A golden age of remote sensing: possibilities and pitfalls for agricultural systems research

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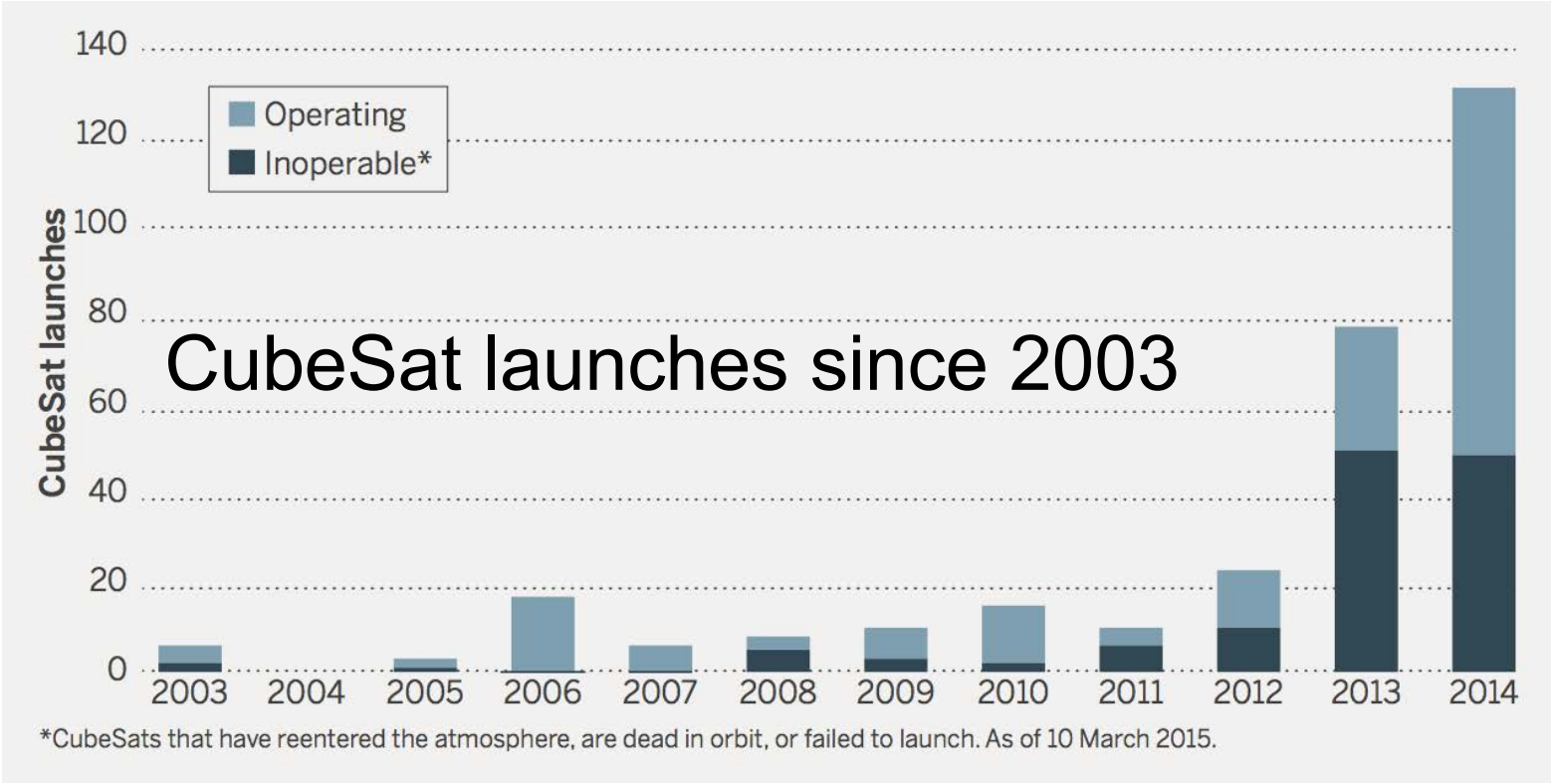
With inputs from George Azzari, Marshall Burke, Meha Jain, and others

