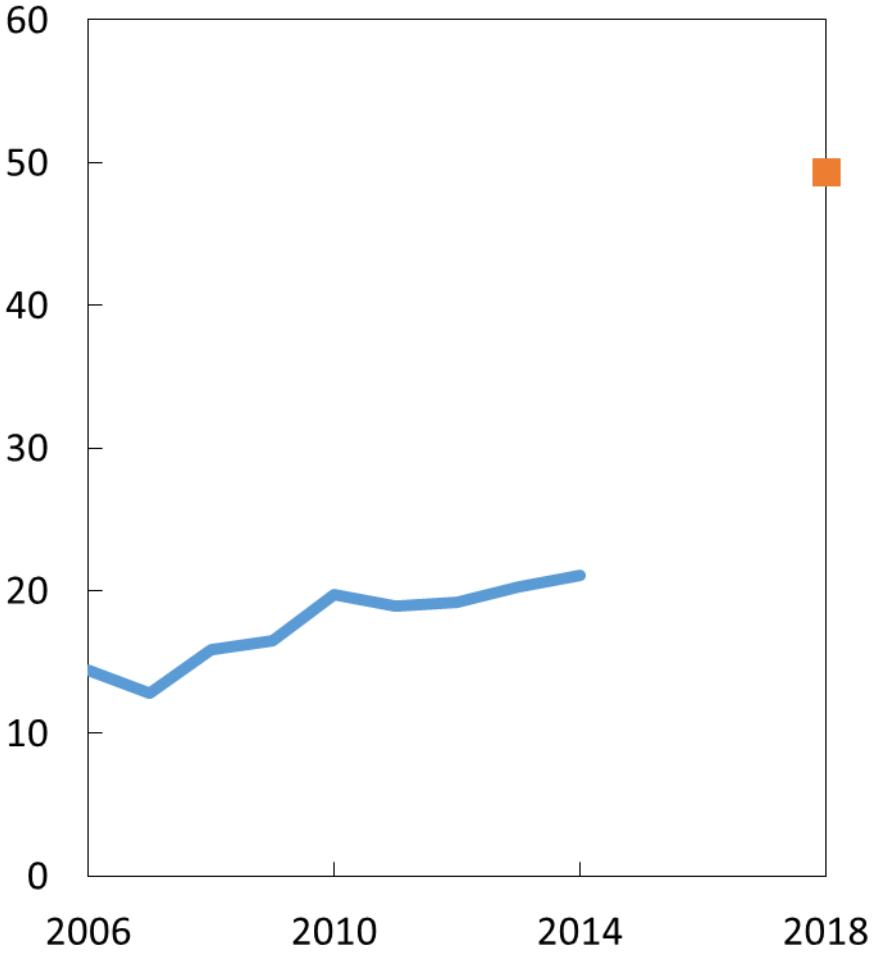
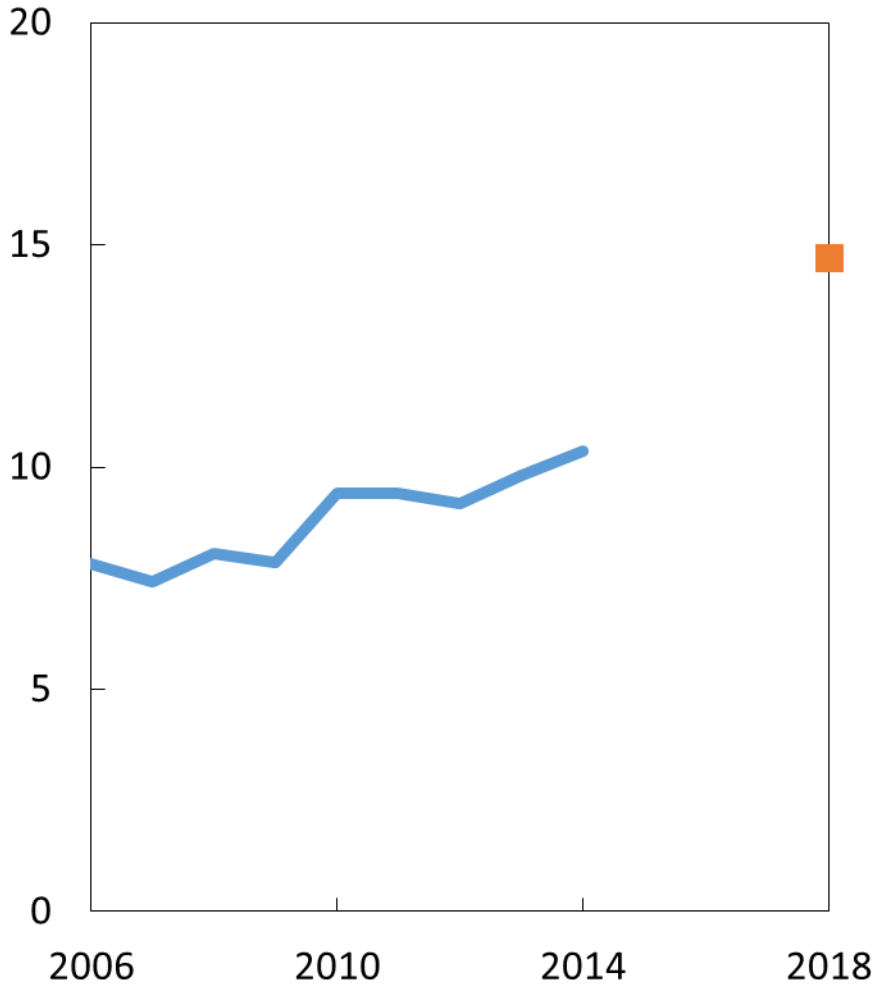
Rice production (x1 million t)



33% increase over 2008-2014 in 18 countries

Source: NRDS and USDA (2015)
West Africa: Benin, Burkina, Cote d'Ivoire, Ghana, Guinea, Liberia, Mali, Nigeria, The Gambia, Togo, Sierra Leone
Central Africa: Cameroon, Congo (Kinshasa)
Southeast Africa: Kenya, Madagascar, Mozambique, Tanzania, Uganda

