Data Driven Agricultural Development:

The Adjacent Possible

Adam Wolf, PhD

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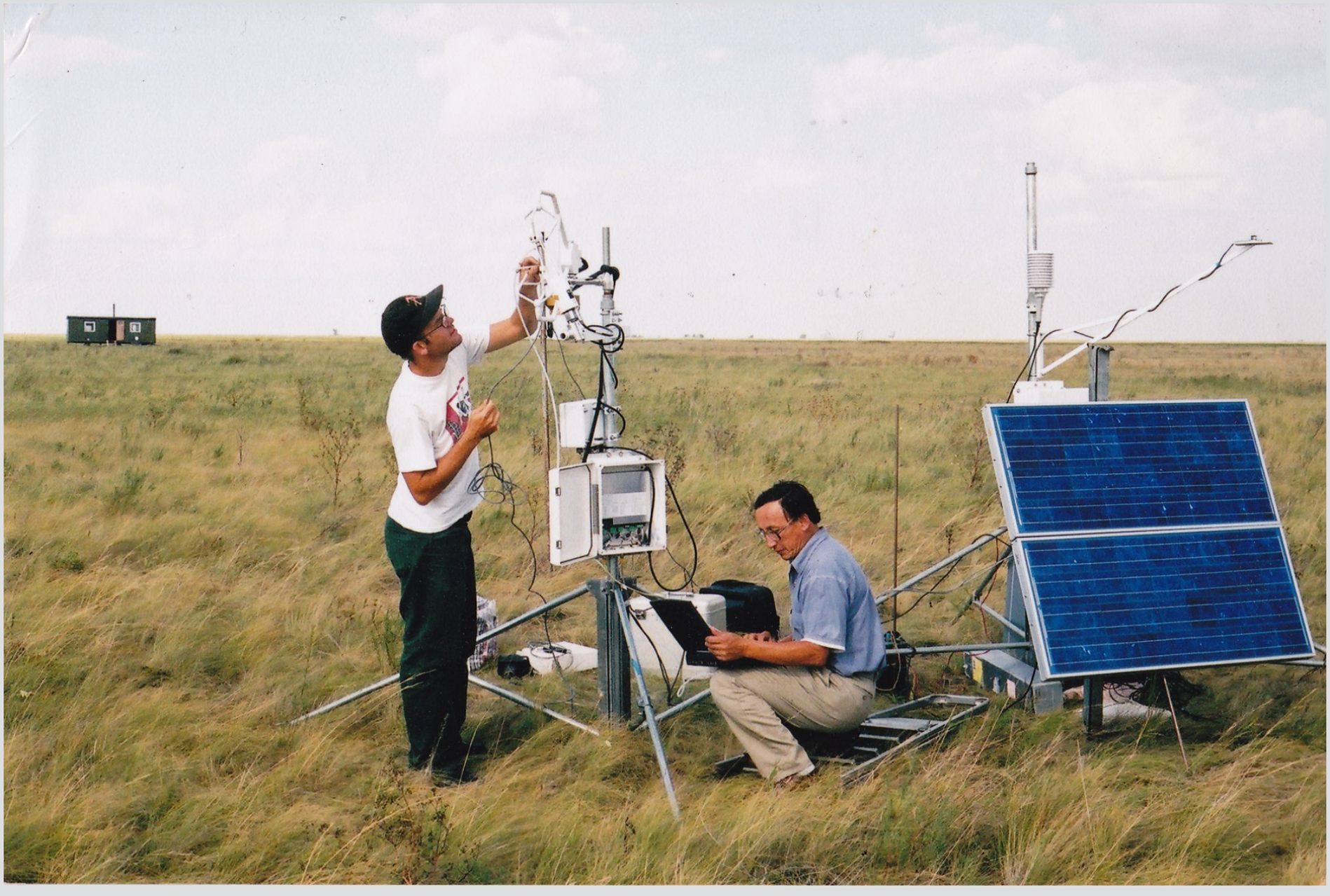
Arable Labs, Inc. Princeton, NJ



Kazakhstan, 1999

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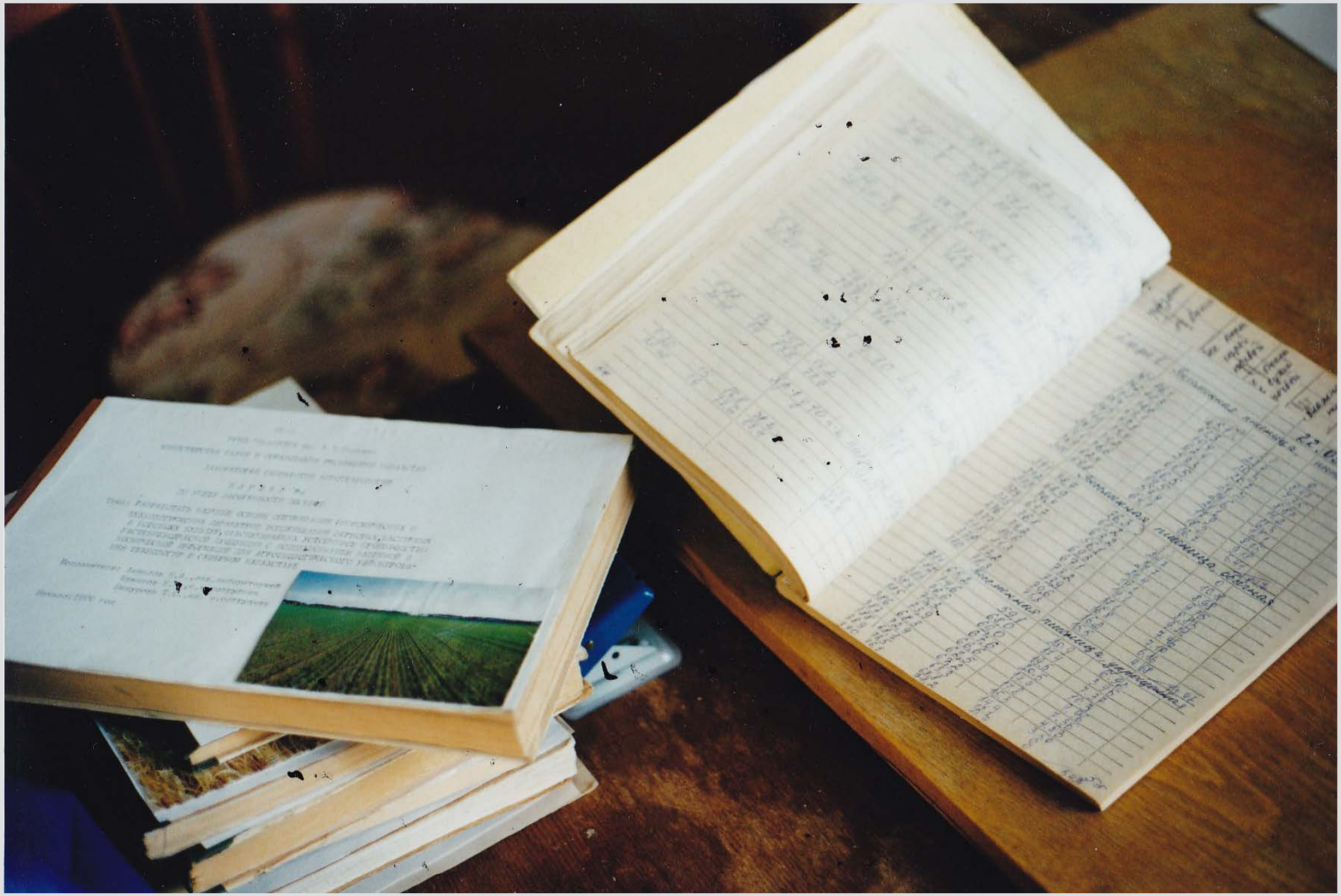

“Big Data”

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Informed Natural Resource Management

A complete approach to crop management with scientific quality measurements and easy to use design.

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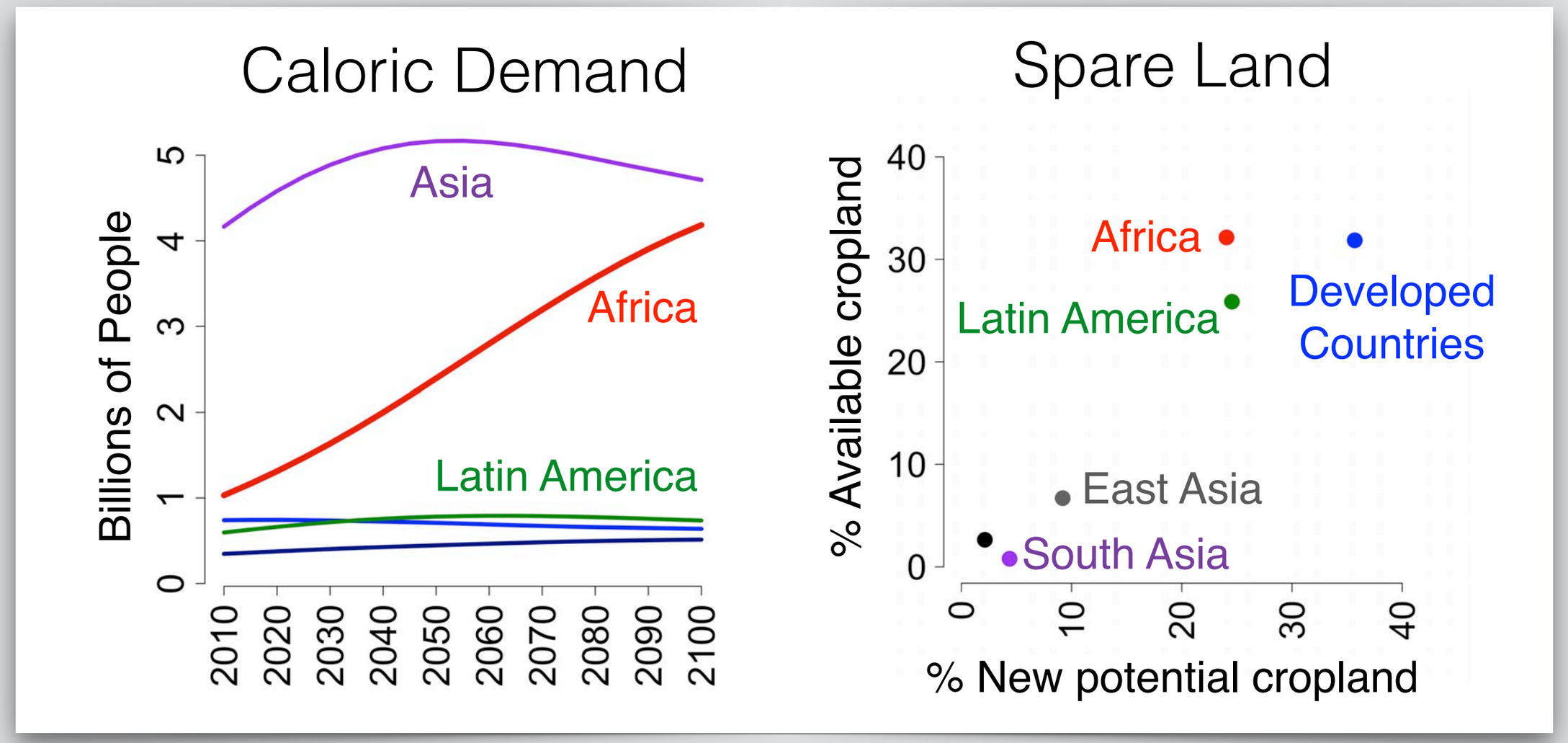
Overview