A Golden Age for smallholder remote sensing…

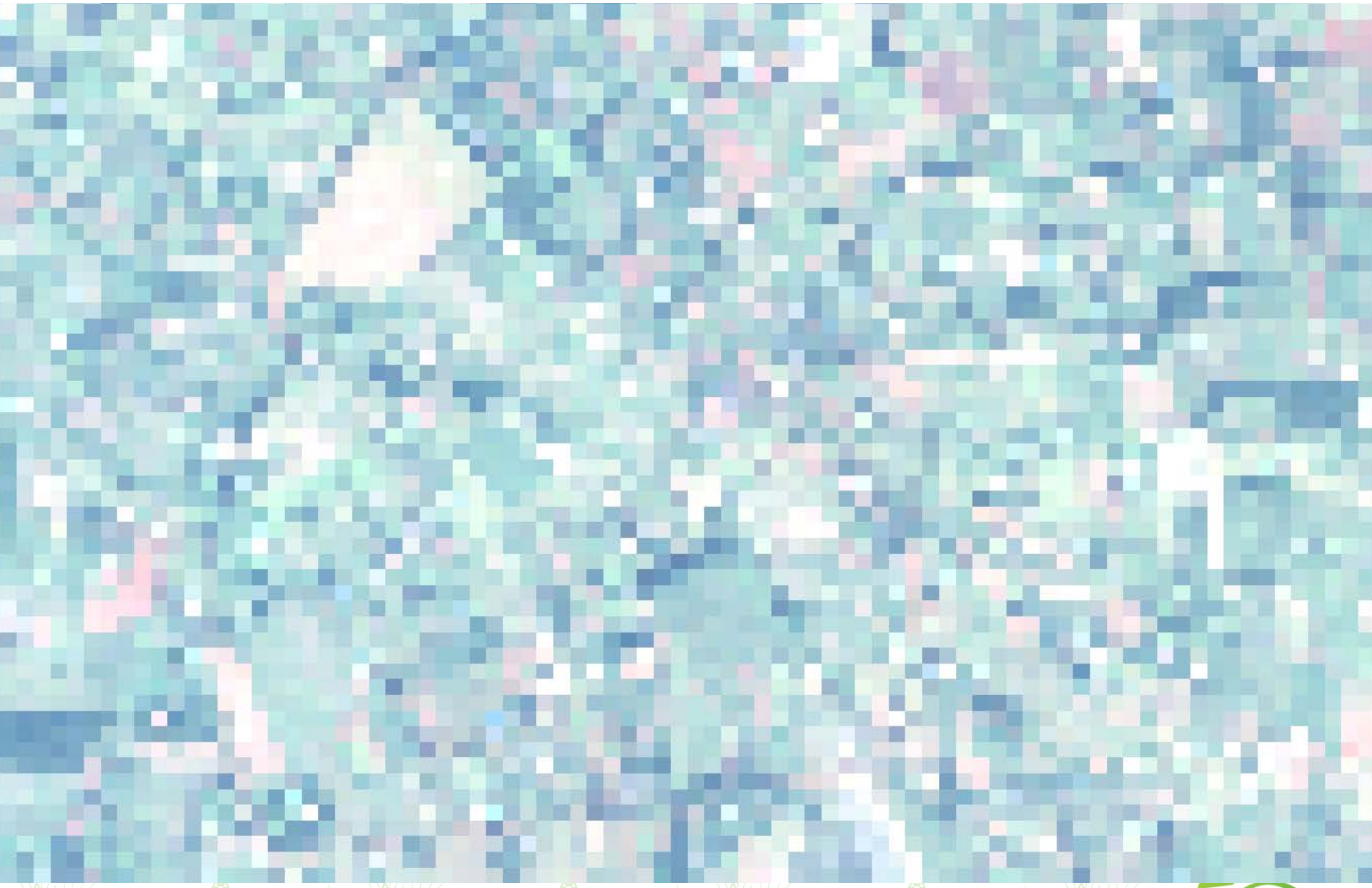


Hand, *Science* News, 2015

Some New Datasets

Sensor	Wavelengths	Spatial Resolution	Revisit frequency	Launch year
Sentinel-1	C-band radar	20m	6 day	2014
Sentinel-2	Optical	10m	5 day	2015
Terra Bella (Skysat)	Optical	1m	~weekly	2013
Planet (Planetscope)	Optical	5m	~daily	2014