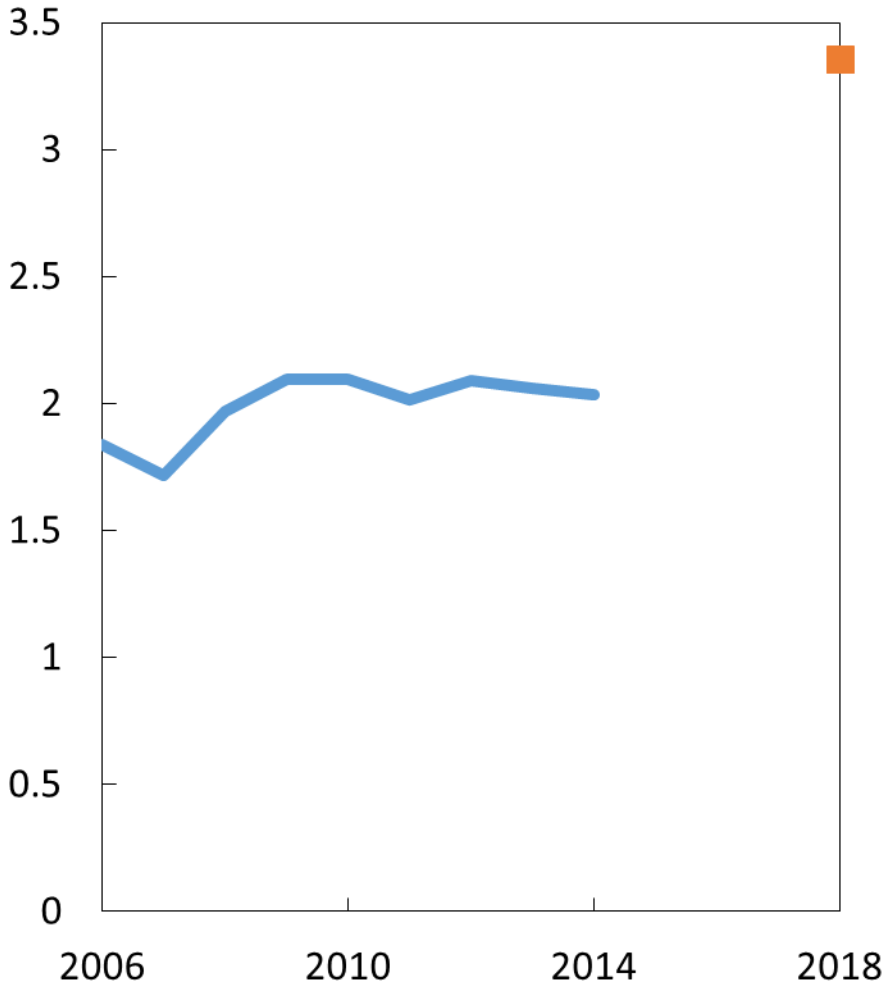
Harvested area (x1 million ha)



29% increase over 2008-2014

Rapid increase from 2009

Rice yield (t/ha)

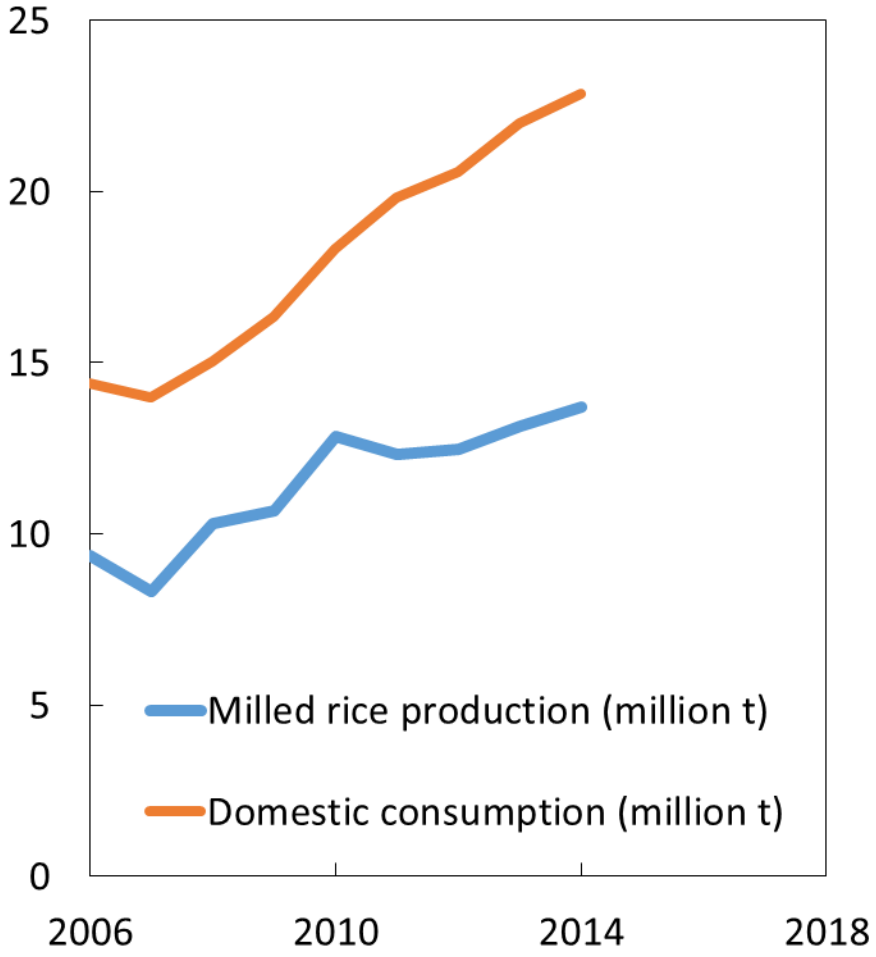


3% increase over 2008-2014

94 kg/ha/year over 2007-2010

4 kg/ha/year over 2011-2014

Demand vs. supply



Summary

- Increased gap between demand vs. supply
- Rice yield has stagnated
- Need to understand reasons:

