Harnessing Digital Solutions to Improve Impact and Reach
WHAT I WILL COVER

- Ways digital solutions are helping solve key challenges in AG market systems
- Some rigorous evidence of impact
- What’s hardest about designing and implementing digital solutions ..... and some best practices for doing so
- A few tips on approaches to implementing digital solutions
HOW DIGITAL CAN HELP

Improve feedback
Lower transaction costs
Increase precision
Reach further
Tighten connections across system
Offer meta-data and analysis
WHERE WE ARE WITH DIGITAL

- Most USAID AG projects are already using some digital tools
  
  *(but far too few are sustainable, scalable)*

- Jury still out on most. Impact?

SO WHAT’S SO HARD?
SOME OF WHAT IS HARD

- You are experts in other things!
- Coolness factor
- Sticking to frugal development with user at center
- Don’t assume impact
- Don’t assume cost effective
- Can’t scale without being sustainable
STATE OF THE INDUSTRY

Increase in unique mobile phone subscribership in Feed the Future countries (2010-2015) - 75%

Growth in smartphone adoption in Feed the Future countries (2010-2015) - 800%

Rise in new mobile money deployments globally (2010-2015) - 400%
Which country’s mobile phone users are most likely to have smart phones?

- A PHILIPPINES
- B MYANMAR
- C AFGHANISTAN
- D INDONESIA
LOOKING CLOSER AT ANE, PICTURE VARIES LOTS

What country’s mobile phone users are most likely to have smart phones?

- **A** PHILIPPINES
- **B** MYANMAR
- **C** AFGHANISTAN
- **D** INDONESIA

<table>
<thead>
<tr>
<th>Country</th>
<th>Smartphone Adoption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myanmar</td>
<td>70%</td>
</tr>
<tr>
<td>Philippines</td>
<td>57%</td>
</tr>
<tr>
<td>Indonesia</td>
<td>51%</td>
</tr>
<tr>
<td>Nepal</td>
<td>38%</td>
</tr>
<tr>
<td>Cambodia</td>
<td>36%</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>36%</td>
</tr>
<tr>
<td>Vietnam</td>
<td>34%</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>28%</td>
</tr>
<tr>
<td>India</td>
<td>28%</td>
</tr>
<tr>
<td>Pakistan</td>
<td>25%</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>20%</td>
</tr>
</tbody>
</table>
ONE MORE QUESTION ABOUT ANE DIGITAL

Which country’s subscribers are most likely to have access to mobile Internet (broadband)?

- A PHILIPPINES
- B MYANMAR
- C CAMBODIA
- D INDONESIA
ONE MORE QUESTION ABOUT ANE DIGITAL

What country’s subscribers are most likely to have access to mobile Internet (broadband)?

- A PHILIPPINES
- B MYANMAR
- C CAMBODIA
- D INDONESIA

<table>
<thead>
<tr>
<th>Country</th>
<th>Subscribers with Mobile Internet (3G, $G)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAMBODIA</td>
<td>48%</td>
</tr>
<tr>
<td>MYANMAR</td>
<td>44%</td>
</tr>
<tr>
<td>PHILIPPINES</td>
<td>43%</td>
</tr>
<tr>
<td>VIETNAM</td>
<td>37%</td>
</tr>
<tr>
<td>INDONESIA</td>
<td>33%</td>
</tr>
<tr>
<td>PAKISTAN</td>
<td>28%</td>
</tr>
<tr>
<td>BANGLADESH</td>
<td>27%</td>
</tr>
<tr>
<td>NEPAL</td>
<td>24%</td>
</tr>
<tr>
<td>TAJIKISTAN</td>
<td>23%</td>
</tr>
<tr>
<td>AFGHANISTAN</td>
<td>23%</td>
</tr>
<tr>
<td>INDIA</td>
<td>20%</td>
</tr>
</tbody>
</table>
DIGITAL OPTIONS

- Cell phones—voice, text, data
- Radios—conventional, digital
- Digital cameras
- Videos (low-cost)
- TV
- GPS-enabled applications
- Internet access and presence
- Remote sensors – ground, sky
- Big (and small) data

