Precision Agriculture for Development

Scalable delivery of customized advice to smallholder farmers globally

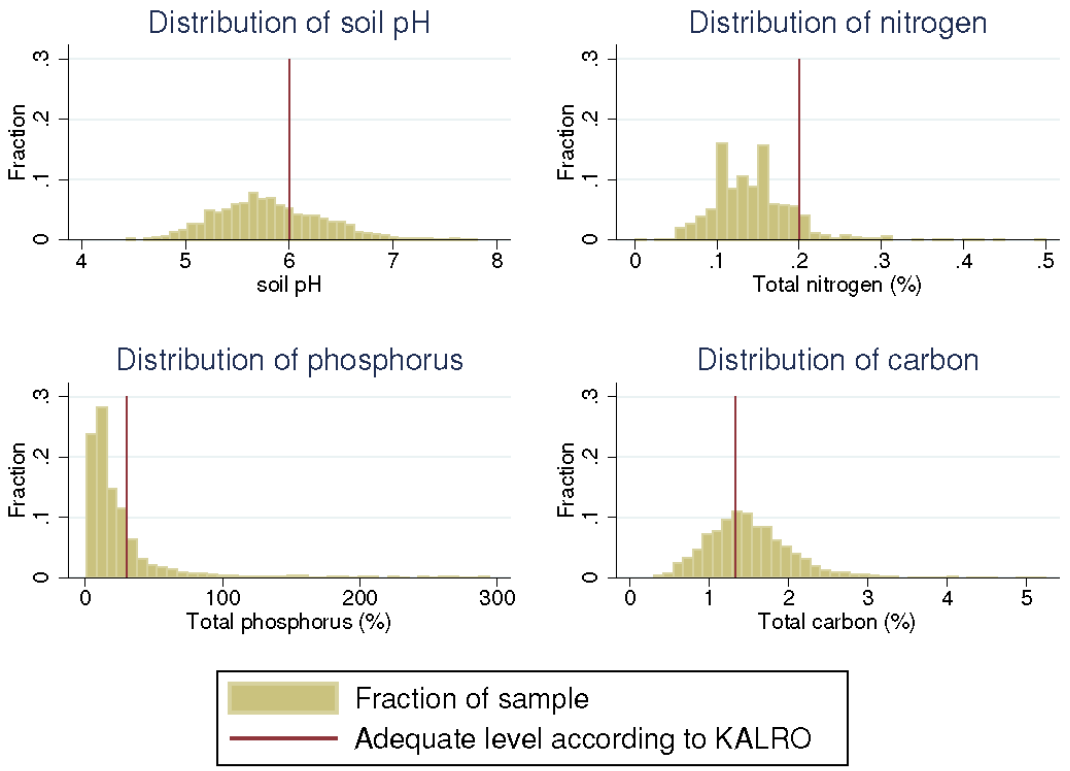
Our vision

Transforming traditional agricultural extension systems using the latest available technologies and research methods to iteratively improve the productivity and income of farmers in developing countries.

The opportunity

Customized agricultural information is valuable to smallholder farmers.

- **Large variation in conditions across geographies, farmers, and markets**
- **"One size fits all" recommendations are inappropriate**
- **Customized input recommendations and ag management information allows farmers to realize yield and profit gains**



Soil nutrient variation in western Kenya.

The opportunity

New technology exists to address barriers.

- Technological advances facilitate learning about local characteristics
  - Mobile soil analysis labs with spectroscopy
  - Satellite and drone photographs
  - New weather prediction models
- Widespread use of mobile phones provide new info delivery and collection mechanisms
- Marginal cost of distributing info via mobile phones is close to zero

The opportunity

Information content and messaging can be improved with latest research methods.

- Behavioral economics can improve messaging and encourage adoption
- Social learning can facilitate the diffusion of relevant information
- Big data and machine learning allow for personalized advice
- A/B tests allow near instantaneous upgrades
- Randomized controlled trials (RCTs) provide opportunities for rigorous evaluation

The evidence

Can mobile ag extension affect behavior change?

- Maize farmers in Kenya 4-7% more likely to buy agricultural lime when promoted through an SMS based service customized to results from local soil tests

Can mobile ag extension increase farmer yields?

- Sugar cane farmers in Kenya experienced yield increases of 8-12% with access to an SMS based info and reminder system tailored to their planting date
- Cotton farmers in India with access to an customized two-way IVR system reported yield increases for cumin (26%) and cotton (8%)