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Large yield gap in SSA

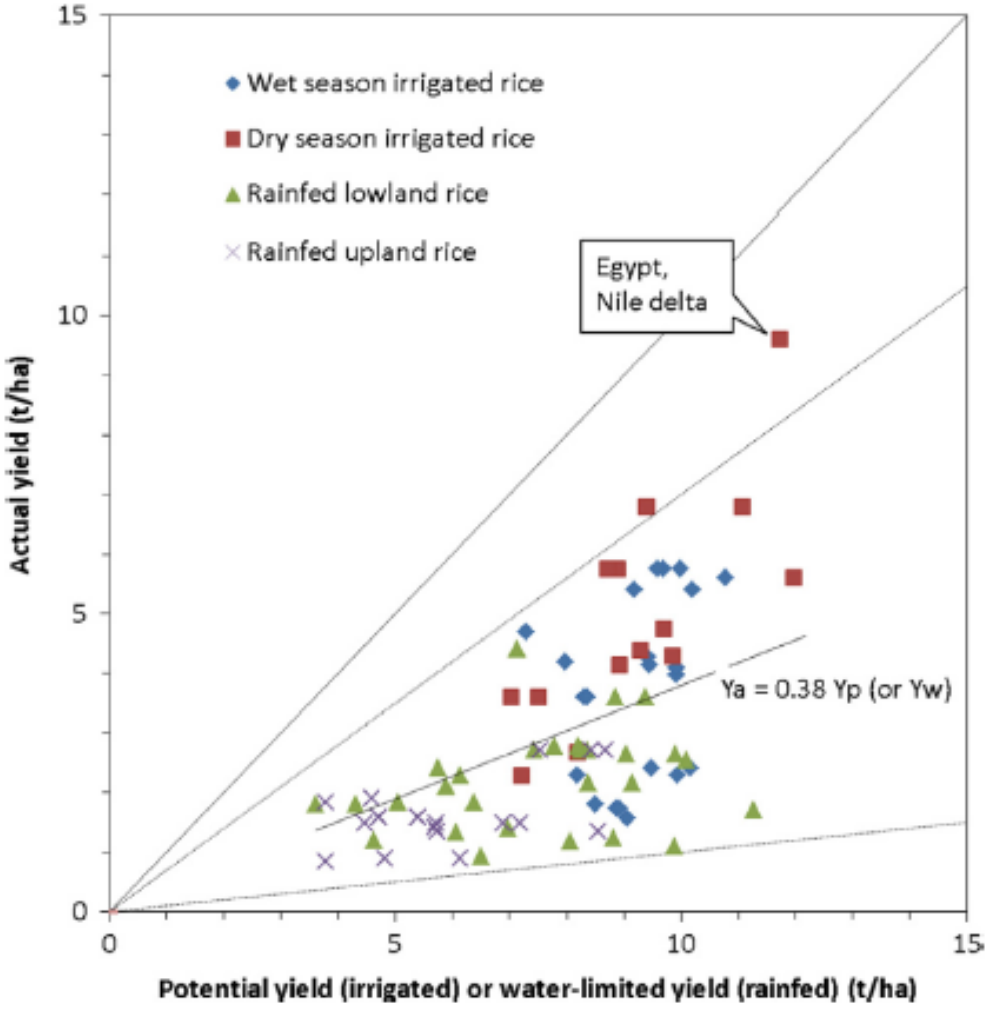


Fig. 3. Simulated and actual yields for all sites in Africa simulated in the Global Yield Gap Atlas (GYGA) project. Lines shown are the 1:1 line, relative yields at 10% and 70% of potential yields, and the regression line through all data points.

(van Oort et al. 2015)