PREREQUISITES

- Affordable access to telecom services
- Access to power
- Devices
- Know our target users
- Access to devices
- Language(s)
- Literacy level
- Gender!
**DIGITIZING THE AGRICULTURAL VALUE CHAIN**

**WHY**

<table>
<thead>
<tr>
<th>PLANNING</th>
<th>INPUT MARKETS</th>
<th>ON-FARM PRODUCTION</th>
<th>STORAGE</th>
<th>POST-HARVEST</th>
<th>PROCESSING</th>
<th>TRANSPORT</th>
<th>ACCESS TO MARKETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Help farmers plan what, when to plant</td>
<td>• Help extension services reach more farmers</td>
<td>• Help farmers plan what, when to plant</td>
<td>• Reduce post harvest loss with digitally-enabled harvest loans and digitally warehouse receipts</td>
<td>• Increase farmer negotiating power by providing market prices</td>
<td>• Reduce costs of transport for processors</td>
<td>• Increase ability of smallholder farmers to sell to larger markets by allowing buyers to track crops to source (certification and provenance)</td>
<td></td>
</tr>
<tr>
<td>• Tighten relationship with buyers, processors</td>
<td>• Reduce costs and risks for buyers</td>
<td>• Tighten relationship with buyers, processors</td>
<td>• Provide timely reminders/alerts</td>
<td>• Improve links between farmers, processors</td>
<td>• On demand transport</td>
<td>• Enable commodity exchanges</td>
<td></td>
</tr>
<tr>
<td>• Adapt to climate change</td>
<td>• Increase access to quality inputs</td>
<td>• Adapt to climate change</td>
<td>• Use behavior change media to promote best practices among farmers</td>
<td>• Increase choice of different types of transport for farmers</td>
<td>• Increase choice of demand transport</td>
<td>• Increase market information available to farmers so that they have more choices, can negotiate better</td>
<td></td>
</tr>
<tr>
<td>• Provide data for farmers to make business decisions on cash flow and maximizing profit</td>
<td>• Enable sellers to know demand in advance</td>
<td>• Provide data for farmers to make business decisions on cash flow and maximizing profit</td>
<td>• Use local storage more efficiently by tracking and sharing</td>
<td>• Reward farmers for meeting quality, timeliness, quantity requirements</td>
<td>• Increase access to timely information so that farmers know if and when transport is arriving</td>
<td>• Increase choice of different types of transport for farmers</td>
<td></td>
</tr>
<tr>
<td>• Provide convenient and secure ways for farmers to purchase, save, and receive credit inputs</td>
<td>• Increase precision and/or adaptability of farming interventions and crop choices through applied data</td>
<td>• Provide convenient and secure ways for farmers to purchase, save, and receive credit inputs</td>
<td>• Inform harvest practices to reduce post harvest losses.</td>
<td>• Monitor storage conditions and levels</td>
<td>• Increase access to timely information so that farmers know if and when transport is arriving</td>
<td>• Increase ability of smallholder farmers to sell to larger markets by allowing buyers to track crops to source (certification and provenance)</td>
<td></td>
</tr>
</tbody>
</table>

**USING CONNECTED DIGITAL TOOLS TO BETTER INTEGRATE THE ENTIRE MARKET SYSTEM**
# Digitizing the Agricultural Value Chain | Digital Options

## Planning
- Farm mapping
- Climate change predictive models
- Farm/farm group financial management

## Inputs
- Seeds
- Pesticides/Fertilizers
- Payments
- Rating service quality
- Soil/water testing

## On-Farm Production
- Pesticides/Fertilizers
- Weeding
- Soil/Water
- Sharing Machinery, services
- Weather info

## Post-Harvest
- Warehousing
- Pests
- Preservation

## Transport
- Crop varieties, quantities planted
- Timing of planting, harvesting
- On-demand transport/selling services

## Access to Markets
- Sales
- Payments
- Quality control
- Market prices

### Data Collection
- Mobile Surveys
- Sensors (ground, aerial, aquatic)
- Low-Orbit Satellite Imagery
- UAVs (Drones)
- Farmer Profiles
- Big Data Analytics

### Transactions
- Mobile Money Payments
- Mobile Money Storage
- Bulk Payments
- Savings Groups
- Digital credit
- E-Vouchers
- POS Devices
- Savings
- Basic credit
- Insurance premiums