1966-2016 CIMMYT



1966-2016
CIMMYT

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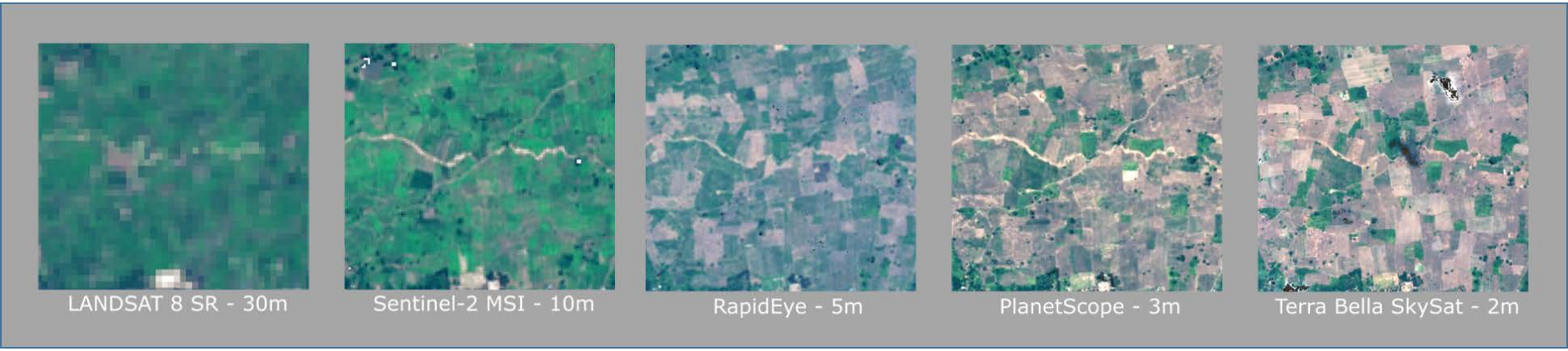
A Golden Age for smallholder remote sensing…

- Morogoro, Tanzania



Skysat imagery: Webuye, Kenya

Possibilities

- New algorithms allow one to rapidly translate raw imagery into insights about the agricultural systems
  - Crop types
  - Yields
  - Sow dates
  - Tillage practices
  - etc.

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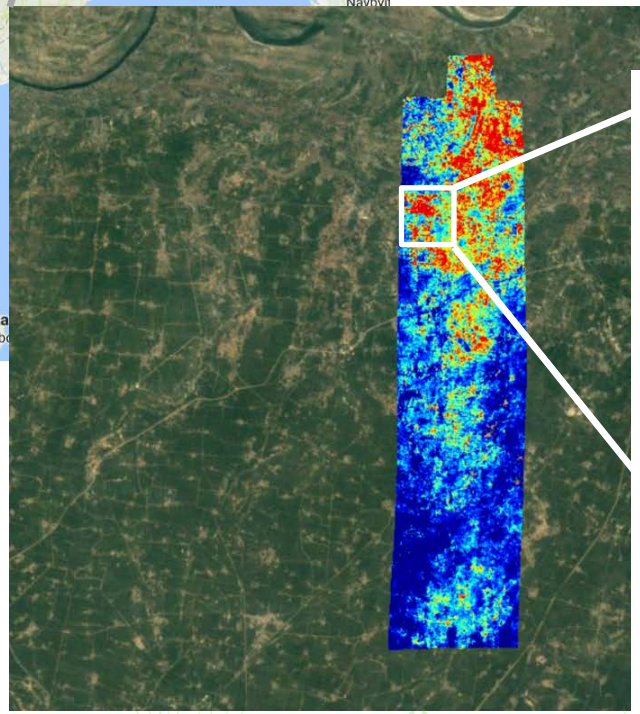
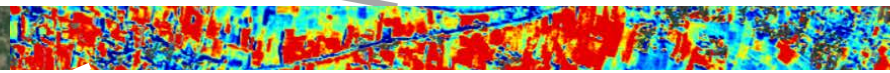
Possibilities