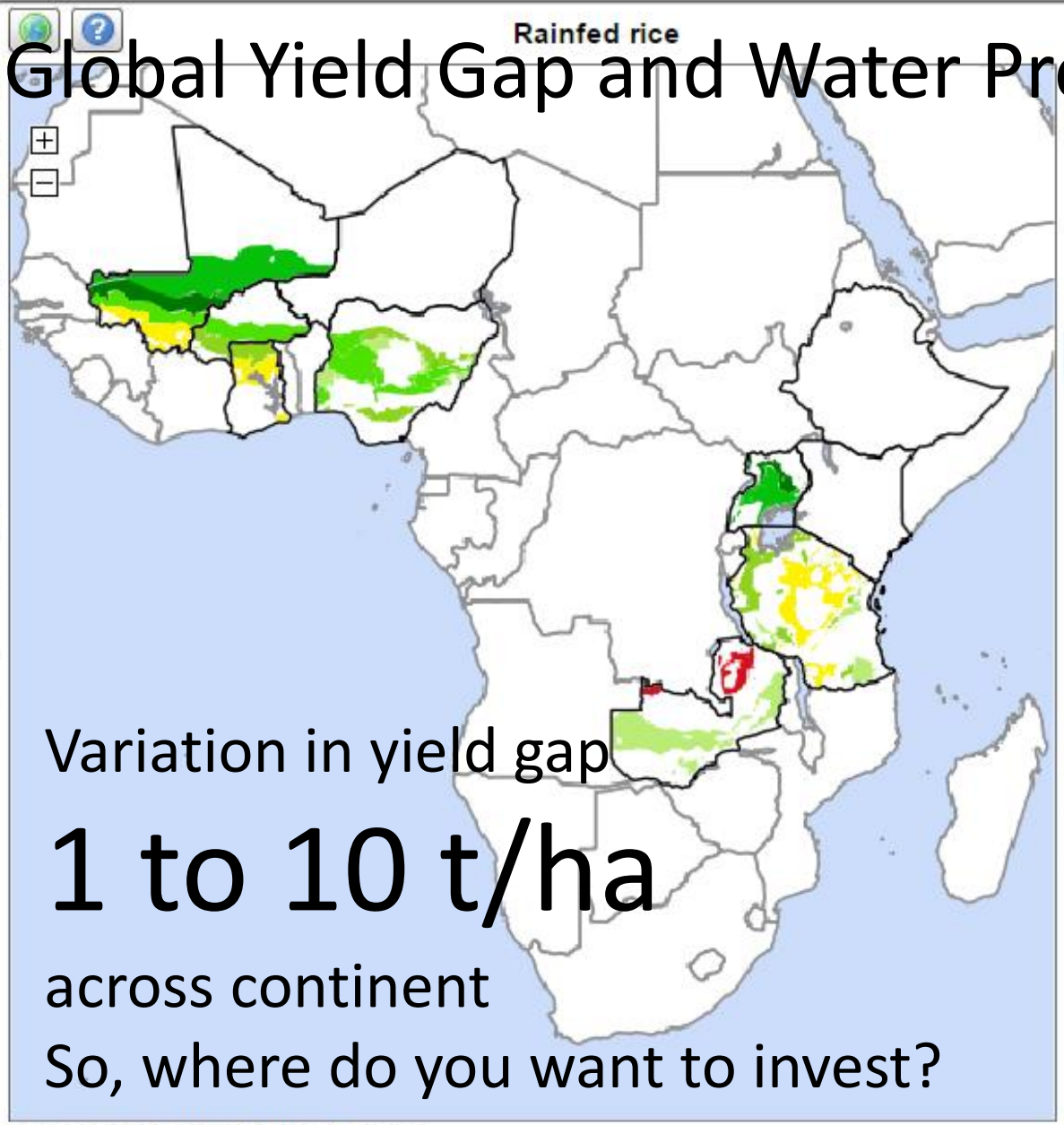
Relative yields are

40% for irrigated rice in wet season;

55% for irrigated rice in dry season;

27% for rainfed rice

Global Yield Gap and Water Productivity Atlas



Variation in yield gap

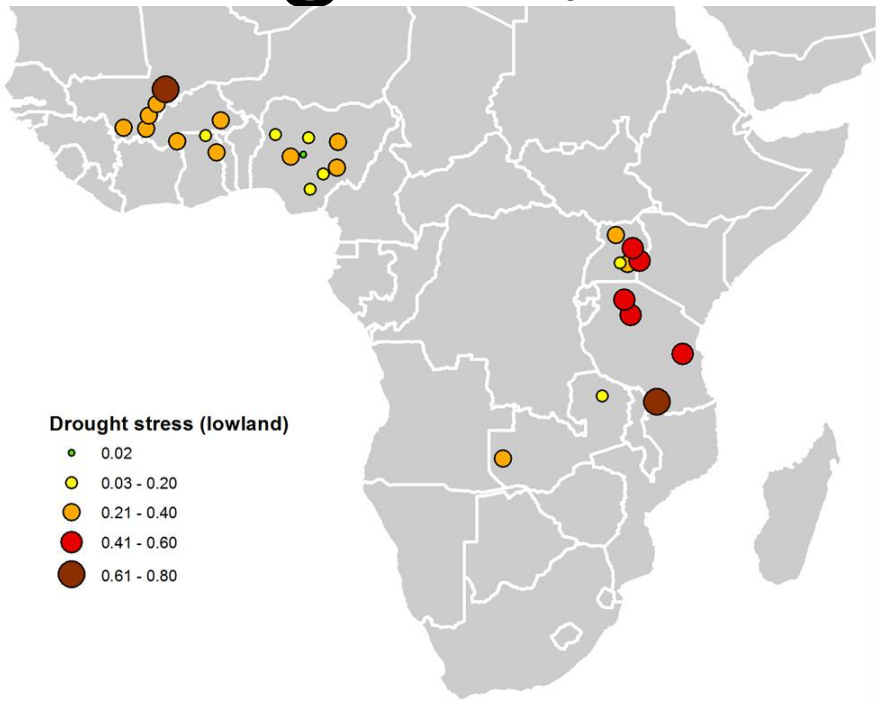
1 to 10 t/ha

across continent

So, where do you want to invest?

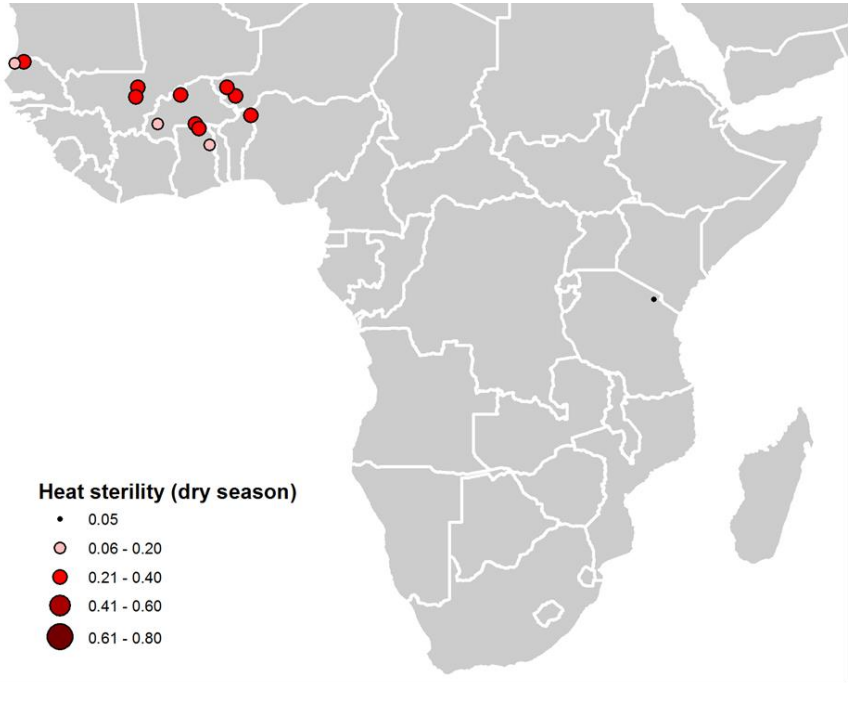
Climate risk (drought, extreme temp, and flooding)