### Information Exchange
- Video
- Mobile (voice, text; push pull; IVR)
- Radio/TV

### Risk Management
- Insurance
- Satellite Imagery
- Sensors
- Digital Payments
- Verification
- RFID Tags
- Bar Codes
- QR Codes
- SMS/USSD

## Extension Delivery
- Farmer Profiles to Enable Custom Info to be Delivered
- Feedback to/from farmers, other stakeholders

## Market Prices
- Payments from buyers to producers
- Savings
- Layaway

## Salaries
- Payments
- Insurance payouts
- Transport fees
- Coop fees

## Warehouse receipts
- Certifications
- Additional Inputs
- Loans

## Traceability
- Traceability
- Traceability
- Traceability

## Seeds
- Weather insurance
- Better agriculture practices
- Market Prices

## Fertilizers
- Counterfeiting

## Pesticides
- Timing of planting, harvesting
- On-demand transport/selling services

## Pesticide/Fertilizer
- Counterfeiting

## Payments
- Merchant payments
- Subsidies
- Savings and layaway plans
- Basic credit
- Leasing

## Info services
- - Vaccinations
- - Certifications
- - Salary Payments

## Warehouse
- - Payments for
- - Info services
- - - Vaccinations
- - - Certifications
- - - Salary Payments

## Certifications
- - Additional Inputs
- - Loans

## Additional Inputs
- - Warehouse receipts
- - Certifications
- - Additional Inputs
- - Loans

## Warehouse receipts
- - Payments
- - Insurance Payouts
- - Transport fees
- - Coop fees

## Payments
- - Warehouse receipts
- - Certifications
- - Additional Inputs
- - Loans
DIGITIZING THE AGRICULTURAL VALUE CHAIN | HOW

<table>
<thead>
<tr>
<th>PLANNING</th>
<th>INPUTS</th>
<th>ON-FARM PRODUCTION</th>
<th>POST-HARVEST</th>
<th>ACCESS TO MARKETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>FarmBook Business Planner</td>
<td>MyAgro</td>
<td>Farm Radio Int’l (with mobile)</td>
<td>Storage I Processing I Transport</td>
<td>Esoko market price service (Ghana, more)</td>
</tr>
<tr>
<td>mFarm</td>
<td>Yelp for Cows</td>
<td>CropManager (Philippines)</td>
<td>One Acre Fund harvest loans, East Africa</td>
<td>FreshPro, Kenya</td>
</tr>
<tr>
<td>CocoaLink</td>
<td>eVouchers Nigeria, Haiti</td>
<td>Digital Green</td>
<td>Nataal Mbay, Senegal</td>
<td>AgroInform with Central Asia Market Prices (Tajikistan)</td>
</tr>
<tr>
<td>iCow</td>
<td>E-Verification, Uganda</td>
<td>Health Network International (HNI)’s IVR service</td>
<td>Loop transport/selling service (India, Ethiopia)</td>
<td></td>
</tr>
<tr>
<td>CIAT (Colombia)</td>
<td></td>
<td>Hello Tractor (Nigeria)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHAI: Climate Change and ICT (Uganda)</td>
<td></td>
<td>Farmerline</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**APPLICATIONS**

<table>
<thead>
<tr>
<th>EVIDENCE</th>
</tr>
</thead>
</table>

CIAT used multiple sources of big data predict when to plant, what to plant. Farmers who listened avoided losing US$3,000.

CHAI reduced crop loss by 40-65% by getting timely localized weather.

In a one-year pilot of using satellite imagery to support pastoral resource management in Ethiopia, herd deaths fell by half.

_Yelp for Cows_: Crowd-sourced reviews led to 26% better service.

18,000 farmers in Mali/Senegal use mobile layaway via myAgro to save for seeds and fertilizer. They’re seeing yield increases of 50% to 100%. That translates into around $150 more income a year.

_Digital Green_: low cost video helped increase cost effectiveness, adoption of new technologies.

_FRI_ participatory radio led to 5 fold increase in adoption.

_Livestock Insurance_ meant households were 36% less likely to anticipate relying on distress sales of livestock and 25% less likely to reduce meals.