- Challenges
- Opportunities
- Our thesis
- Outlines of a solution
- Arable

Challenges

We need more food, most likely from Africa



Source: UN

Alexandratos & Bruinsma, 2012

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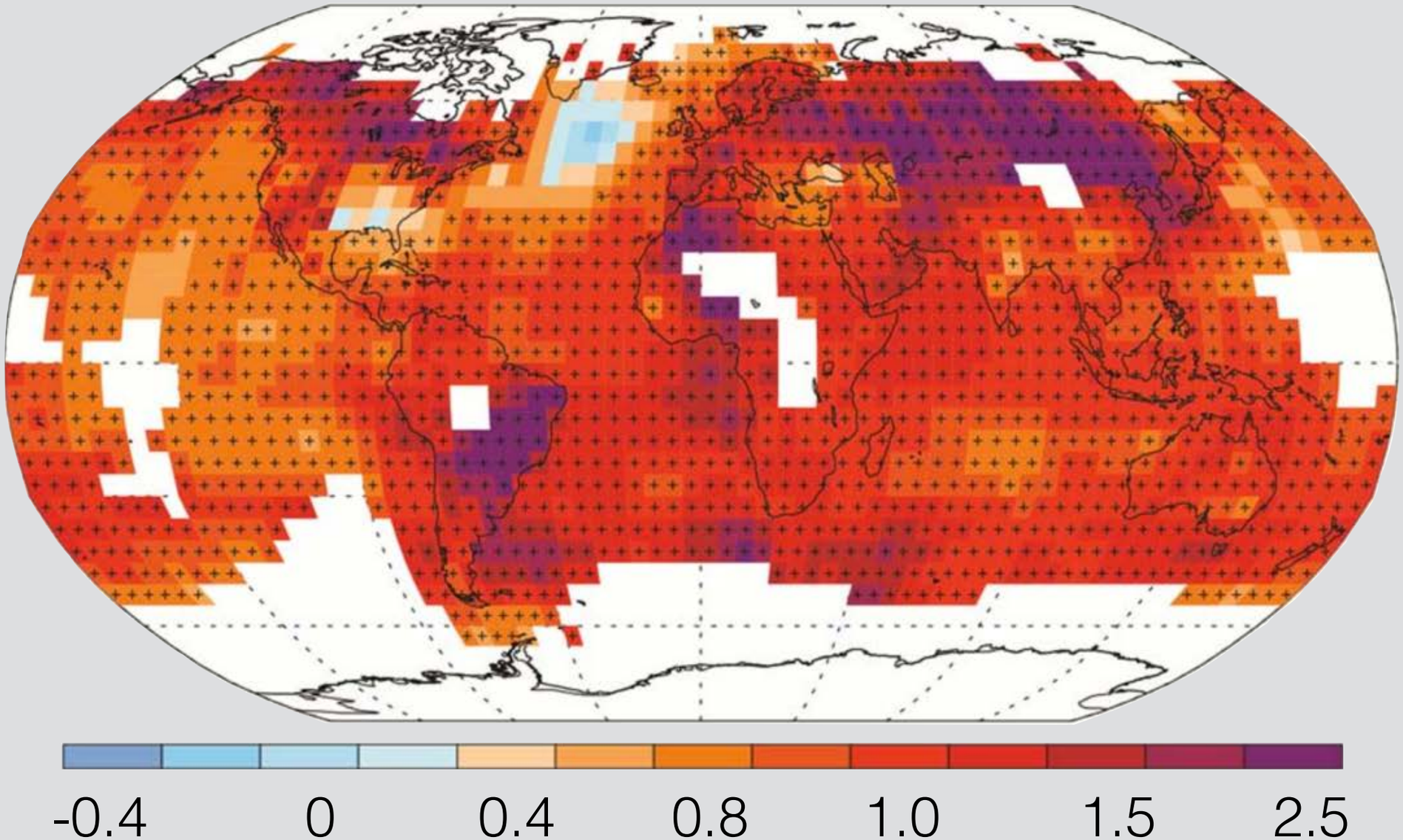
Challenges

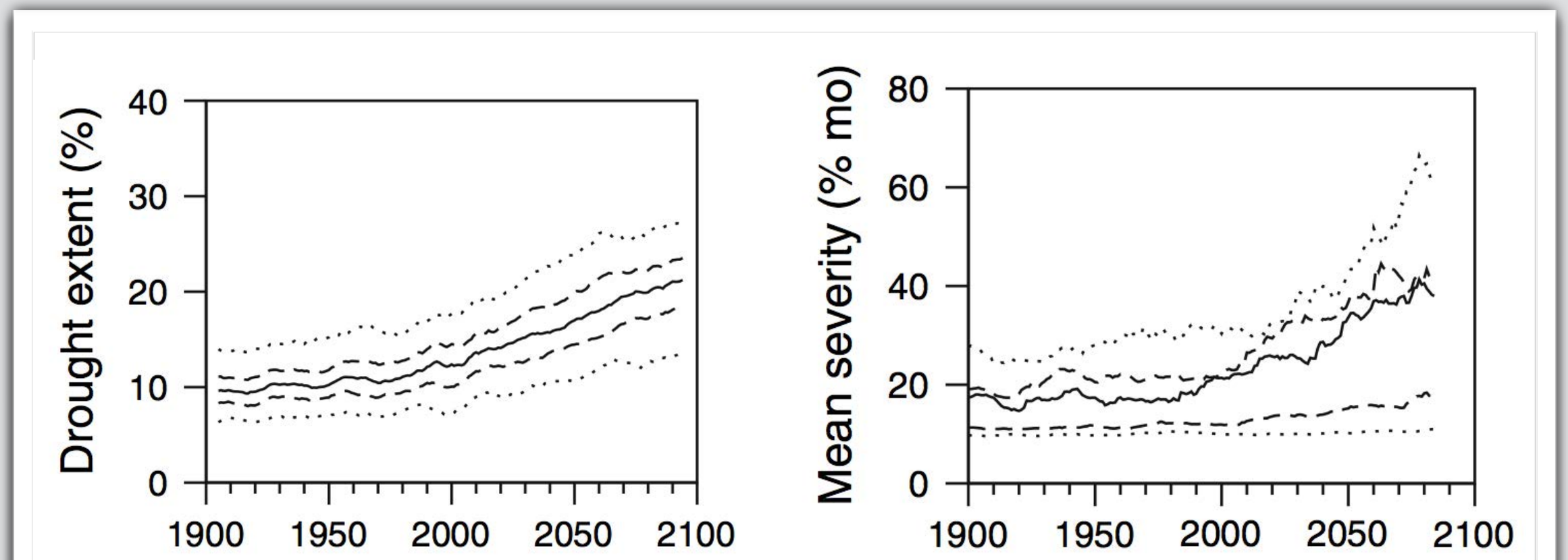
Climate change doesn’t make this easier



Source: IPCC WGII

Challenges

Extreme events are becoming more common



Sheffield and Wood 2008

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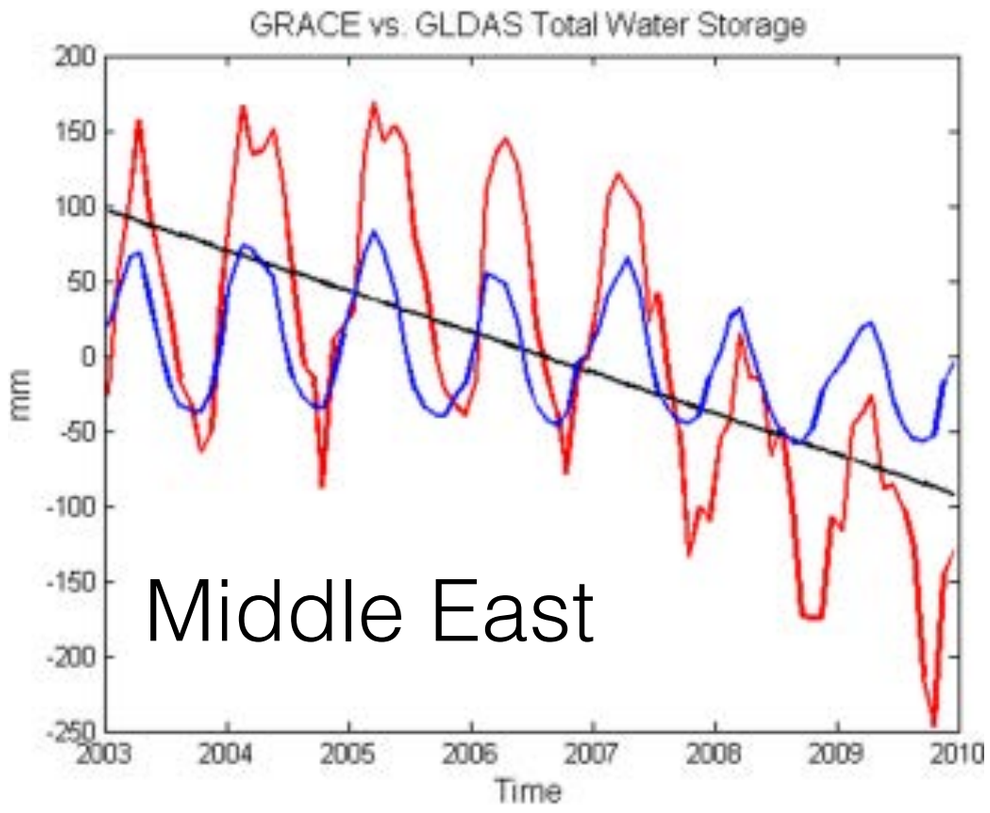
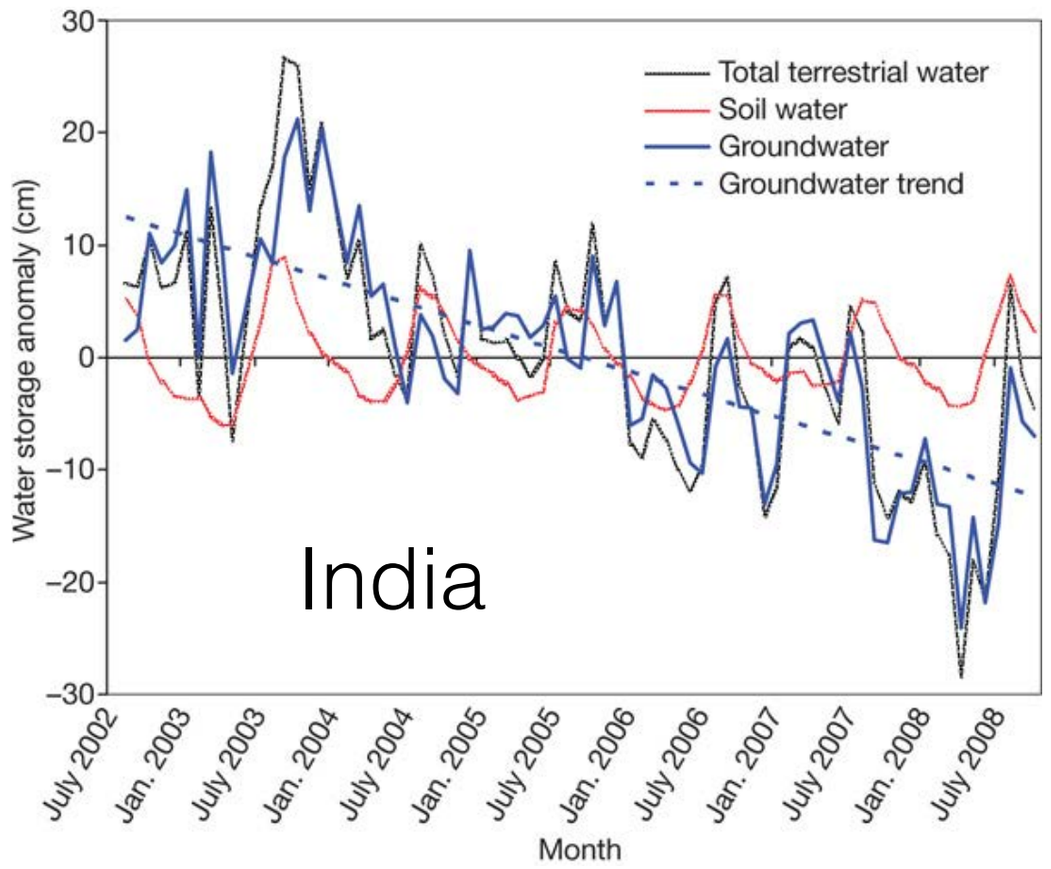
Challenges