Drought - upland



Scale: 0 to 0.7 = 0 to 70% yield reduction

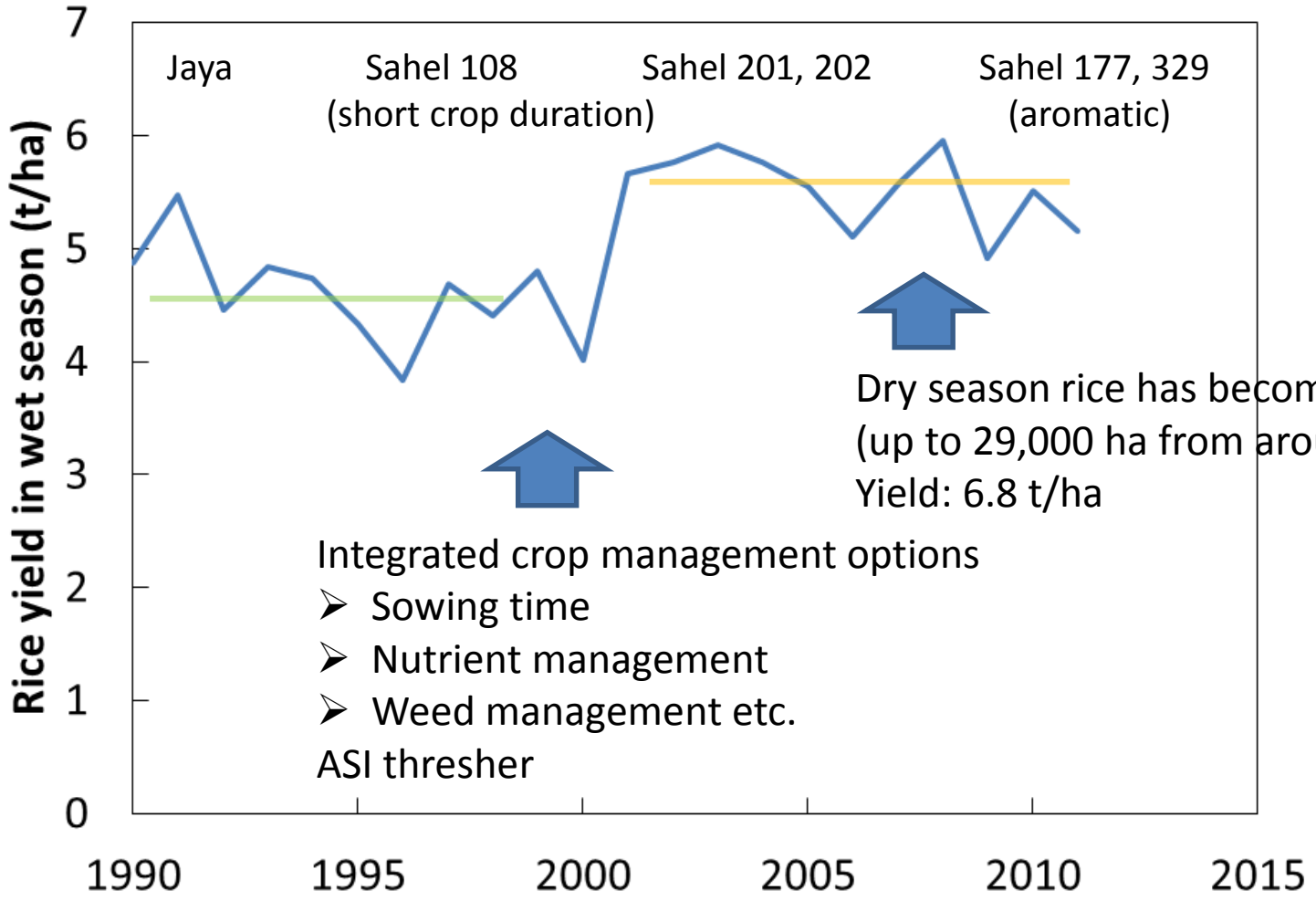
Heat stress in dry season



Scale: 0 to 0.3 = 0 to 30% sterility

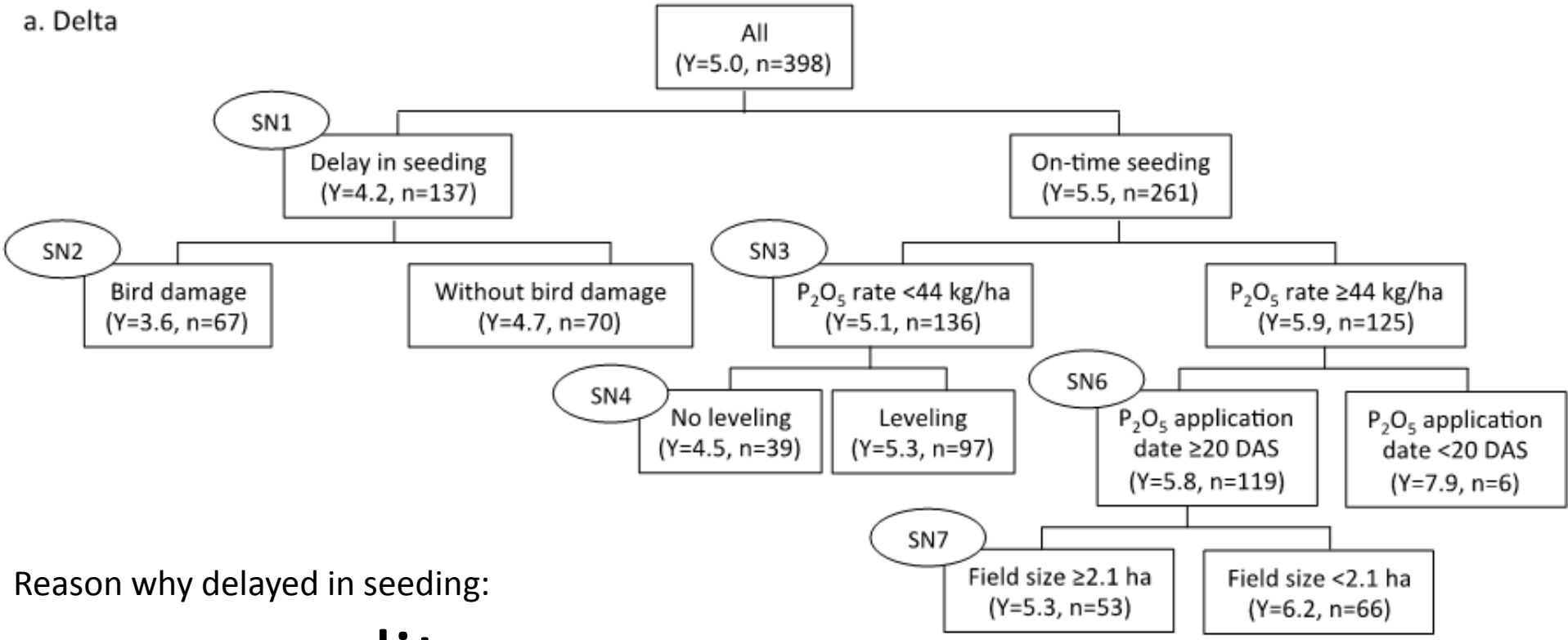
(van Oort et al. unpublished data)