_One Acre Fund_: loan led to significant increases in farmer storage and subsequent farm profits.

_Nataal Mbay_, the farmer-owned cloud database, resulted in better prices for higher quality fertilizer, more sharing of better agricultural practices, and ultimately a 25 percent increase in maize yields.

IDEO.org prototyped _Spoilage Sensor_, a $4 temperature and-humidity sensor, which allows farmers time to act to prevent spoilage.

Loop farmers pay roughly 25% less to traders due to consolidation.

*Illustrative only, for more details see https://docs.google.com/spreadsheets/d/1g_ze_yJQUE7zUB4JeNn7JxEBdxeP8XYrP6J7Sxqyb2U/edit#gid=0

With Esoko, all farmers get 8-9% price increase (not just subscribers), increasing income by $170. with a 200% return on investment for farmers paying for the subscription service.

_RUDI_'s mobile ordering has allowed 3,000 women retailers to increase their income by up to 300%, and farmers receive prices 20-30% higher.

In Haiti, a mango exporter saved more than $1,600 per year by shifting purchases from cash to mobile.
EVIDENCE!

Sending simple SMS message reminders to do known tasks at the right time, increased yields by

A  11 %  
B  8 %  
C  6 %  
D  15 %
EVIDENCE!

Sending simple SMS message reminders to do known tasks at the right time, increased yields by

A 11%
B 8%
C 6%
D 15%

A STEP TOWARD PRECISION FARMING!
EVIDENCE!

Farmers in sub-Saharan Africa who pay for a private market price service, realize what return on their investment in better prices?

A 100 %
B 200 %
C 50 %
D 250 %
Farmers in sub-Saharan Africa who pay for a private market price service, realize what return on their investment in better prices?

A 100 %
B 200 %
C 50 %
D 250 %
FIVE TYPES OF TRANSFORMATIVE DIGITAL APPLICATIONS

• Crowd Sourcing
• Citizen Scientist
• A Quiet Application
• Mining Data
• A Digital Web Across a Market System
The Power of CROWD SOURCING: Yelp for Cows:

Where: Pakistan

Problem: Low success rates of gov’t livestock artificial insemination services

How it works: Farmers rate AI agent via simple phone application

Who Pays: An experiment to test power of crowdsourcing for government accountability

Scale: 1250 farmers

Impact: AI services improved by 26% - service providers shaped up!

How else can we leverage crowdsourcing to improve service quality?
**CITIZEN SCIENTIST:** Land PKS (Potential Knowledge System)

Where: Being tested in many countries

Problem: Farmers don’t know enough about their soil

How it works: AG agents can walk farmers through step-by-step “citizen science” learning – with hands on soil testing. Farmers learn soil structure and water holding capacity on *their plots* + data crowd sourced

Who Pays: Application is free + paper ‘app’ available

**Scale:** 1000s so far in Kenya, beyond

**Impact**

- Better use of inputs
- Understand short term use of land vs. long term sustainable uses
- Understand climatic trends for location

See: [www.landpotential.org](http://www.landpotential.org)
Big gains for farmers from sharing data: USAID/Senegal’s Naatal Mbay Activity

Where: Senegal

Problem: Large buyers and 10,000s of small farmers frustrated. Buyers needed more predictable deliveries of high quality cereals + lower transport costs or would turn to importers. Small farmers wanted better prices.

How it works: Farmers learned how supply chain and prices worked, got offer from Mill at great farm gate price if quality criteria met. With this strong incentive, farmers organized better. Tracked, collected and shared key data.

App: Spreadsheets shared via web track basic farm info including plot sizes (GPS), actual sowing dates, varieties planted, harvest schedule. Miller uses data to schedule transport, make payments.

Who Pays: Naatal Mbay paying up front; on-going: farm groups and mill will pay.

Scale: Eventually 100,000s small farmers

Impact: Small farmers get better prices. Big buyer gets quality needed, lower transport costs + eventually can move into AG services too. **Farmers learn how to use data themselves.**
Where: Colombia (CIAT + others)

Problem: Farmers’ yields falling due to climate change. They no longer know what to grow when, where and how.

How it works: Historical weather, sowing dates, yield data “mined” with advanced analytics to make recommendations on what varieties to plant, when.