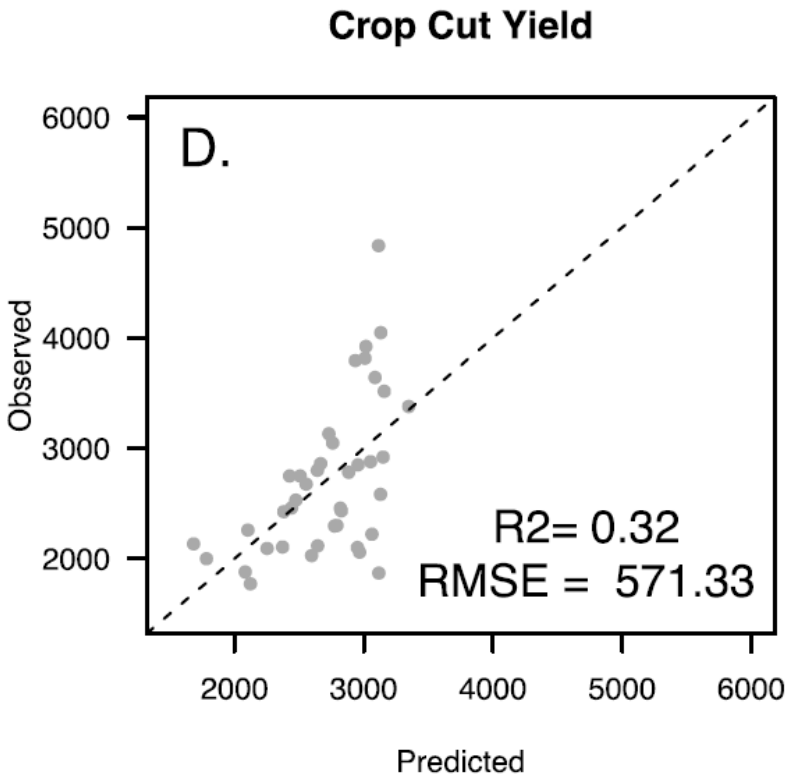




Wheat yield

3 t/ha

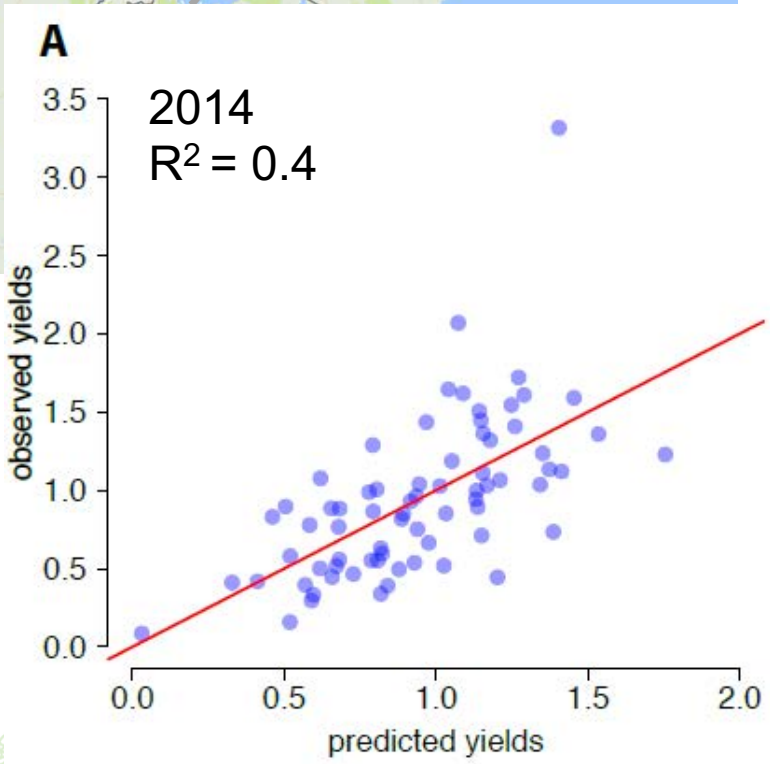
2 t/ha

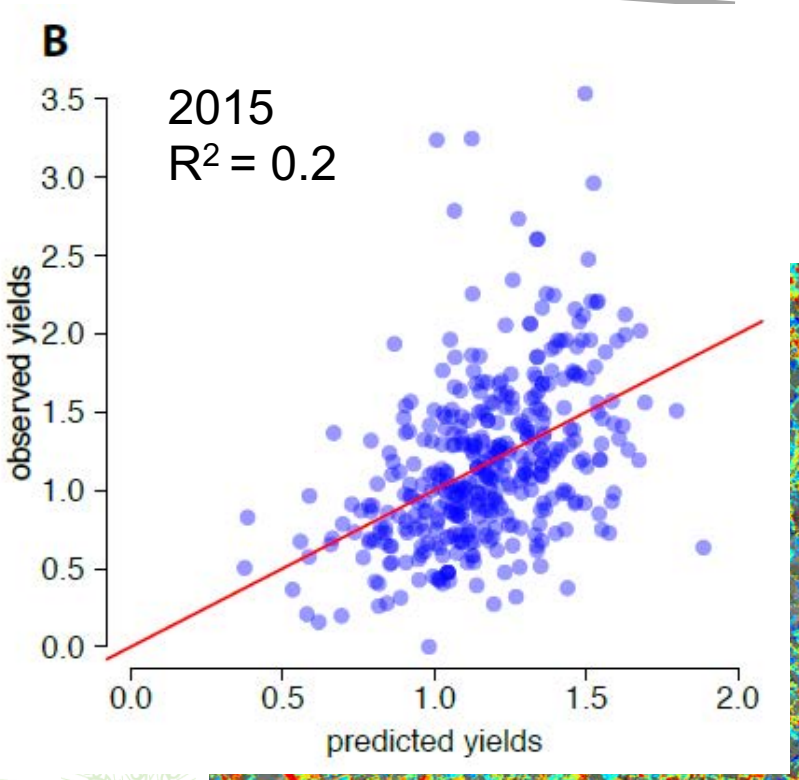


Maize yield

2 t/ac

0.8 t/ac





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Possibilities

With much greater speed and lower cost, we could:

1) Evaluate impacts of ongoing and past interventions
2) Develop hypotheses for new interventions (via analysis of data on yields and production factors)
3) Target interventions to the most responsive fields/farmers