Success story: closed yield in irrigated lowland rice yield in Senegal River Valley



Causes of yield stagnation in 2000s in the Senegal River Valley

(Tanaka et al. 2015)



Reason why delayed in seeding:

Poor access to credit

machinery

irrigation water

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Yield growth rate in Asia

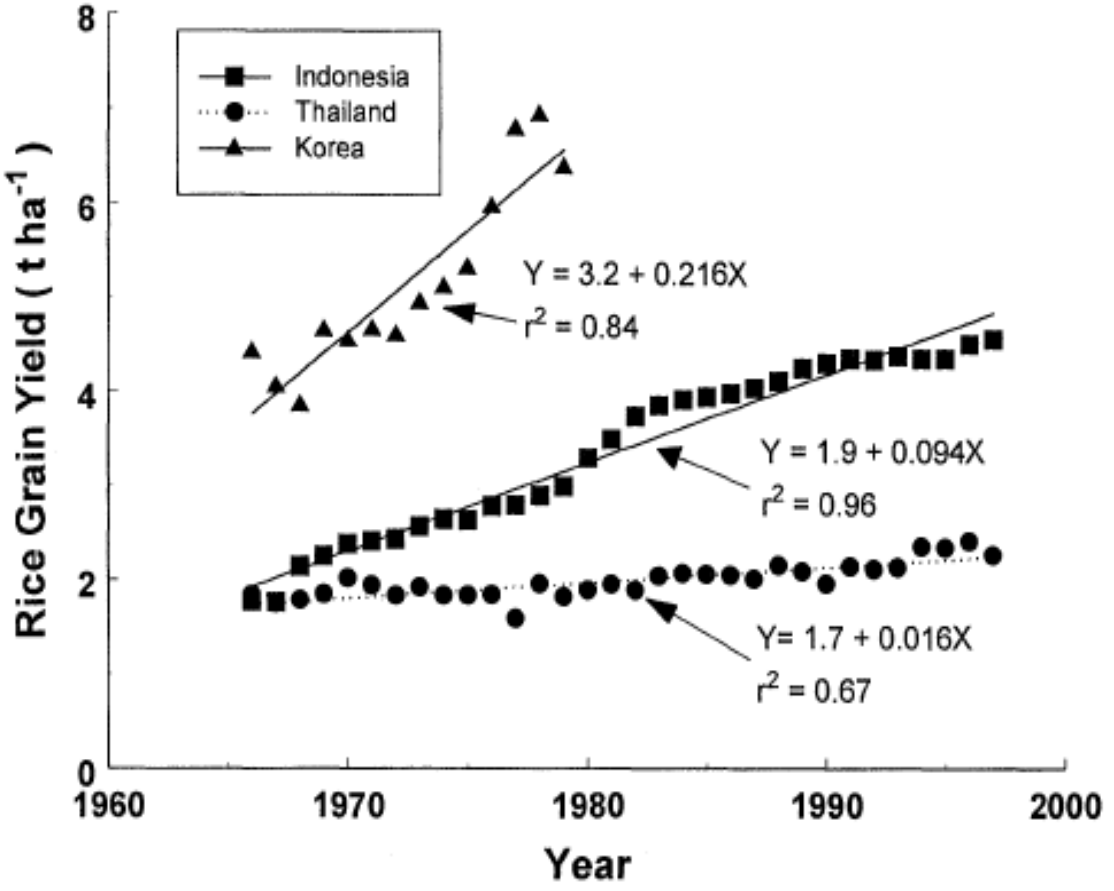
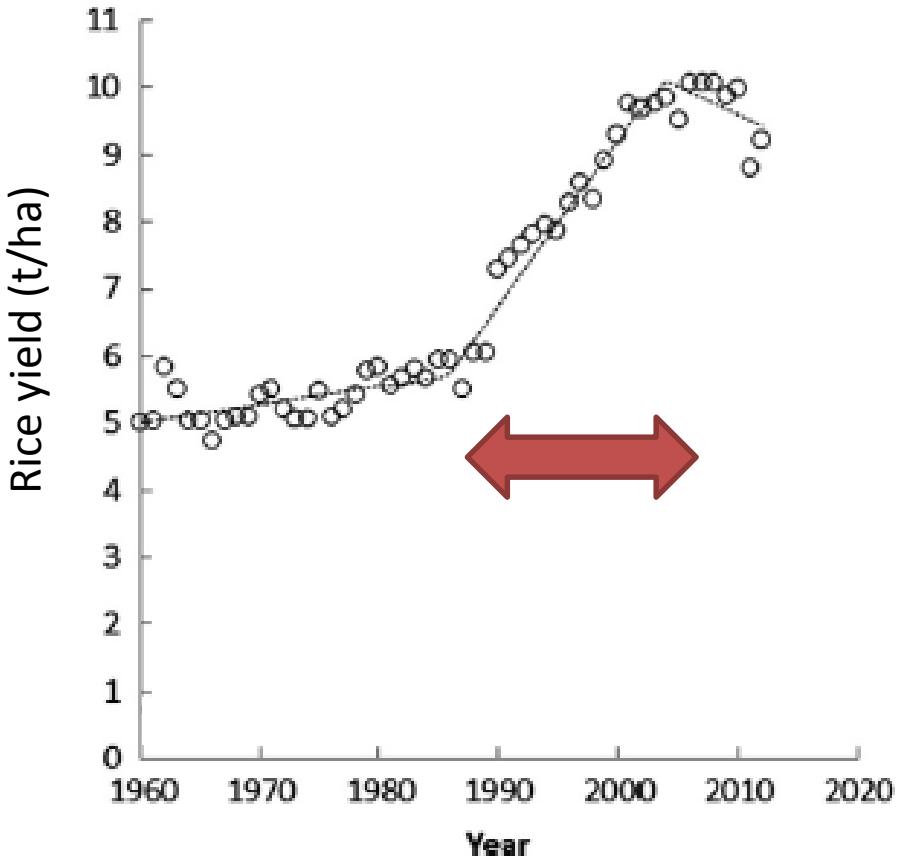


FIG. 1. National average rice yields from 1967 to 1997 in three Asian countries (http://apps.fao.org).