Less groundwater to stabilize crop water needs





Voss 2013 / Rodell 2009

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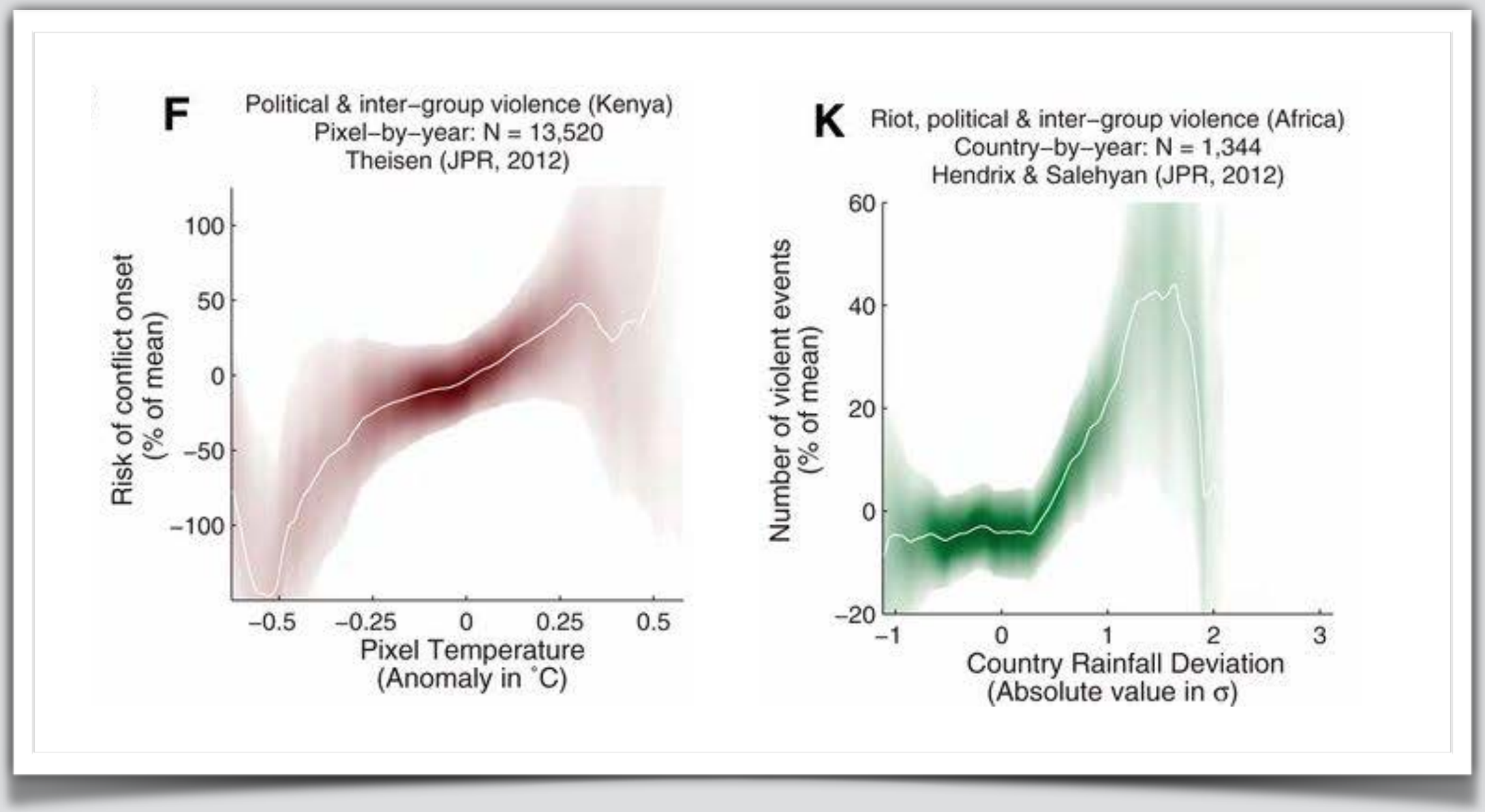
Challenges

Extreme events make political solutions harder



Hsiang 2013

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Challenges

Last Mile Problems: Recast as Risk

- Seed Selection - Uncertain and expensive
- Fertilizer - Unavailable and perhaps counterfeit
- Marketing - Bad roads and opaque markets

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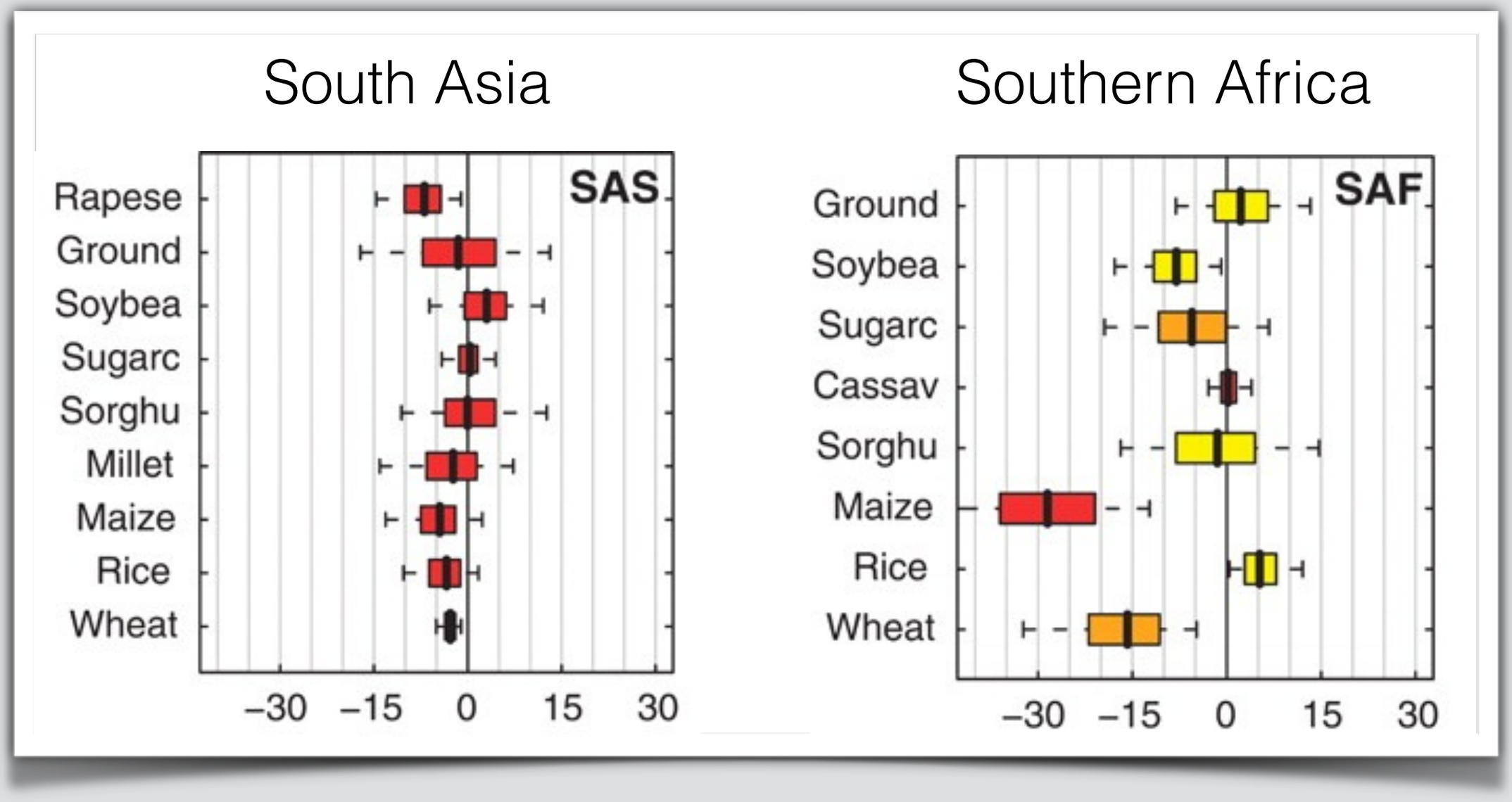
Challenges

Highly unconstrained crop responses to climate



Lobell et al 2010

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Challenges

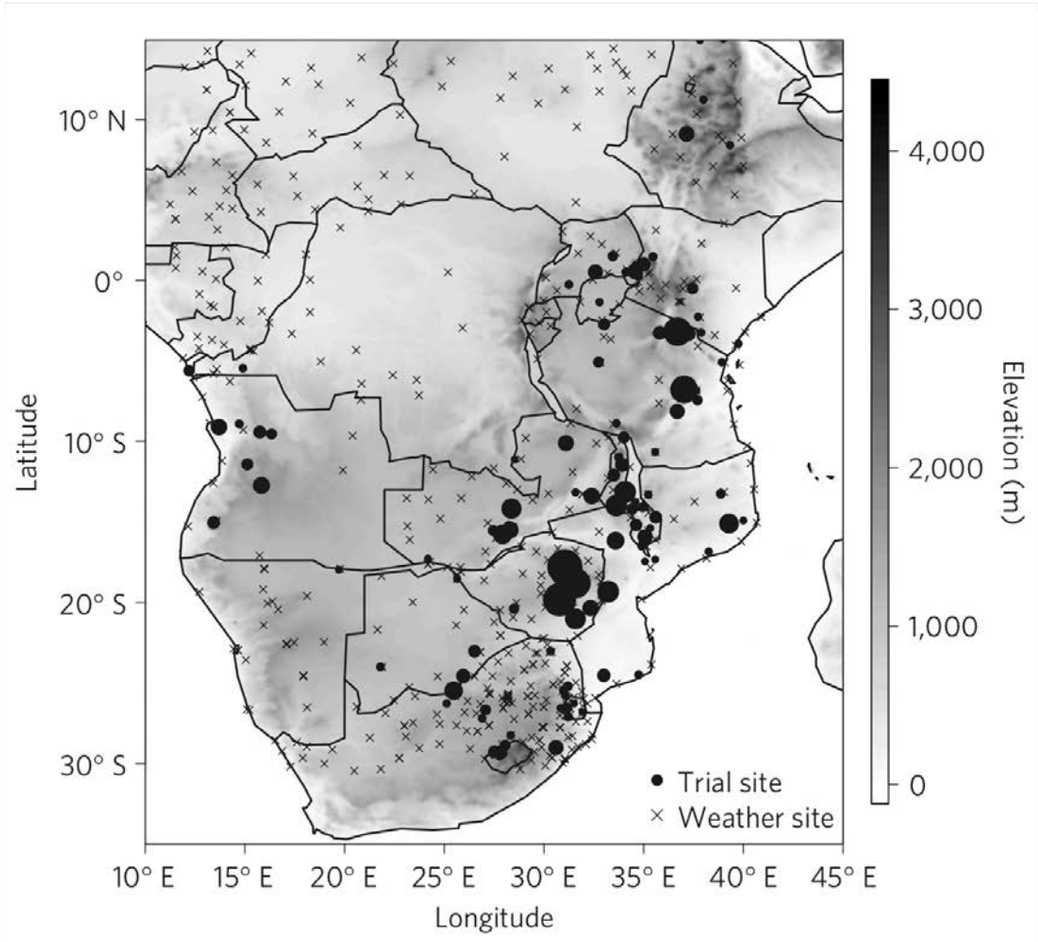

Figure 1 | The study region in Africa. The circles show locations of crop trials, with the size of the circle indicating the number of trials per site (ranging from 20 to 1,249). Weather stations with daily data for at least some portion of the study period 1999–2007 are marked as crosses. The background map shows elevation, with higher altitudes appearing darker.

Lobell et al 2011

Q: How can we not know this?

A: Because there isn't enough data!

Met stations in Africa are about 1 per state of Maryland

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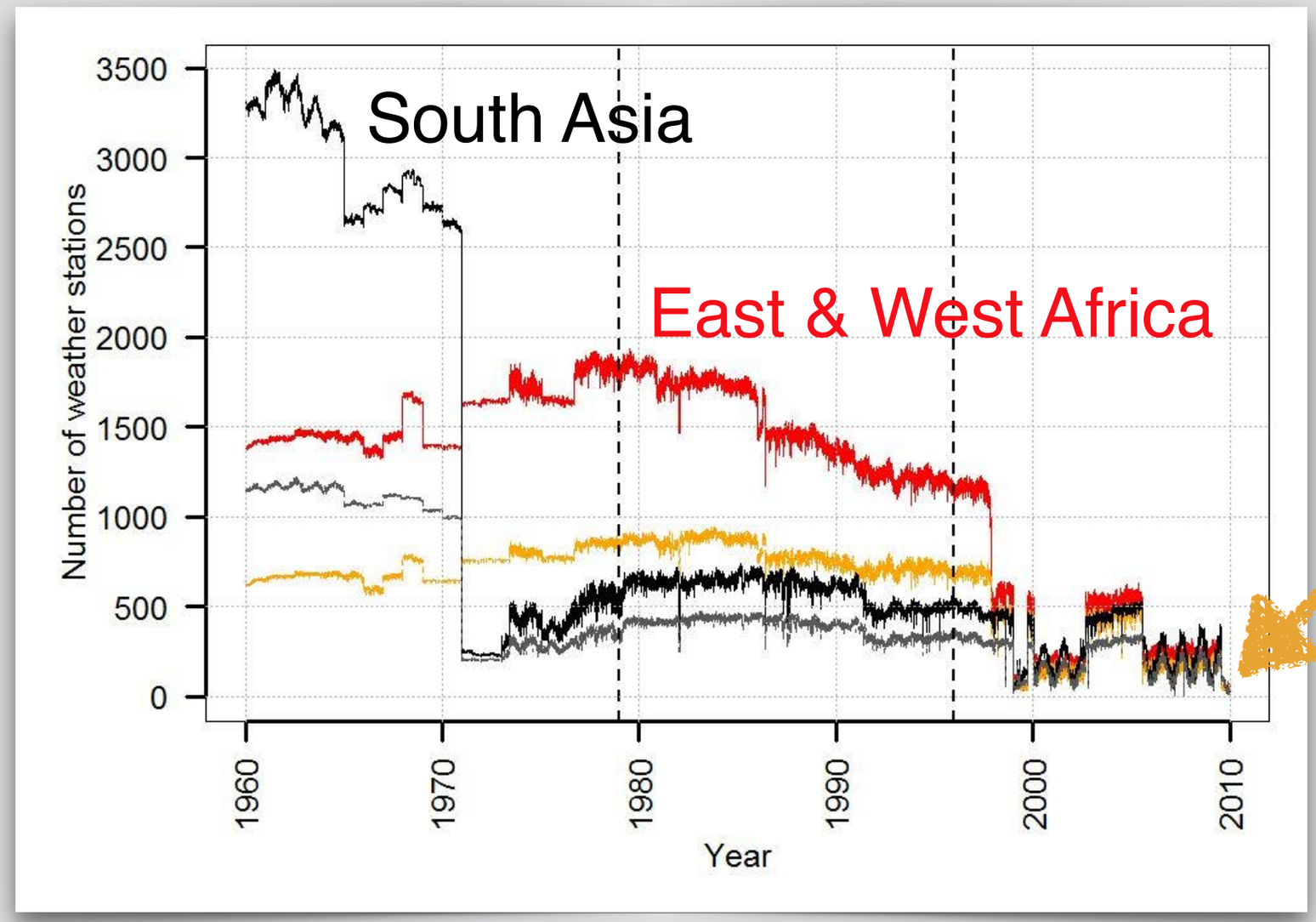
Challenges