Pitfalls

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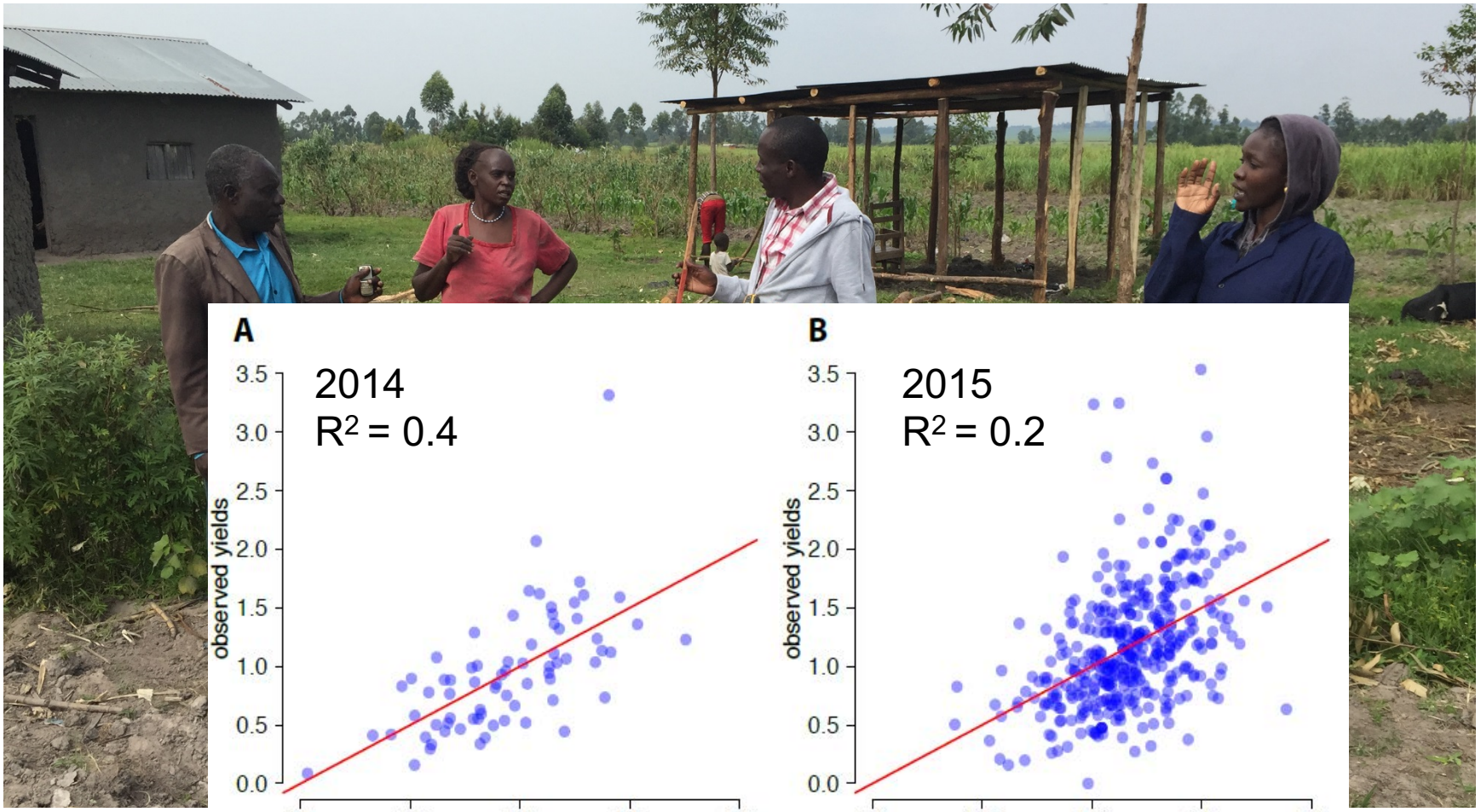
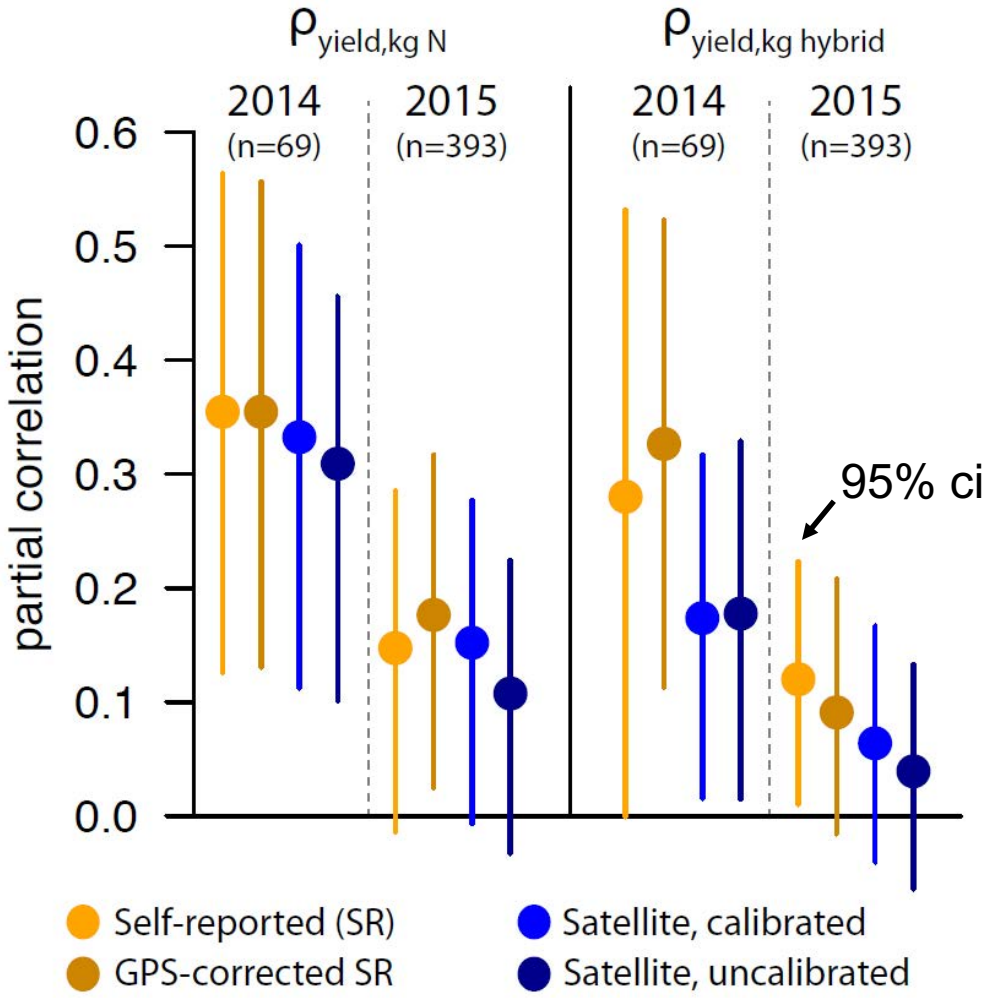
Pitfalls