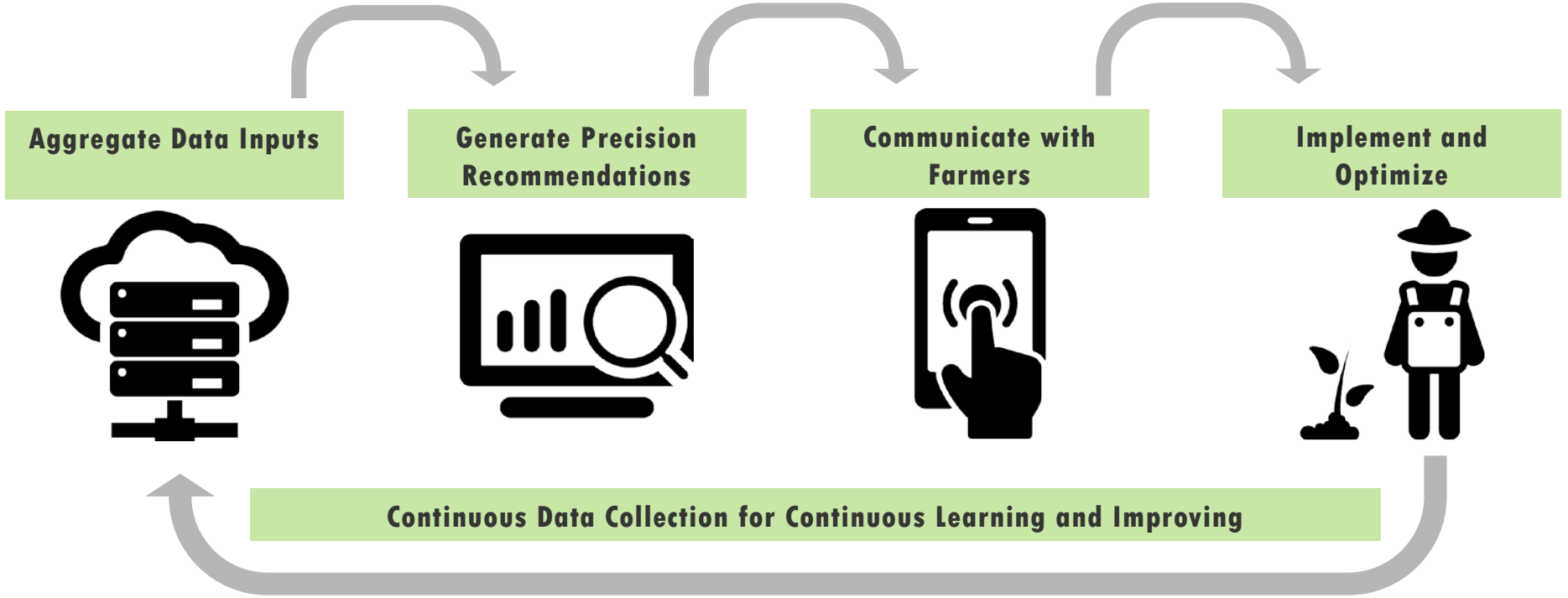
Can mobile ag extension increase farmer profits?

- Cotton farmers in India with access to a customized two-way IVR system reported increases in net profit of $100/farmer/season (benefit/cost ratio = 10/1)

Can farmers provide accurate information via phone useful to others?

- Sugarcane farmers in Kenya made reports via mobile phones that reduced late fertilizer delivery by 23% and non-delivery by 54%

Our solution: *Silicon Valley comes to ag extension*



Our solution: *Silicon Valley comes to ag extension*

PAD creates and delivers value to farmers through multiple channels.

	PAD Lab	PAD Building	PAD Advisory	PAD Knowledge Hub
What we do	• We design, build, operate, and learn from our own services	• We design, build, operate and evaluate mostly new high-growth services with and for others	• We perform cutting-edge data analysis, evaluate and help make existing high-potential services better	• We disseminate knowledge and tools
Why we do it	• Serves as lab, where we can experiment, identify best practices, and build credibility	• Start new services with high growth and learning potential based on PAD lab experiences	• Main avenue for impacting large number of farmers in a very cost-efficient manner	• Contribute to field by making learning and code widely available
Examples	• Krishi Tarang, Gujarat, India • Pilots in western Kenya	• Government of Odisha, India • Government of Punjab, Pakistan • DTMASS Program Africa	• One Acre Fund • IFFCO-Kisan • Government of Ethiopia	• Publications • Presentations • Tools
Scale and costs 12-18 month	• 50-100k farmers, $10-50 per farmer	• 20-300k farmers, $1-2 per farmer	• 300k-2m farmers, $0.1-0.9 per farmer	• TBD farmers, $close to 0

Our team

PAD was founded by a strong team with diverse experience that remains heavily involved in PAD's management and governance.

Michael Kremer
Development expert

Academic with experience bringing research-backed ideas to scale, expertise in African agriculture

Shawn Cole
Social enterprise expert

Academic with experience with mobile for development in India

Daniel Björkegren
Technology expert

Academic with tech background, expert in mobile phone systems and behavior in networks

Heiner Baumann
Fundraising expert

Funder with experience advising high-growth social enterprises on strategy

Our team

Madhur Jain, *ag-business background serving as country director in India*

Carolina Corral, *development economist serving as country director in Kenya*

Megan Sheahan, *agricultural economist serving as director of operations*

Ofir Reich, *data scientist and entrepreneur*

Tarun Pokiya, *lead agronomist for work in India*

…and many others.