Too little data, even the most basic



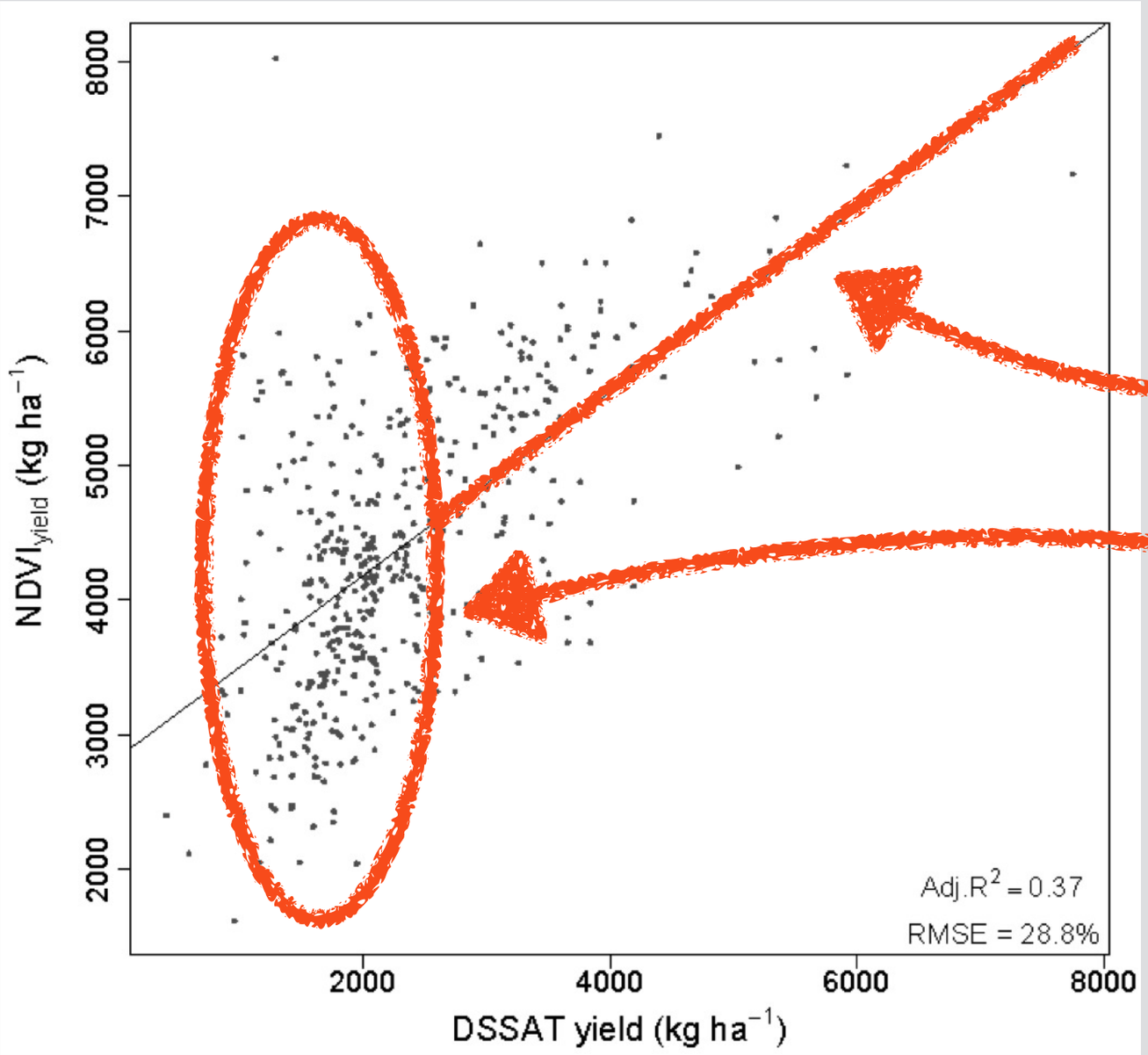
!!!

Number of available met stations (1960-2010)

Ramirez-Villegas & Challinor, 2012

Challenges

What data does ag development need?



The best farmers act like models say

Smallholders in low-yield settings unpredictable

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Challenges in Development Practice

- Impact per dollar
- Development innovation ecosystems
- Financial sustainability of initiatives
- Monitoring and evaluation

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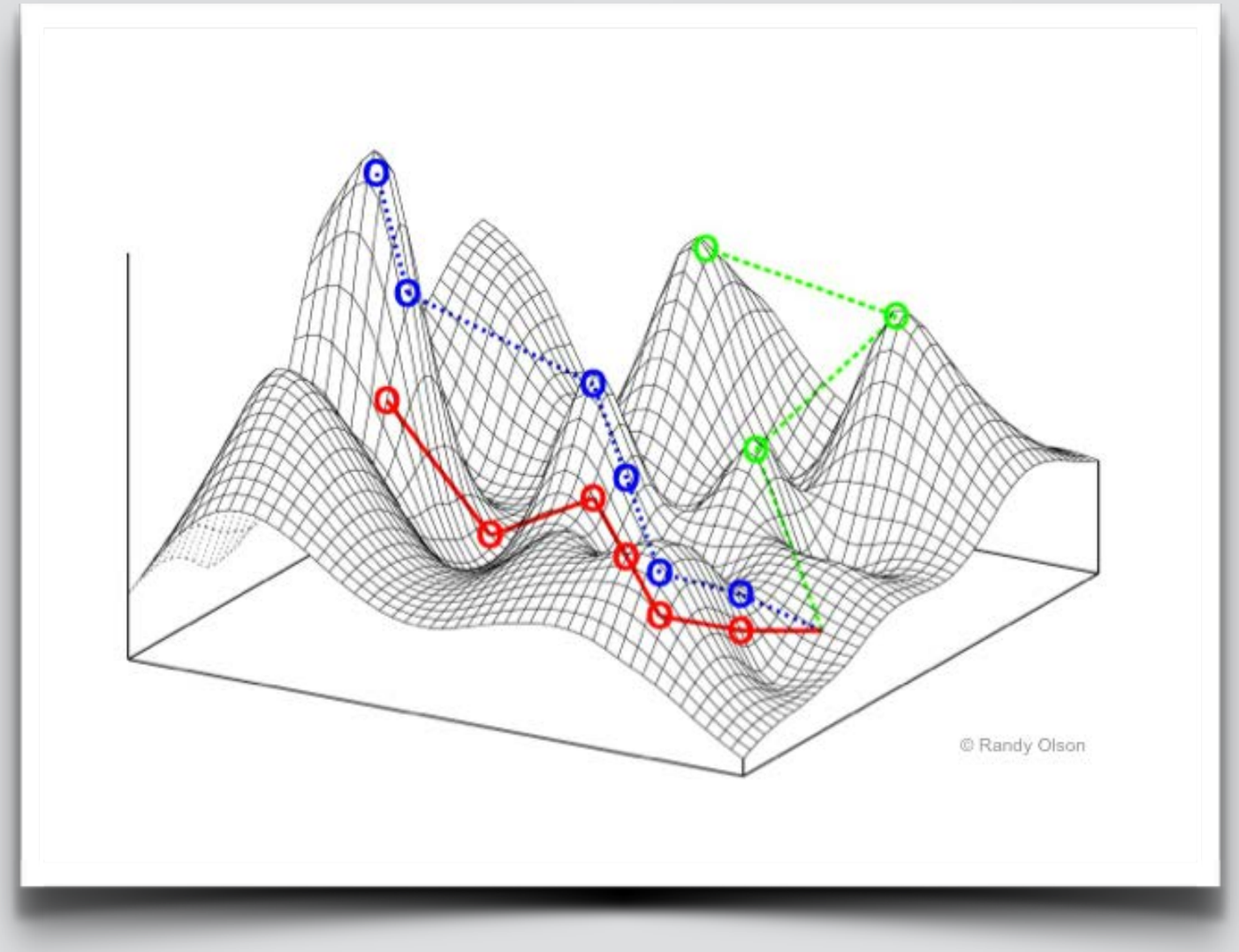
Opportunities

the Adjacent Possible



The future is a small departure from the present

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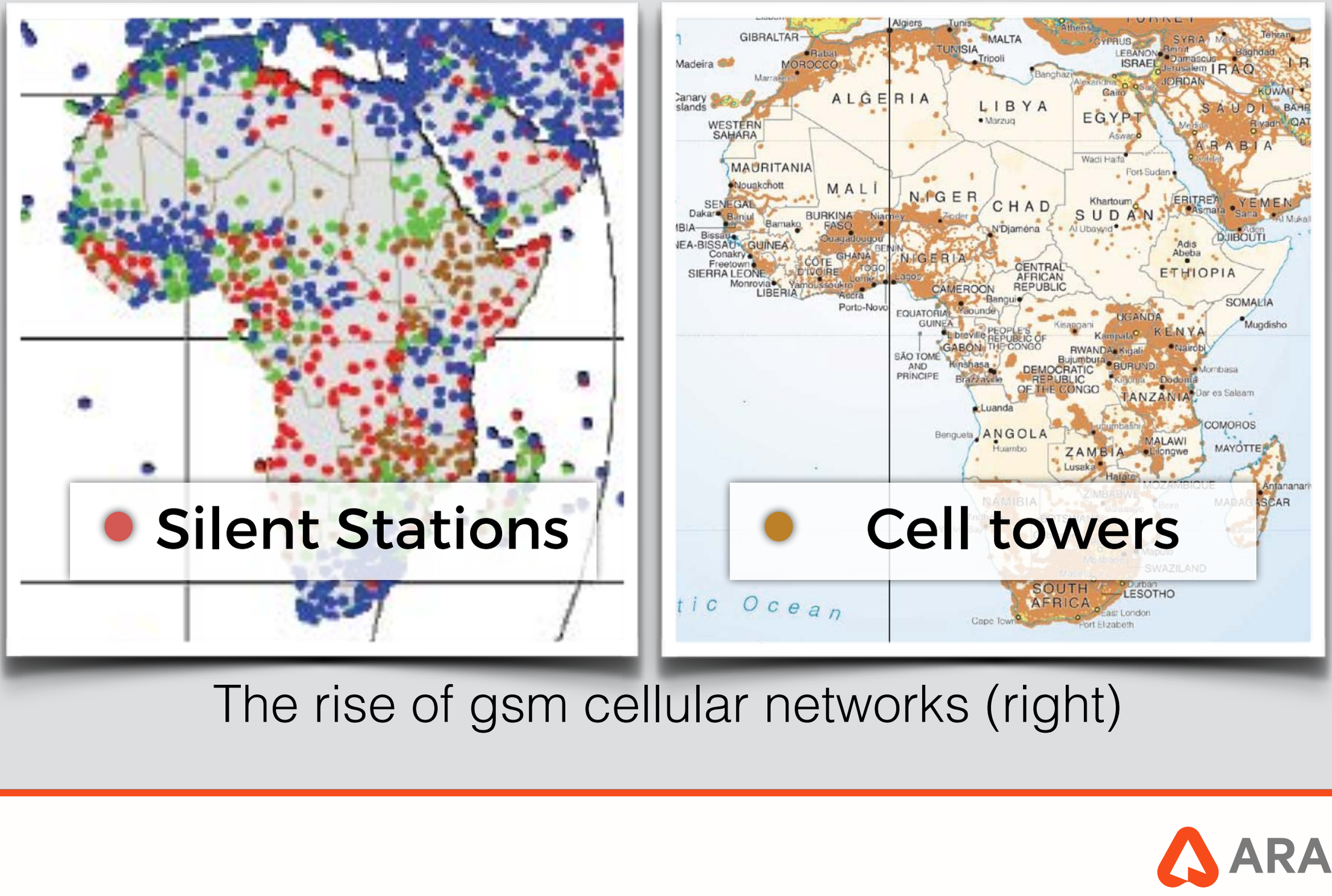
Opportunities

Collapse of meteorological networks (left)



The rise of gsm cellular networks (right)