(Cassman, 1999)

Egypt (Cassing etal.,2007)



(i) a physically concentrated rice industry

(ii) strong R & D effort

(iii) policy reform that created price incentive for rice farmers

Assessment of rice self-sufficiency in 2025 in eight African countries

Table 4
Production/consumption (*P*/*C*) for scenarios 2025 with no area expansion.

	Production/consumption (*P*/*C*) for scenarios 2025 with no area expansion					
	Current diet					
	No yield increase	Y trend '07–'12	Yield +1 t ha^{-1} (78kg/ha/yr)	Yield +2 t ha^{-1} (156kg/ha/yr)	Yield to 80% of *Yp* or *Yw*	80%+ double crop
Burkina Faso	0.35	0.54	0.51	0.68	0.92	0.92
Ghana	0.13	0.33	0.22	0.31	0.62	0.64
Mali	0.59	0.89	0.78	0.96	1.22	1.79
Nigeria	0.37	0.64	0.54	0.72	1.10	1.55
Tanzania	0.57	0.57	0.96	1.35	1.84	1.90
Uganda	0.65	0.78	1.00	1.34	1.59	1.59
Zambia	0.38	1.18	0.69	1.01	2.54	2.54
Egypt	0.99	0.99	0.99	0.99	0.96	0.96
Total	0.55	0.73	0.70	0.85	1.12	1.39
Total excl. Egypt	0.41	0.65	0.61	0.80	1.17	1.53

(van Oort et al., 2015)

Factors affecting yield growth rate	Example
Share of irrigated rice area in total rice area	Higher yield growth due to higher input response in irrigated systems

(based on Saito et al. 2015)

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Irrigated and rainfed rice physical area expansion	Low yield growth rate due to expanded area in high risky rainfed environments

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Price incentive (or high demand)	Rapid increase in yield after food crisis

(based on Saito et al. 2015)

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Conclusions 1/4

- Production increased
- Yield has been stagnated
- Large yield gap, but large variation
- Various factors can affect yield growth rate

Conclusions 2/4

Short-term investment option

Improve farmers' and/or other value chain actors' access to:

- inputs (e.g. fertilizer)
- credit
- provision of service (e.g. improved practices, machineries)
- market

in the locations where potential impact will be high (e.g. large yield gap; low climate risk; value chain actors availability; short distance to market; high demand)

Challenges across 15 presentations in this meeting

Challenge	Private sector (%, n=5)	Development project (%, n=4)	Country (%, n=6)	Total (%)
Market	80	75	83	80
Policy	80	50	50	60
Infractracture (e.g. road, irrigation)	80	25	67	60
Crop management and post-harvest practices (technology availabilty; knowledge gap)	80	75	33	60
Mechanization (e.g. processing)	40	25	83	53
Inputs (e.g. fertilizer; pesticides)	60	75	33	53
Finance	40	100	33	53
Seed	60	50	33	47
Extension service	20	25	17	20
Climate change	0	25	17	13

Conclusions 3/4

Long-term plan

- Determine target yield level and self-sufficiency level based on realistic yield growth rate (100-200kg/ha/year) and yield gap
- Accelerate yield growth rate for enhanced rice production
- Identify (i) most suitable new land for rice area expansion and (ii) areas that should be protected

Conclusions 4/4

AfricaRice and its partners can

- quantify yield gap and identify its causes
- assess climate risk

- generate/disseminate scientific-based options including:
  - decision support tool “RiceAdvice”
  - climate resilient varieties
  - other technologies & innovations

