Precision Agriculture for Development

Scalable delivery of customized advice to smallholder farmers globally

Core Issue

High quality agricultural data is increasingly available, but farmers in developing countries lack access.

Our Solution

Provide customized agricultural advice to farmers through their mobile phones.

Voice - Text - USSD - App

Better decisions

Crop/seed selection Fertilizer application Pest and disease management

Leadership Team





Michael Kremer Development expert Professor, Harvard University

Shawn Cole Social enterprise expert Professor, Harvard Business School Adnan Khan Management and Finance

IGC, LSE

Heiner Baumann Management and Finance MBA, Harvard Business School



Daniel Björkegren *Technology expert* Professor, Brown University

PAD is a non-profit organization. Our motivation; Impact at scale

High Quality Advice

Customized Advice Provision Flow

Farmer profile information

- Location
- Socio-demographics
- Crop variety
- Water management

Agricultural data

- Soil type
- Rainfall
- Market prices
- Pest/disease outbreaks

Customized content

- Input recommendations
- Management advice

Agro-Climatic Zones by pH Value



Data Driven Decisions: Daily!

Behavioral economics + Human centered design + A/B tests + Big data and machine learning = Silicon Valley comes to ag extension

Global Expertise/Approach 750,000 farmers now, 5 million by 2020



Work cooperatively with governments, firms, NGOs to deliver impactful services at scale

PAD's Impact: Policy Integration

PAD's Introduced ICT based Pilots in India, Kenya & Rwanda:

India

Kenya & Rwanda Yield ↑ 26% cumin Yield ↑ 8-11% cotton Yield ↑ 8-12% sugarcane 10-26% ↑ in use of lime on maize

Net income ↑ \$100/farmer/year at a cost of <\$10/farmer/year.

Policy integration

Government of Gujarat (India) scaled up the IVR system set up by PAD

PAD's model is being replicated in other Indian States

In Kenya and Rwanda, PAD has set up an SMS based advisory system which has been scaled up to more than 200,000 farmers.

PAD in Pakistan : Milestones 2017



PAD in Pakistan : Milestones 2018



PAD's Impact: Soil Health Card – Redesign

					رڈ	56	نت	ن کی صح	ز مدر			,		LAHORE	
		č	<u>ٹ</u> کی تارز	ر پور.			ينبر	بر موبائل	نناختی کارڈ ^ن	<u> </u>		- 1 -		يداركا نام	زمي: پية:
يوران (B) فی کرام بلکورام)	مینگا نیز (Mn) (لی کرم بکارکرم)	آترن (Fe) (فی کرم بکوکرم)	(Cu)ئېلارىم) (لىكرىم كىلارىم)	(Zn) زنگ (لی کرم بکوکرم)	جیهم کی ضروریات (ثن ۱۰ یکٹرر6ایچ)	ریین کی بانت	ىيرشدگى(فيمد)	قابل حصول پوناش (ملی گرام دیکلوگرام)	تایل حسول فاسفورس (ملی گرام کلوگرام)	نامیاتی ماده (نیصد)	مٹیکا تعامل (پی ایچ)	برقی موصلیت (ڈ لی <i>ی تلوز ایمز</i>)	گېرانۍ (ينډي يمر)	ايكۇنىر	نموند نبر
0.2 تے کم = کزور 0.5 - 0.2	= م ح 0.5 مزور 1.0 - 0.5	= م 2.0 كزور 4.5 _ 2.0	0.1 = کم = کزور 0.2 = 0.1	= کرد کردر =1.0 - 0.5				80 ئے کم = كمزور 181 ئى	7 = کودر 7 = 15 کردر	م 20.86 کے کم = کرور = 0.86	8.5 <i>ع</i> م محوى 8.5 <i>ع</i>	4 سے کم = کلراطمی نہیں ہے 4 سے زیادہ		مد و فاصل	
=ررمیانی 1.0-0.5 زیادہ=زرخیز	=درمیانی 1.0 _زیادہ =زرفخر	=ررمیانی 4.5 _زیادہ =زرفیز	=ررمیانی 0.2 <u>- زما</u> ده =زر <u>فخز</u>	درمیانی 1.0 - مذیاده =زرخیر				=ررمیانی 180 سےزیادہ=زر فیز	=درمیانی 15 سے زیادہ = زرفیز	1.29 = درمیانی 1.29 حذایادہ =زرفیز	زياده باژه	= ڪرائھي ہے		, 0,5,7,0	
	2		-	زآفيسر	د شخط مجاز									ں ننیخ	ريمار- تاريخ