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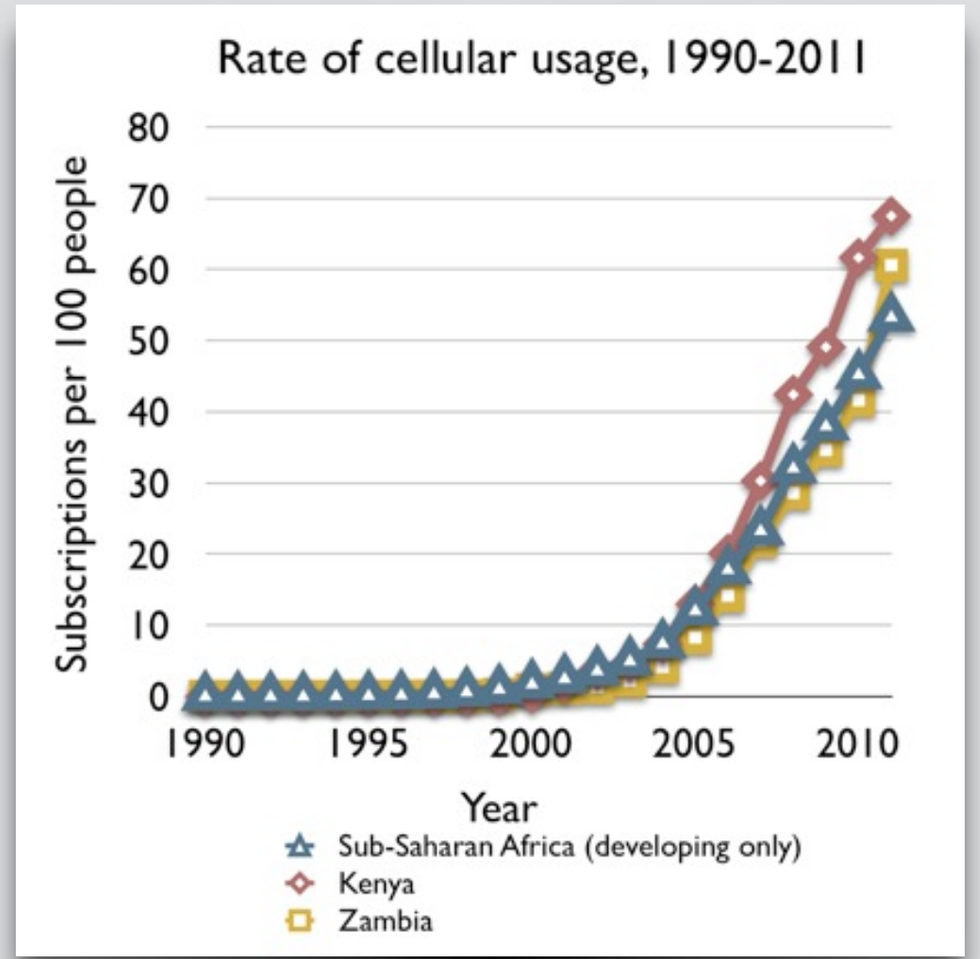
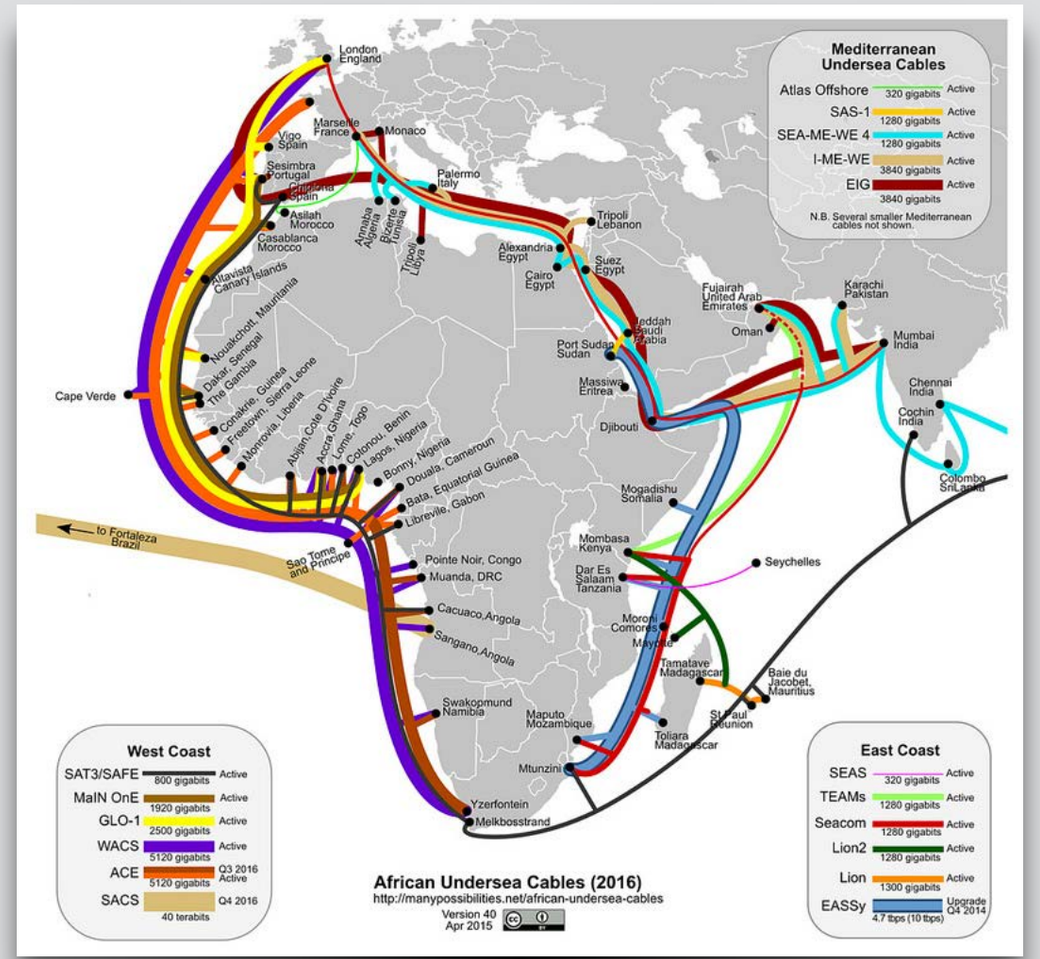
Opportunities

Technological Leapfrogging



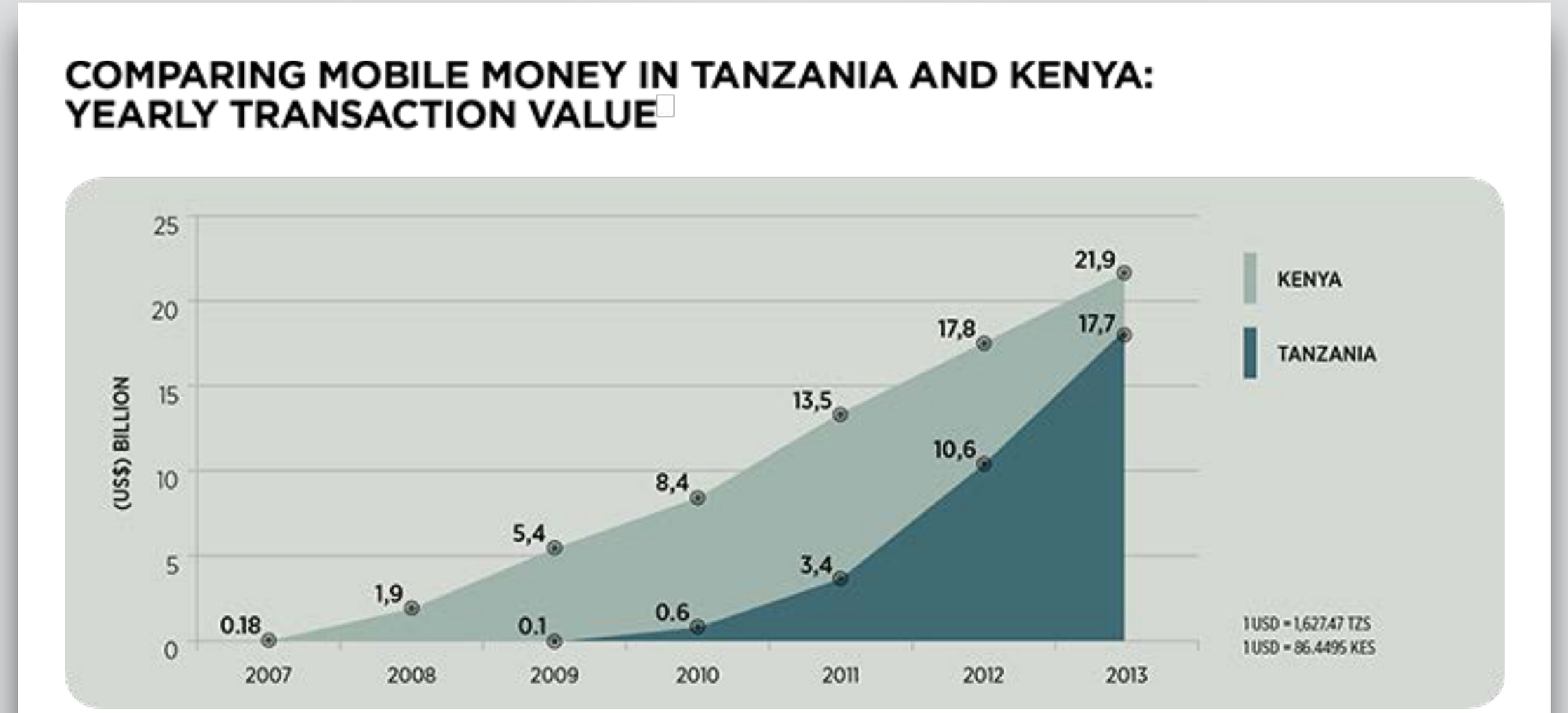
Cellular



Cable

Opportunities

Rapid adoption of mobile money



Safaricom 2013

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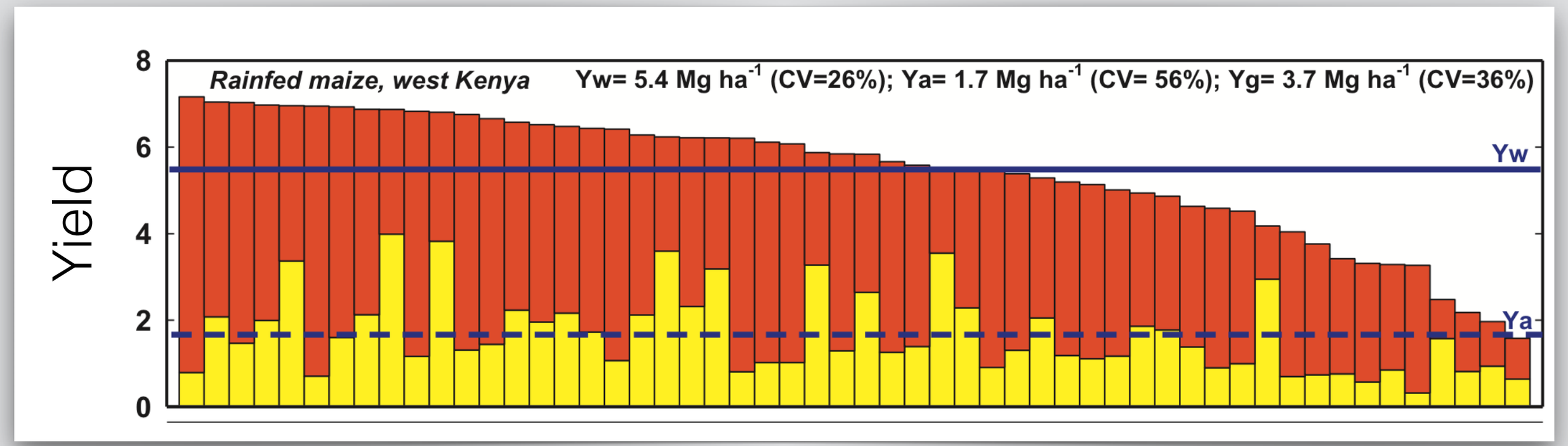
Opportunities

Huge value to be created



Yield gaps 2x the attained yield!