Innovations along with rice value chains

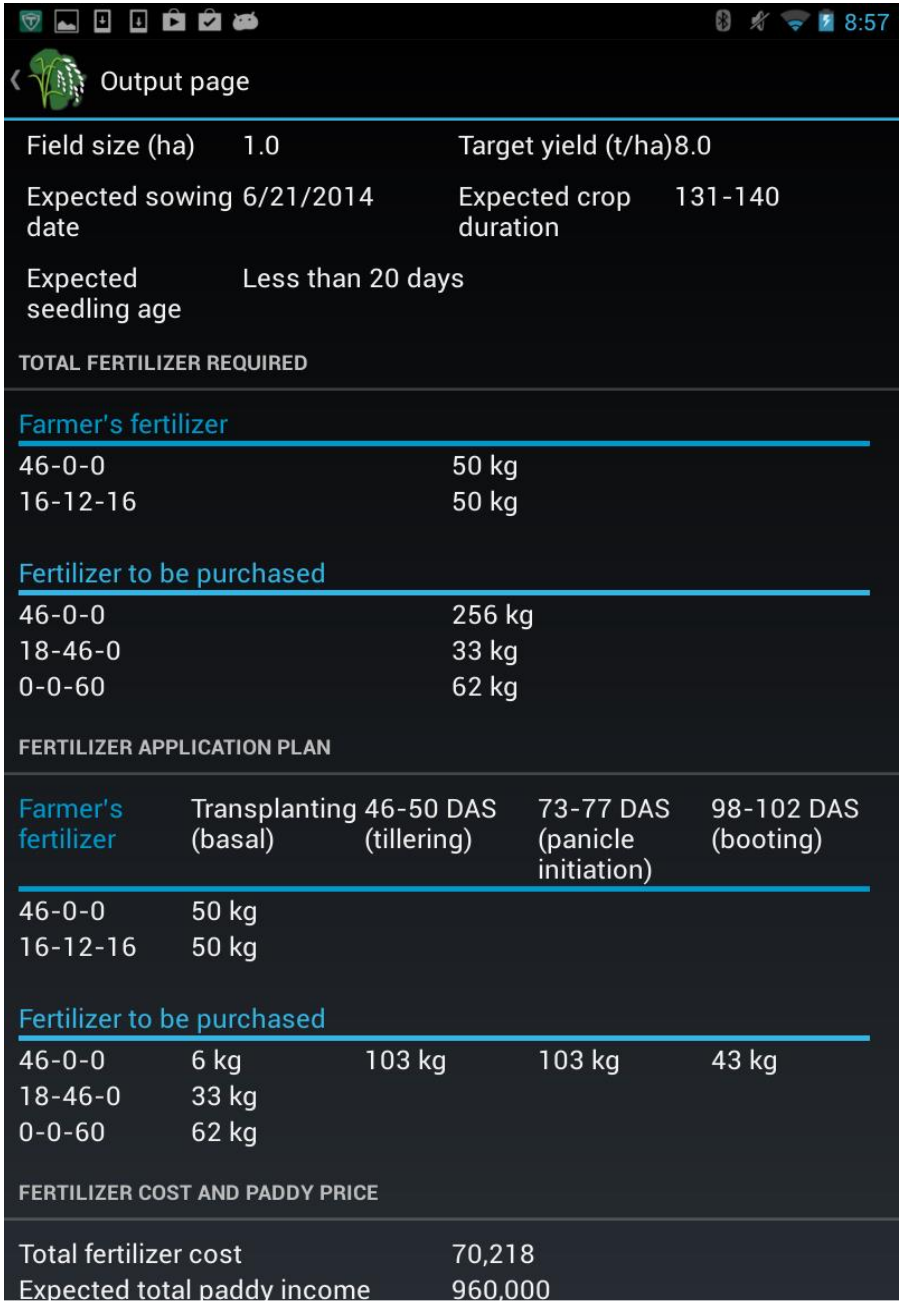
http://www.africarice.org/

http://www.ricehub.org/

Thank you!

email: k.saito@cgiar.org

- Free android-based app
- A decision support tool on crop management options
- Self target setting
  - ✓ Yield level & budget base
- Best fertilizer choice for cost saving
- Offline



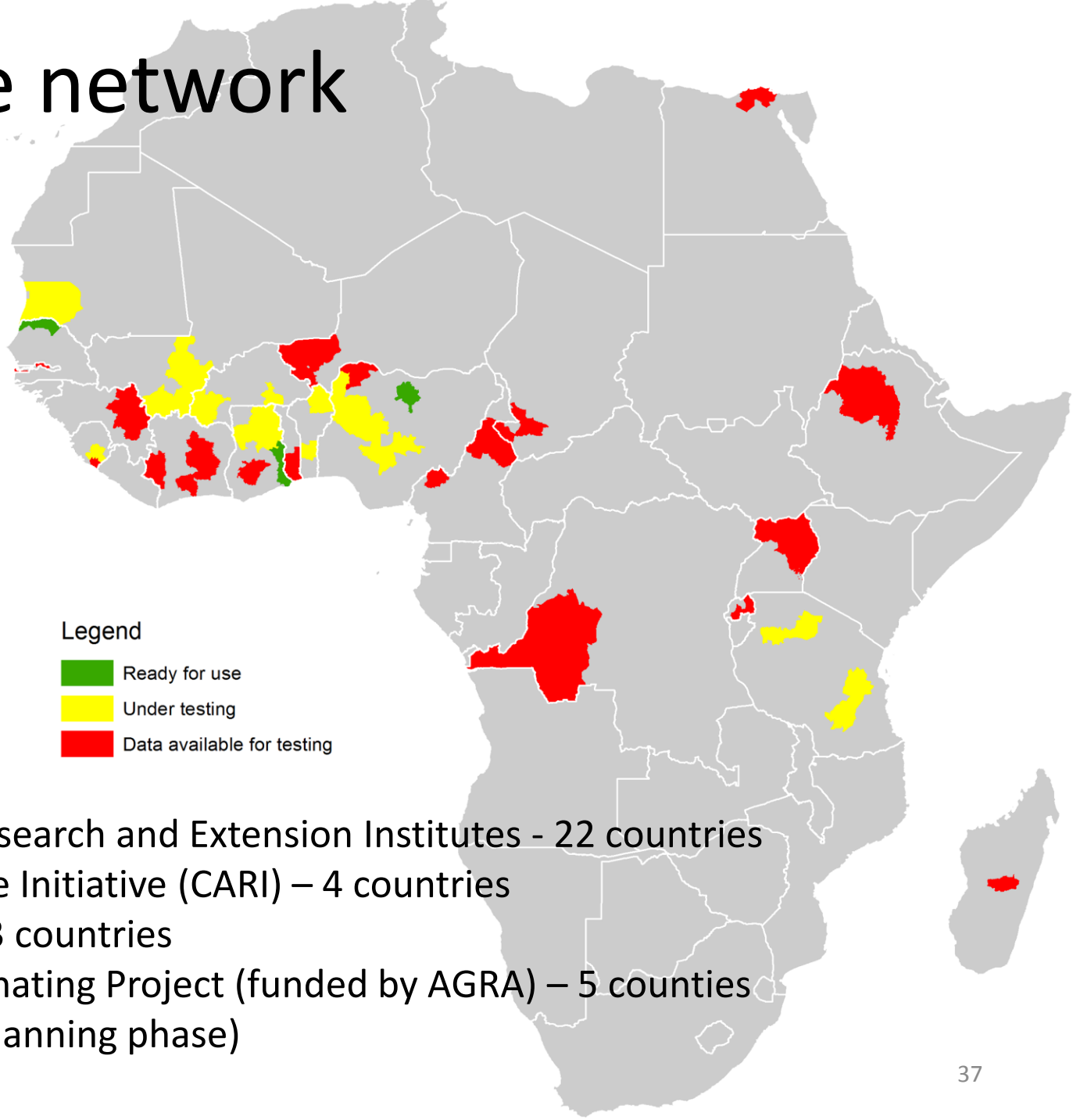
Yield advantage using RiceAdvice over farmer practices

Yield difference between RiceAdvice and farmers practice (t/ha)	% of farmers (total = 322*)	Yield in farmers' practices (t/ha)
x =<-2	2	8.1
-2< x =<-1	4	7.4
-1< x =< 0	14	6.1
0< x =< 1	34	5.2
1< x =< 2	30	4.8
2< x =< 3	9	3.8
3< x	8	4.4

* Burkina Faso (17), Ghana (50), Mauritania (20), Mali (28), Nigeria (60), Senegal (128), and Sierra Leone (19)

Introducing RiceAdvice increased yield by 1 t/ha & farmers' income by 200 USD/ha

RiceAdvice network



Partners

National Agricultural Research and Extension Institutes - 22 countries

Competitive African Rice Initiative (CARI) – 4 countries

Syngenta foundation – 3 countries

West Africa Rice Coordinating Project (funded by AGRA) – 5 counties

WAAPP – 7 countries (planning phase)