Before

The understanding of the SHC improved: Old Design <6%



PAD design: >80%

PAD Impact: Soil Data

Key Challenges

- Data for 2.5 million farmers 10 acre resolution
 - LIMS
 - Data quality
 - Data validation and validity
- Extension staff capacity constraints
- Access to farmers no two-way platform exists

PAD Solutions

- Automate workflow for extension staff
- Leverage existing/ongoing interventions such as World Bank
 SMART Project to
- Introduce analytics and data quality checks
- Customised solutions for Pakistan using IVR and SHC – boost extension staff productivity
- Training extension workers using IVR solutions will significantly enhance capacity and efficiency

IVR Flowchart

Customized advisory on your finger tips

Linked with soil analysis data

Automation of SHC distribution and monitoring

Flexible platform with scope for further customization based on famer needs



IVRS Log Frame

PAD has implemented IVRS in India and Africa; this experience can help shape a best in class system for Pakistan; working backwards from Impact is key



Customization of Information

Present



Other technology opportunities

Multiple Languages

Sensors and lasers

Satellite / drone imagery

Smartphone

Ask an Expert: How it works

Farmer asks a question





Moderator approves expert's answer and farmer gets response on his mobile phone!



Moderator receives question and directs to an expert





Expert gives his answer and sends for moderation

2

IVRS Specialities

• Every Week 1 Announcement sent to each registered users

- Customized by CROP, Type of Crop (Irrigated/Rain fed)
- Right now 2 Crops: Cotton and Groundnut
- > Additional information: Weather Alerts, Government Schemes
- All Questions Answered in 48 hrs. (question answered for any crop or any agriculture related questions)

Upcoming/Proposed Features

• Forward to Friend option for each inbound call

When farmer call-in to KT line, once they listen any Q&A, Announcement or Message; if they like they can forward any recordings to their friends.

• Ratings in each Outbound call

Whenever we send any outbound call (announcement of answer, once farmer listen that messages they can rate that particular message from 1 to 5)



Thank You!



www.precisionag.org

ANNEXURES

PAD India: Krishi Tarang Service (KT)

- Two-way communication system
- Algorithm-based content on pest, disease and fertilizer management
- Implementation missed call service, computer provides free call-backs in response to a missed call, free airtime
- Centralized web-based moderation system

Push call	 ~2 minute call every Wednesday Designed by experts based on local crop 				
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 AO				
Forward to friend	 Farmers can forward messages they receive to any of their friends. 				
Ratings	• We rely on ratings from 1-5 to gauge quality of content and what is desired.				

KT: Results

KT was built on pilot that showed increased yield gains of 8% for cotton and 32% for cumin with increase of farmer net income of \$100 per year*



Results 2016 (9 months)

- 27,000 active users
- 250,000 push calls sent
- 43,091 unique calls
- 13,520 unique callers
- 82% average pick-up rate
- 62% average listening duration

KT launched in April 2017

*See 'Mobile'izing Agricultural Advice: Technology Adoption, Diffusion and Sustainability (Cole and Fernando 2016)

Observations from Large Scale IVRS in Africa

- The portion of users completing their registration can be quite low
- An increase in the number of registered users does not always translate into system usage
- Many users drop the call during the welcome message
- <u>Users not using the menus to access the content we might expect (Menu</u> <u>navigation and Crops selection)</u>
- <u>Messages containing very complex recommendations limit users ability to absorb</u> <u>information</u>

Many users drop the call during the welcome message.

Distribution of call lengths



Users do not appear to use the menus to access the content we might expect (Menu)

Number of times each content menu was selected



Percent of times each content menu was selected



Users do not appear to use the menus to access the content we might expect (Crops)

Distribution of times each crop is accessed

Percent of times each content is accessed





Messages contain very complex recommendations.

Value chain stage	Agronomic topics key to achieving productivity		Value chain stage	Agronomic topics key to achieving productivity		
Pre-planting	Seed varieties			Insect control		
	Planting season			Disease control		
	Seeding rate		Crop protection	Weed control (1st)		
	Sowing in rows			Weed control (2nd)		
Planting	Seeding rate for transplanting			Weed control (3rd)		
	Soil depth planting		Fertilizer top dressing	N fertilizer application		
	Plant nutrition - fertilizer			Harvesting		
	application rate					
Moisture	Application of Tie-ridging		Post-harvest and	Drying in Hillas		
conservation	Insect control		Processing	Threshing and cleaning		
Crop	Disease control			Processing (storage, grading, bagging, labeling, etc.		
protection	Weed control (1st)					
	Weed control (2nd)					
	Weed control (3rd)					

The portion of users completing their registration is lower than ideal.

Cohort	Number of callers	% who completed the registration menu
2014	10,732	70%
2015	12,564	60%
2016	11,998	46%
Total	35,294	58%