van Itters 2013

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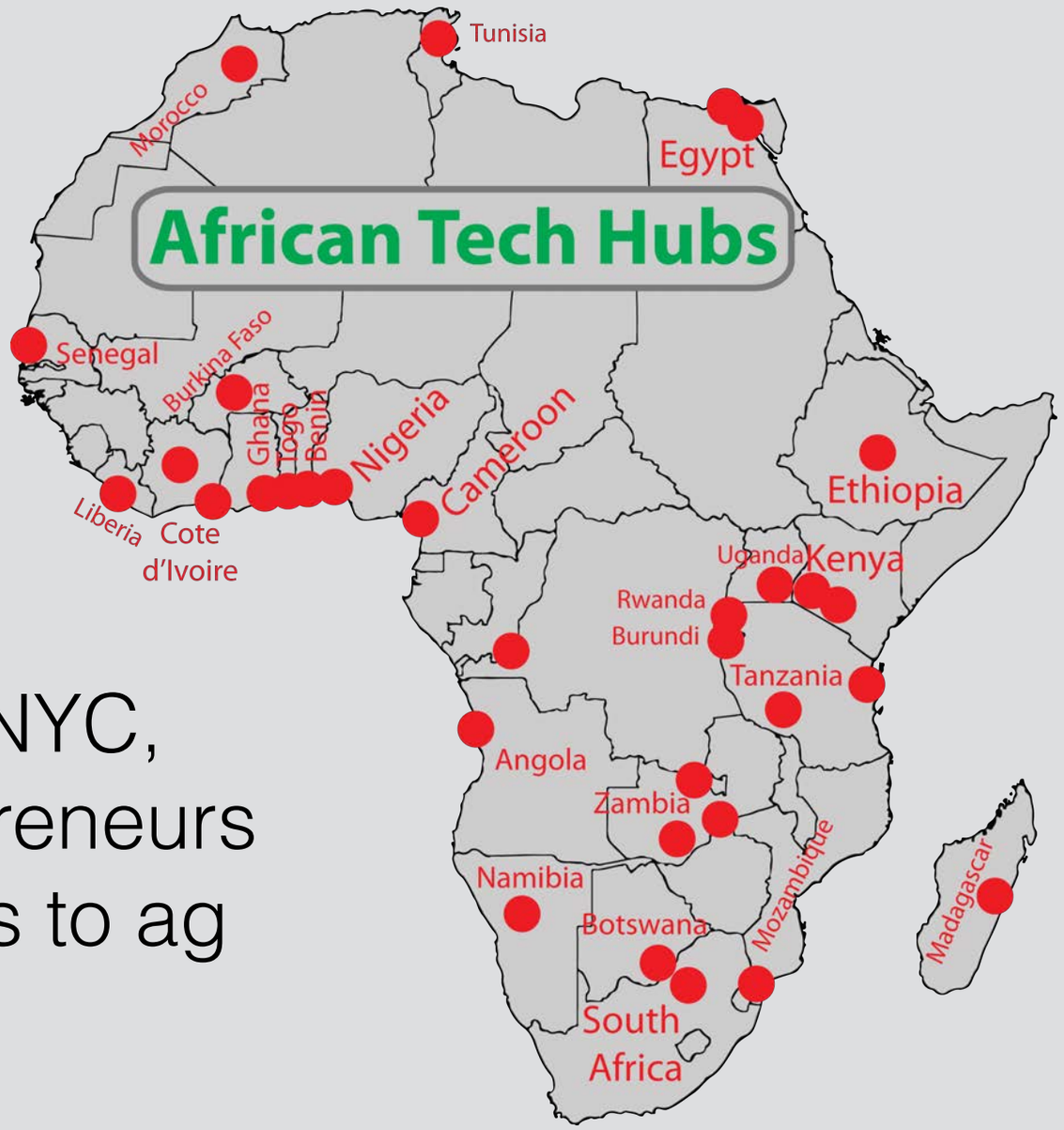
Opportunities

Boom in Tech Entrepreneurship



Unlike SF and NYC,
these tech entrepreneurs
have connections to ag

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Our Thesis

Data Binds Us

Soils & Nutrients

Weather & Climate

Prices & Transport

Inputs & Practices

Operations & Coordination

Risk & Options

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Our Thesis

Data reduces uncertainty

Suppliers		Farmers		Buyers
Deere Agco Syngenta MRI Seeds Yara	? what where how much ?		? what where how much ?	Cargill ADM Olam Bunge Nestlé

Data adds transparency and predictability between strategic partners

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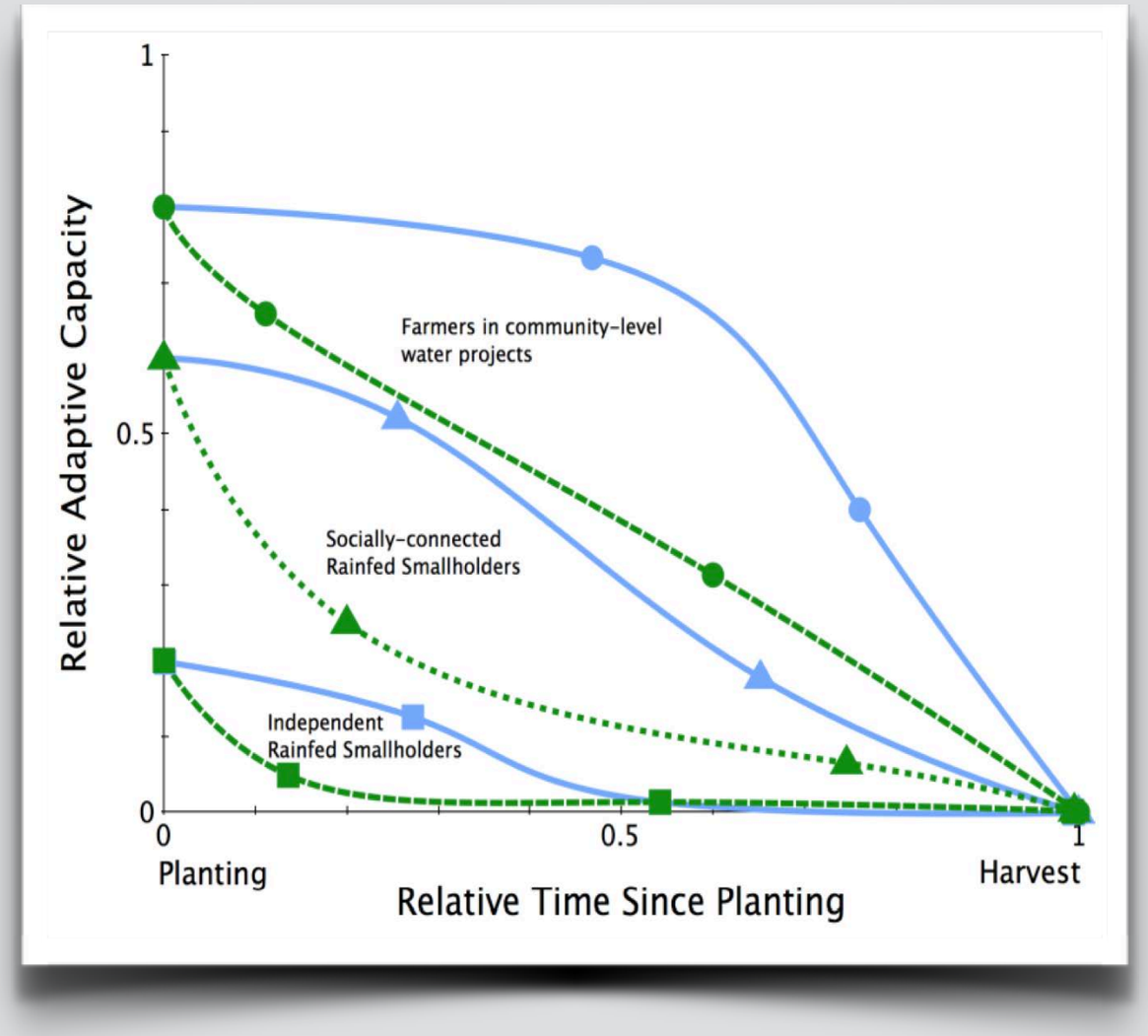
Our Thesis

The later a decision is made,
the more expensive it is



Evans, Caylor, In Prep

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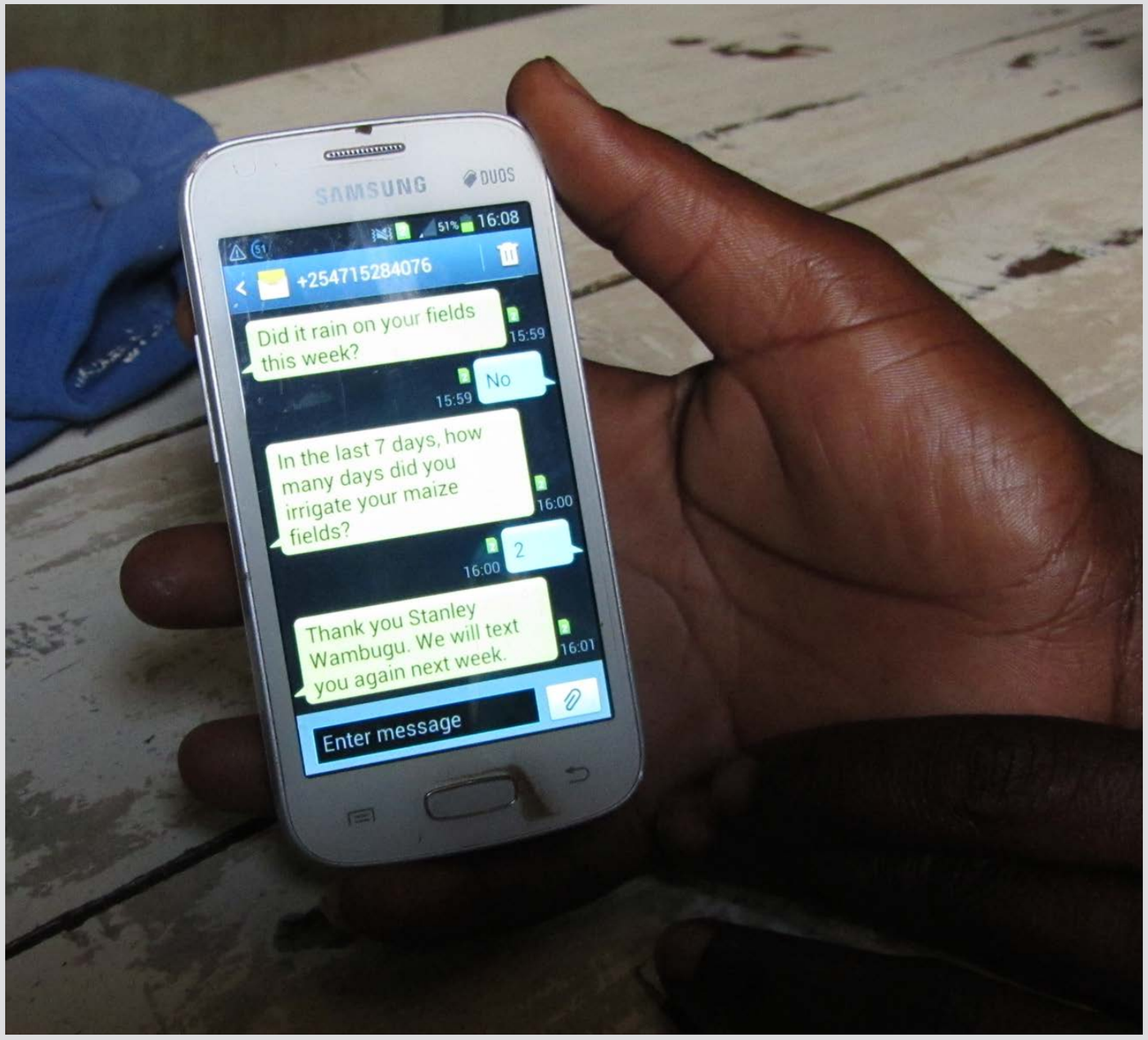
Outlines of a solution