Who Pays: An experiment to show power of big data

Impact: Recommendations for two regions: one for specific variety; one for change in sowing date. Farmers who heeded recommendations won!

Good news: power of advanced analytics to provide recommendations to farmers!

Bad news: Such historic data all too rare – but will be easier in future
A DIGITAL WEB ... ACROSS A MARKET SYSTEM

Farmer growing vegetables
A DIGITAL WEB ... ACROSS A MARKET SYSTEM

Farmer growing more vegetables

DIGITALLY ENABLED EXTENSION ➔ SURPLUS TO SELL
A DIGITAL WEB ... ACROSS A MARKET SYSTEM

Farmers growing surplus vegetables

TRANSPORT TO MARKET

Video

Extension Worker

DIGITALLY ENABLED EXTENSIION
A DIGITAL WEB ... ACROSS A MARKET SYSTEM

Farmers growing surplus vegetables

Video

Extension Worker

DIGITALLY ENABLED EXTENSION

PAYMENT

TRANSPORT TO MARKET
A DIGITAL WEB ... ACROSS A MARKET SYSTEM

Farmers growing surplus vegetables

PAYMENT - DIGITAL

TRANSPORT TO MARKET

Video

Extension Worker

DIGITALLY ENABLED EXTENSION

IVR
A DIGITAL WEB ... ACROSS A MARKET SYSTEM

Farmers growing surplus vegetables

FEEDBACK, SCHEDULING

SMS, IVR

PAYMENT - digital

TRANSPORT TO MARKET

DIGITALLY ENABLED EXTENSION

Video

Extension Worker

IVR
Farmers growing surplus vegetables

A DIGITAL WEB ... ACROSS A MARKET SYSTEM

Video
Extension Worker
IVR

DIGITALLY ENABLED EXTENSION

FEEDBACK, SCHEDULING
SMS, IVR
TRANSPORT TO MARKET

PAYMENT - digital

INPUT MARKETS
Farmers growing surplus vegetables

Additional Services to Farmers
Farmer Profiles
Data FROM farmers
Plant date
Variety

FEEDBACK, SCHEDULING
SMS, IVR
TRANSPORT TO MARKET

PAYMENT - digital
INPUT MARKETS

DIGITALLY ENABLED EXTENSION
GOOD PRACTICES: DIGITAL DEVELOPMENT PRINCIPLES

1. Design with the user
2. Understand the ecosystem
3. Design for scale
4. Build for sustainability
5. Be data driven
6. Use open data, open standards, open source
7. Reuse and improve
8. Address privacy and security
9. Be collaborative
GOOD PRACTICES: DIGITAL DEVELOPMENT PRINCIPLES

1. Design with the user
2. Understand the ecosystem
3. Design for scale
4. Build for sustainability
5. Be data driven
6. Use open data, open standards, open source
7. Reuse and improve
8. Address privacy and security
9. Be collaborative
IMPLEMENTING DIGITAL IN FTF PROGRAMS

• Don’t require digital
• Provide incentives for scale, impact
• Think beyond “applications” to emerging systems
• Tap private partnerships
• Leverage innovation funds – but beware of “winners”
• Build in performance metrics!
ONE LAST POP QUIZ RE: EVIDENCE!

A simple lay-away saving service in West Africa is helping farmers buy the inputs for their plots, resulting in yield increases of

A  25 to 30 %
B  40 to 50 %
C  50 to 100 %
D  125 to 150 %
A simple lay-away saving service in West Africa is helping farmers buy the inputs for their plots, resulting in yield increases of

A  25 to 30 %
B  40 to 50 %
C  50 to 100 %
D  125 to 150 %
A simple lay-away saving service in West Africa is helping farmers buy the inputs for their plots, resulting in yield increases of

A 25 to 30%  
B 40 to 50%  
C 50 to 100%  
D 125 to 150%  

WHY SUCH IMPACT?

Not just savings product
Tackles constraints across system:
• Verification of quality of inputs
• Right sizes inputs to plot size
• Delivers inputs for correct planting date
DISCUSSION

Judy Payne, Digital Solutions for Agriculture
Bureau of Food Security
US Agency for International Development
jpayne@usaid.gov