Our work to date: *India*

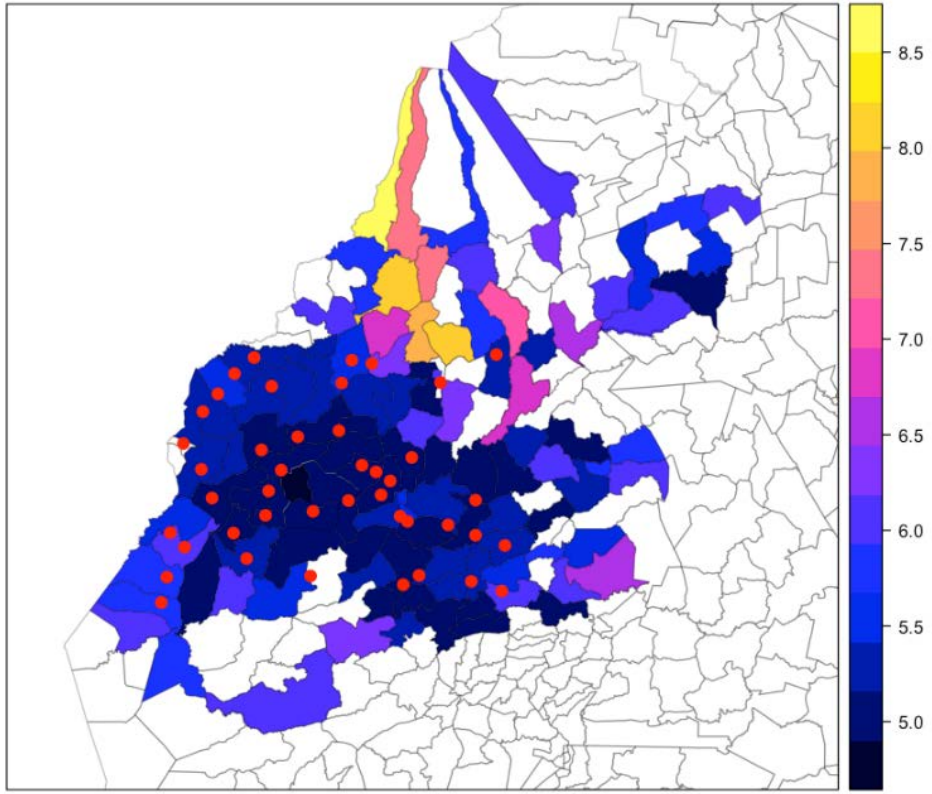
- PAD lab service in Gujarat
- New service for rice farmers in collaboration with **IRRI** and **Government of Orissa** (with 2 million farmer potential)
- Data analysis for **IFFCO-Kisan** (with 1.7 million farmer reach)
- Partners: J-PAL Awaaz.De
- Emerging opportunities:
  - Work with ag input aggregator (**Agrostar**) on potential for generating sales and leads
  - Advise **Coffee Board of India** to bring services to all coffee farmers

Push call	• ~2 minute call every Wednesday • Designed by experts based on local crop and geography
Q&A	• Farmers can call in and ask questions, answered by expert • Farmers can listen to questions asked by other farmers
Experience sharing	• Farmers can share experiences and perspectives with other farmers
Personal inbox	• History of farmers' interaction on service
Forward to friend	• Farmers can forward messages they receive to their peers
Ratings	• We rely on ratings from 1-5 to gauge quality of content and what is desired

Features of Krishi Tarang service in Gujarat.

Our work to date: *Kenya*

- PAD pilots in western Kenya with maize farmers
- Growing partnership with **One Acre Fund** to design and evaluate services with their clients (potential reach of 300,000 farmers)
- Partners:
- Emerging opportunities:
  - Work with the **Ministry of Agriculture** in Kenya and largest mobile operator (**Safaricom**) to distribute messages about recent fall army worm outbreak (potential reach of several million farmers)
  - Assist international ag research institution (**CIMMYT**) to design and evaluate effectiveness of information on locally appropriate seed varieties distributed through mobile phones



Soil pH levels by ward in Western Kenya and market locations (red dots).

Our work to date: *Rwanda*

- Partnership with **One Acre Fund** in Kenya created opportunity to help design and evaluate an SMS-based service for lime promotion among all 200,000 clients in Rwanda (full scale)
- Only half of all farmers have access to a mobile phone, so explicitly designed intervention to encourage and measure spillovers from farmers with phones to those without
- Partner: ONE ACRE FUND

Our work to date: *Pakistan*

- Partnership with **Government of Punjab** to support their provision of agricultural extension through mobile phones (5 million farmer potential)
- Planning to couple the dissemination of soil health cards with messages through phones that explain results and recommendations to farmers
- Partner: CERP Center for Economic Research in Pakistan

Other emerging opportunities

- **Ecuador:** Work with palm oil contract farming company to create and evaluate customized mobile phone ag extension system (2,000 farmer reach)
- **Uganda:** Advise on and evaluate a mobile phone ag system among coffee farmers of an NGO (60,000 farmer potential)


Thank you!
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