Data is local and personal



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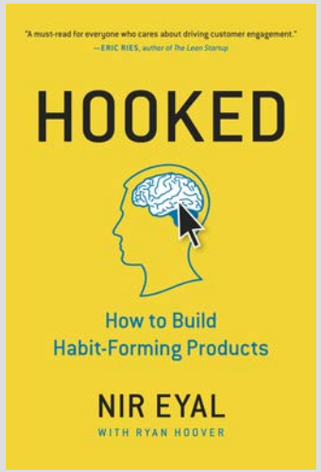
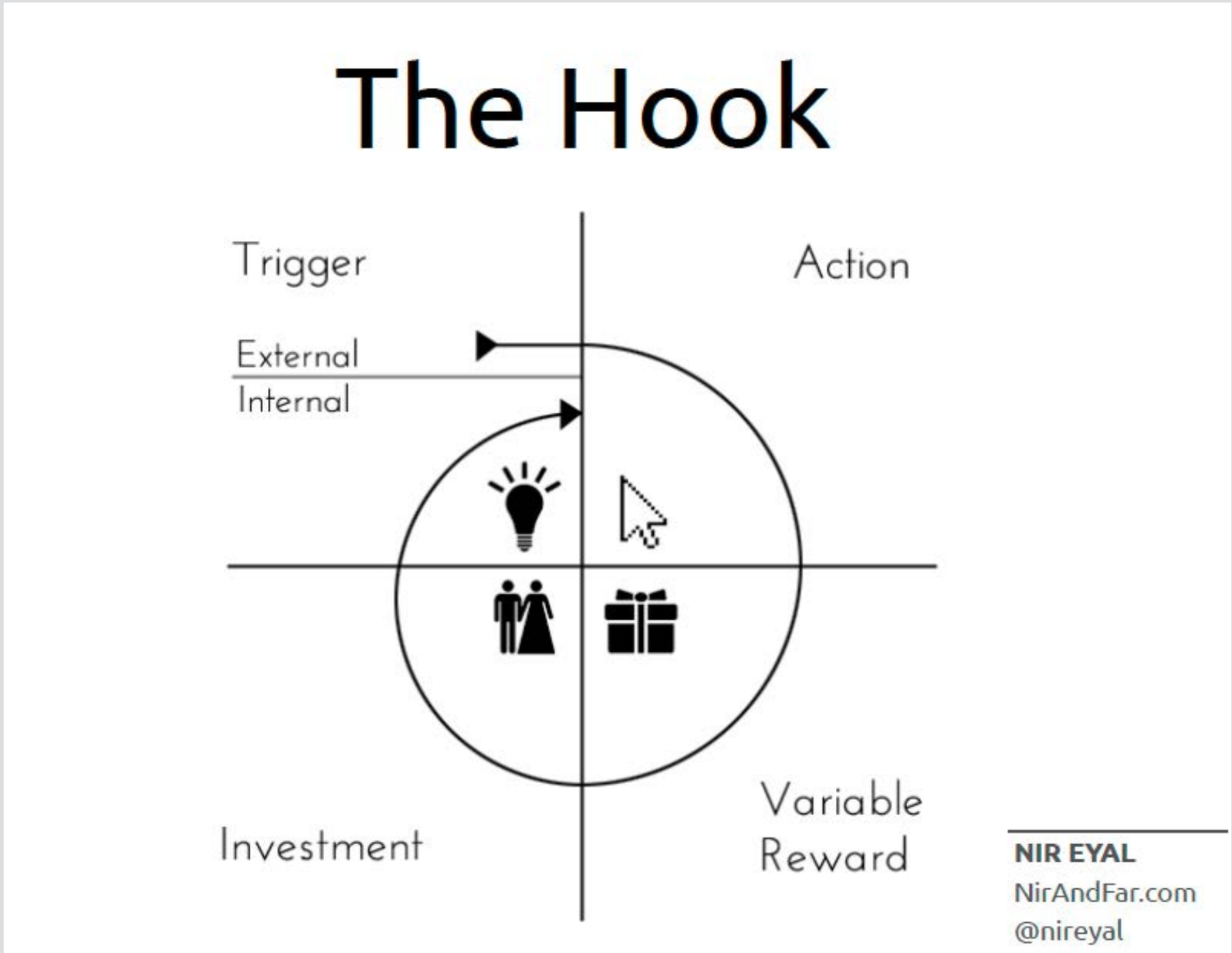
Outlines of a solution

Stickiness is Essential for Technology





Outlines of a solution

Stickiness is Essential for Technology

Early traction is the best predictor for late stage success

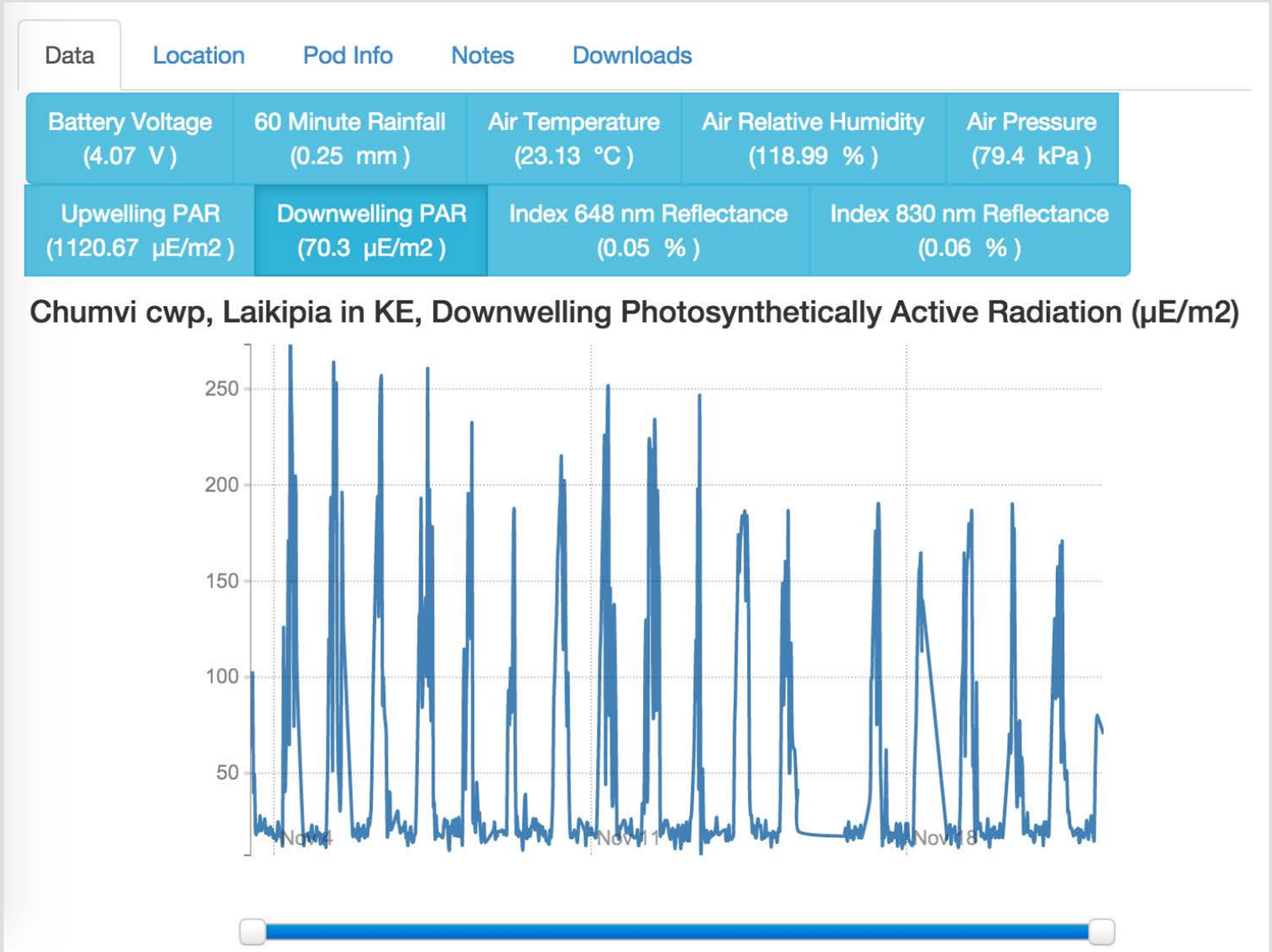
acre AFRICA

Case Study: Kilimo Salama as a **UX design** innovation

It's not the product - it's reducing the friction to adoption, and communicating the value proposition through every step of user onboarding and ongoing user engagement

Outlines of a solution

Data *per se* is not sticky!



This is our own data and I don't want to see it

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Outlines of a solution

What's Sticky: data that grounds communications leading to learning and decisions

From places people care about

Between people sharing strategic goals

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Informed Natural Resource Management

We've designed a complete solution to crop management that provides you with scientific-quality measurements when and where you need them.

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The Pulsepod: *the most data per dollar*

Data Rich

Each Pulsepod measures rainfall, crop water demand, water stress, microclimate, canopy biomass and more.

Connected

Arable's Pulsepod syncs data over WiFi, Cellular or BlueTooth.

Secure

Communicates with military-grade encryption. Access information anywhere using a secure API.

Simple

Designed for ease of shipping, installation, and use.

ARABLE

Arable API: Open but Secure

Your API key

You can find your API key under your user settings in http://app.pulsepod.io.

It will be a 32-byte ascii string like `9196014b951447adbd91ac1208affe27`.

Requests on notebooks

`http://hapi.pulsepod.io/get/`**[which]**`/notebooks/`

`http://hapi.pulsepod.io/get/`**[which]**`/notebooks/near/`**[lon,lat]**

`http://hapi.pulsepod.io/get/`**[which]**`/notebooks/tagged/`**[tag]**

`http://hapi.pulsepod.io/get/`**[which]**`/notebooks/called/`**[OID]**

`http://hapi.pulsepod.io/get/`**[which]**`/notebooks/measuring/`**[variable]**

`http://hapi.pulsepod.io/get/`**[which]**`/notebooks/where/?`**[key=value]**

Data


```
{
  "loc": {},
  "t": {
    "$date": 1416096001000
  },
  "v": 51.86895751953125,
  "variable": "Air Relative Humidity"
}
```


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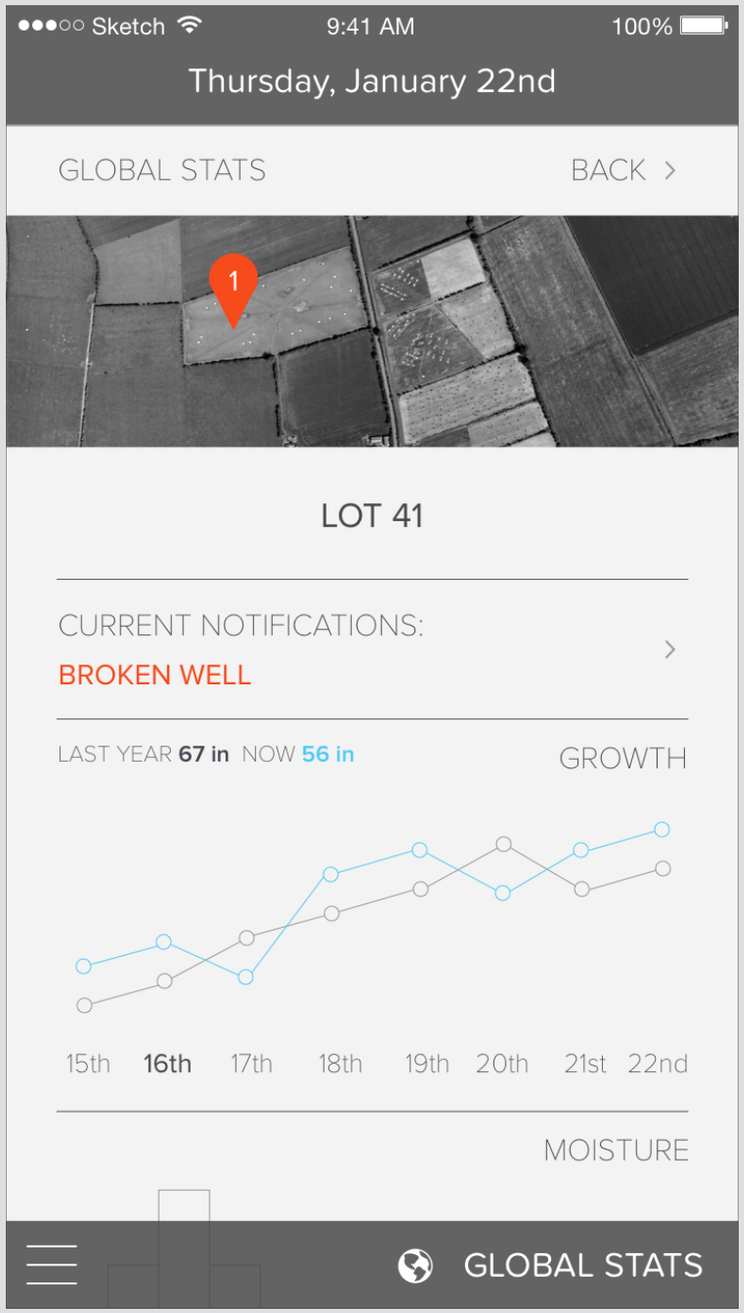
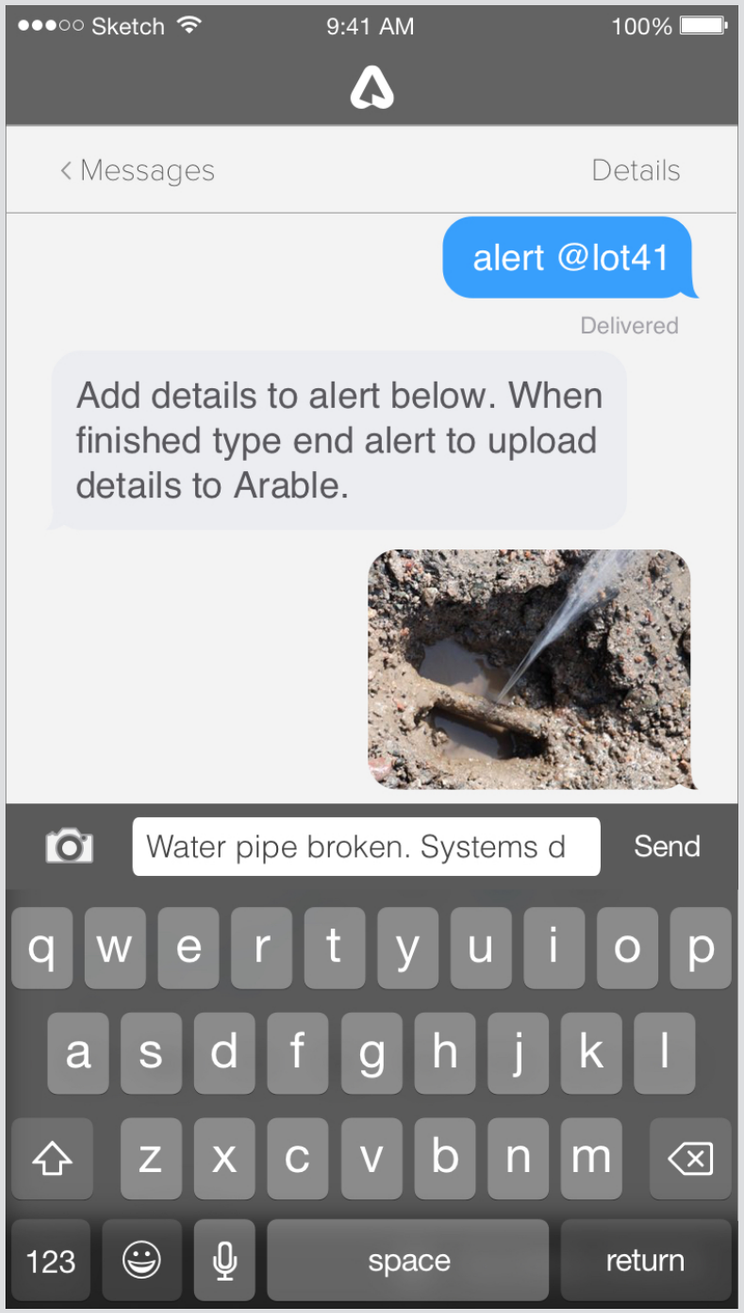
Mobile Messaging Platform