- Demanding too much in terms of “proven accuracy”
  - Because even a lot of “so-so” data can be very powerful
  - Because ground data aren’t always great


A
2014
R^2 = 0.4
observed yields
predicted yields
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
B
2015
R^2 = 0.2
observed yields
predicted yields

Similar conclusions from cheaper data

Relationships between inputs and maize yields in Western Kenya for two years (Burke and Lobell, in review)



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Summary

- Satellite approaches are finally poised to fulfill their promise
- Three ways this could help CIMMYT (and others) is for evaluating impact, generating hypotheses, and targeting
- We are excited to partner with others on each of these, or other ideas you might have…

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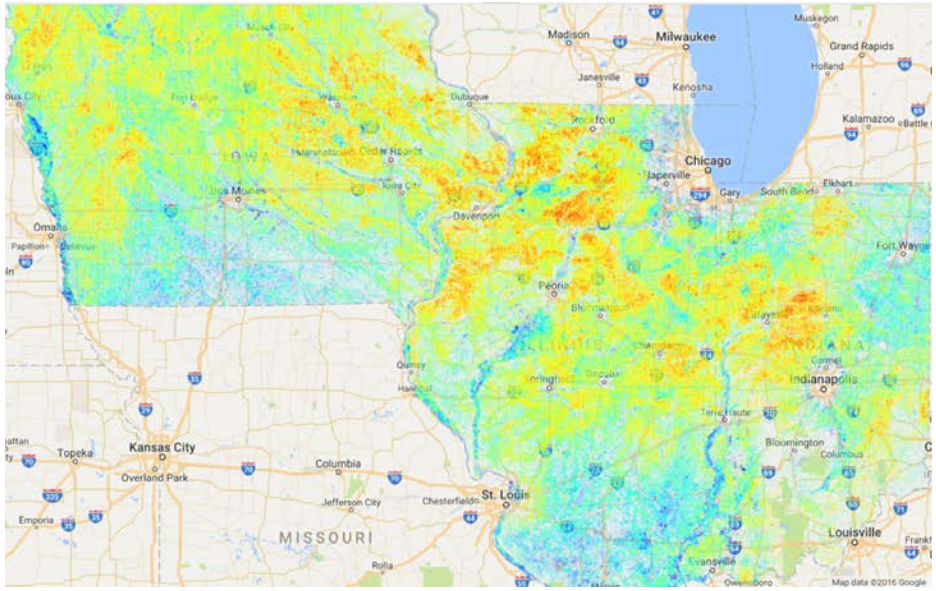
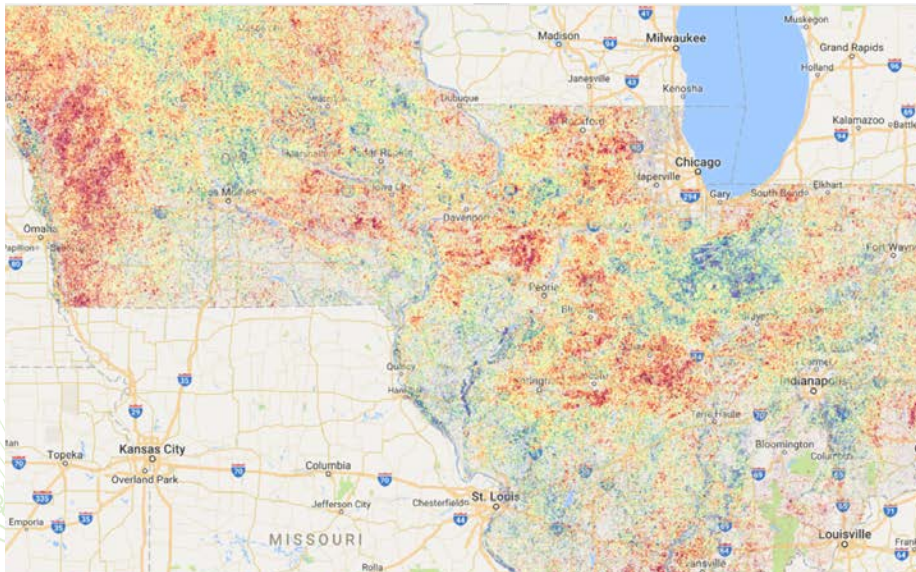
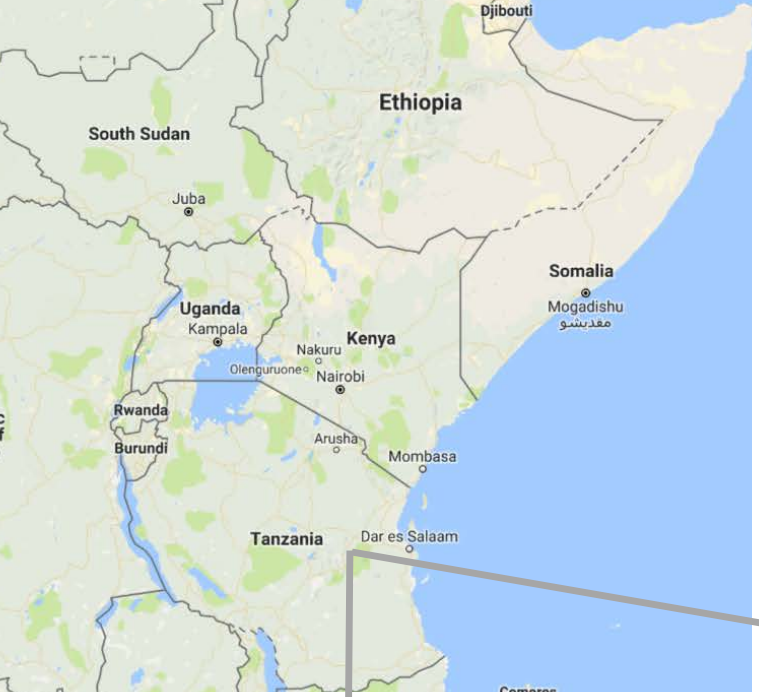
Imagine the questions you could answer…



US Average maize yields, 2000-2015

Trend maize yields, 2000-2015





Maize yield

5 t/ac

2 t/ac

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