Messages are Data

Push by Farmer:

- Pests
- Crop variety
- Phenology
- Quality & Quantity

Pull by Farmer:

- Advice on timing
- Advice on inputs
- Price & transport

Push by Agronomist

Pull by Buyer

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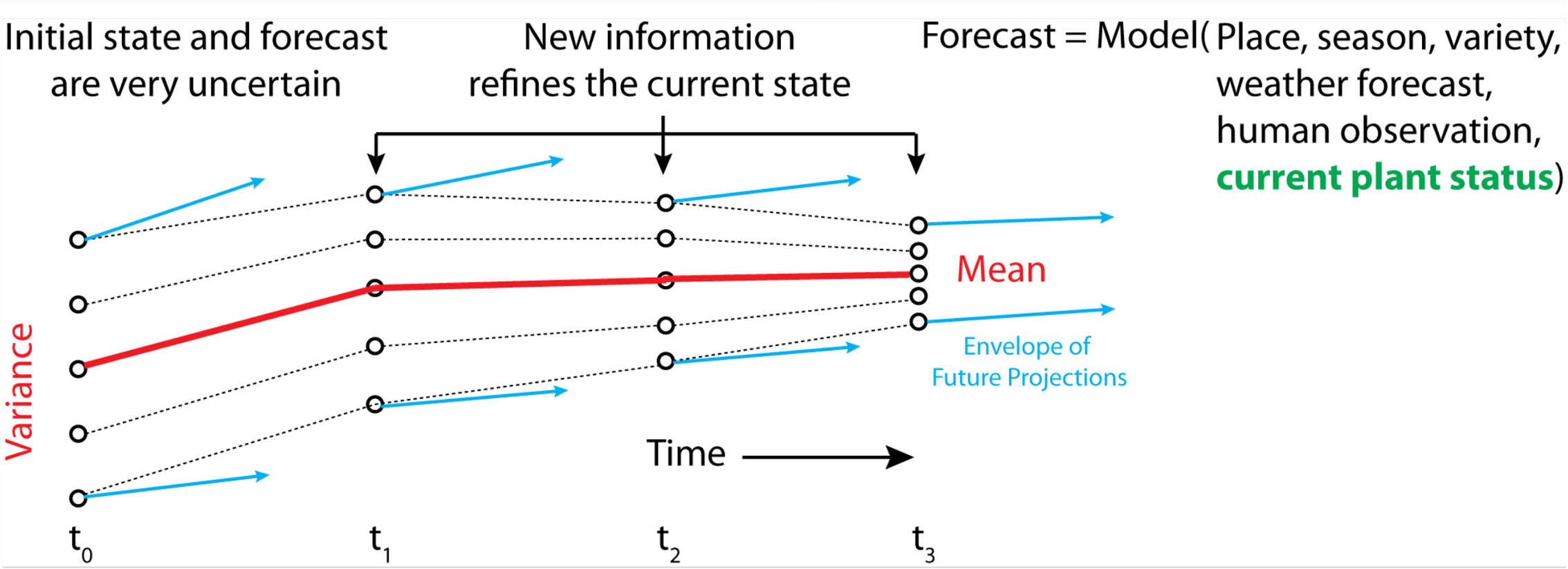
Crop Forecasting

Forecasts link growers and contract buyers



Processors capture better market prices
revenue share with growers adds rural value

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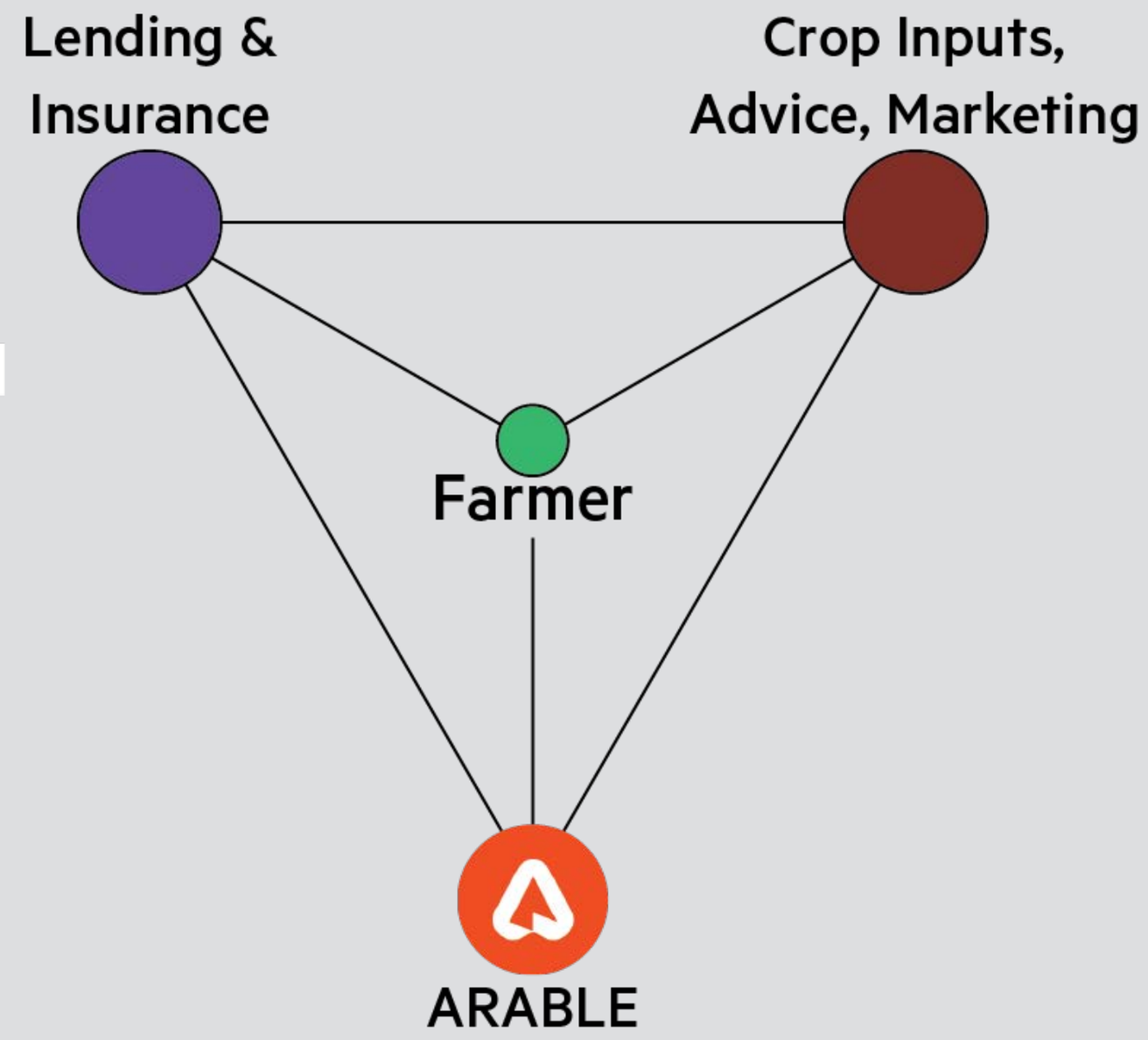
Crop Insurance

Local data drives customer engagement
Customer engagement reduces moral hazard



Blue Marble
MICROINSURANCE

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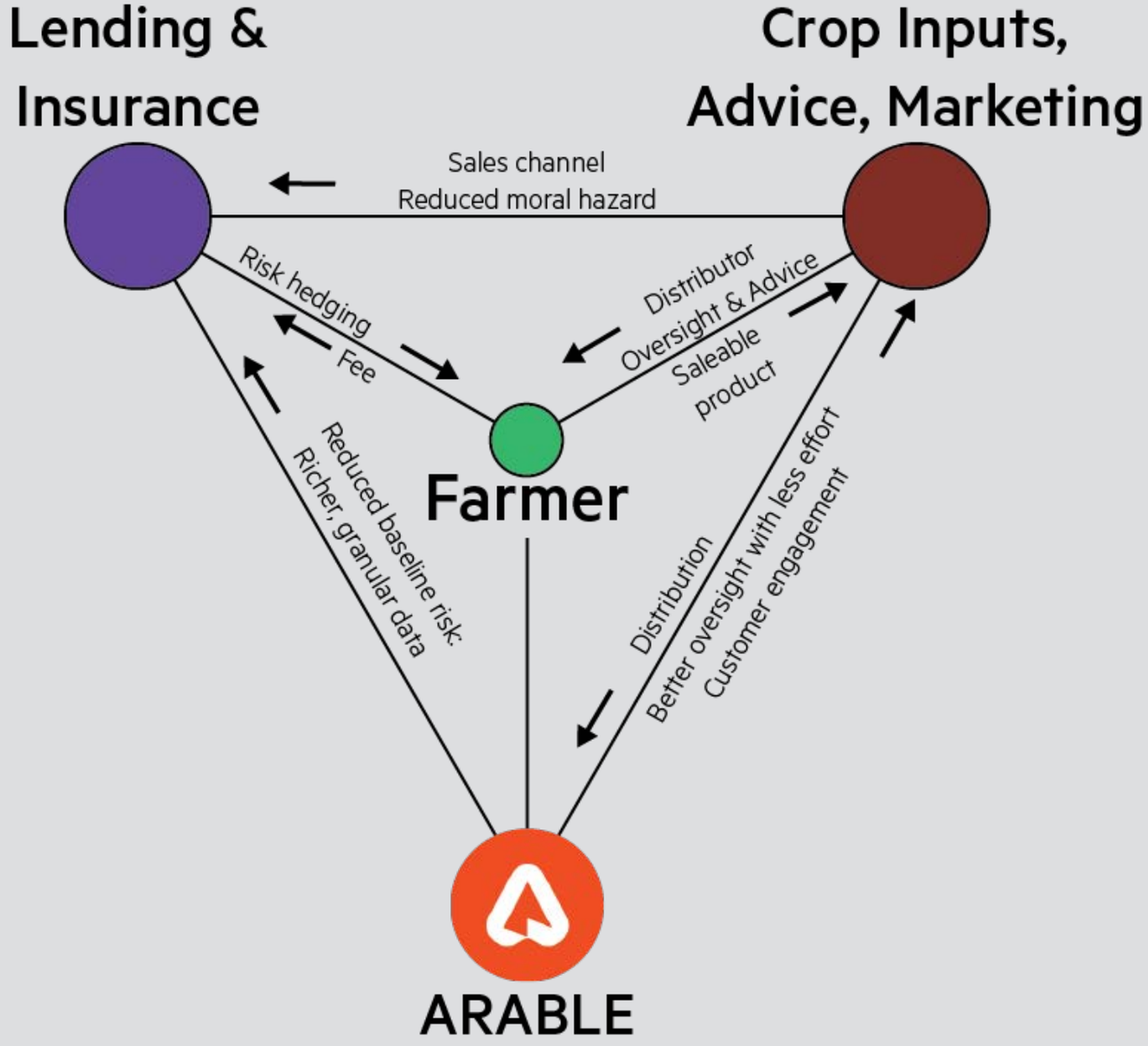
Crop Insurance

Local data drives customer engagement
Customer engagement reduces moral hazard



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Thank You!

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