



**FEED**<sup>THE</sup>**FUTURE**

The U.S. Government's Global Hunger & Food Security Initiative

GLOBAL LEARNING AND EVIDENCE EXCHANGE  
**M A R K E T   S Y S T E M S**

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MARCH 21–24, 2017 // BANGKOK, THAILAND

**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





# FEED THE FUTURE

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## 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



75%

Increase in unique mobile phone  
subscription in Feed  
the Future countries  
(2010-2015)



800%

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



400%

Rise in new mobile  
money  
deployments  
globally (2010-  
2015)



# FEED THE FUTURE

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## LOOKING CLOSER AT ANE, PICTURE VARIES LOTS

Which country's mobile phone users are most likely to have smart phones?

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

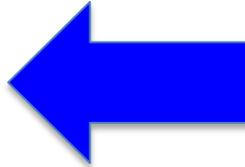




## LOOKING CLOSER AT ANE,

What country's mobile phone use is most likely to have smart phone use?

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SMART PHONE ADOPTION	
MYANMAR	70%
PHILIPPINES	57%
INDONESIA	51%
NEPAL	38%
CAMBODIA	36%
TAJIKISTAN	36%
VIETNAM	34%
BANGLADESH	28%
INDIA	28%
PAKISTAN	25%
AFGHANISTAN	20%



## 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 A

What country's subscribers are most likely to use mobile Internet (broadband)?

- **A PHILIPPINES**
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SUBSCRIBERS WITH MOBILE INTERNET (3G, 4G)	
CAMBODIA	48%
MYANMAR	44%
PHILIPPINES	43%
VIETNAM	37%
INDONESIA	33%
PAKISTAN	28%
BANGLADESH	27%
NEPAL	24%
TAJKISTAN	23%
AFGHANISTAN	23%
INDIA	20%

## 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



## PLANNING

- Help farmers plan what, when to plant
- Tighten relationship with buyers, processors
- Adapt to climate change
- Provide data for farmers to make business decisions on cash flow and maximizing profit

## INPUT MARKETS

- Reduce counterfeiters
- Reduce costs and risks for buyers
- Increase access to quality inputs
- Enable sellers to know demand in advance
- Provide convenient and secure ways for farmers to purchase, save, and receive credit inputs

## ON-FARM PRODUCTION

- Help extension services reach more farmers
- Provide timely reminders/alerts
- Use behavior change media to promote best practices among farmers
- Increase precision and/or adaptability of farming interventions and crop choices through applied data

## STORAGE

- Reduce post harvest loss with digitally-enabled harvest loans and digitally warehouse receipts
- Use local storage more efficiently by tracking and sharing
- Inform harvest practices to reduce post harvest losses.
- Monitor storage conditions and levels

## POST-HARVEST

- Increase farmer negotiating power by providing market prices
- Improve links between farmers, processors
- Reward farmers for meeting quality, timeliness, quantity requirements

## TRANSPORT

- Reduce costs of transport for processors
- On demand transport
- Increase choice of different types of transport for farmers
- Increase access to timely information so that farmers know if and when transport is arriving

## ACCESS TO MARKETS

- Increase ability of smallholder farmers to sell to larger markets by allowing buyers to track crops to source (certification and provenance)
- Enable commodity exchanges
- Increase market information available to farmers so that they have more choices, can negotiate better

← USING CONNECTED DIGITAL TOOLS TO BETTER INTEGRATE THE ENTIRE MARKET SYSTEM →

# DIGITIZING THE AGRICULTURAL VALUE CHAIN | DIGITAL OPTIONS



## PLANNING



## INPUTS



## ON-FARM PRODUCTION



## Storage



## POST-HARVEST Processing



## Transport



## ACCESS TO MARKETS

### DATA COLLECTION

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

- |  |  |  |  |  |   |   |
|--|--|--|--|--|---|---|
| <ul style="list-style-type: none"> <li>• Farm mapping</li> <li>• Climate change predictive models</li> <li>• Farm/farm group financial management</li> </ul> | <ul style="list-style-type: none"> <li>• Seeds</li> <li>• Pesticides/ Fertilizers</li> <li>• Payments</li> <li>• Rating service quality</li> <li>• Soil/water testing</li> </ul> | <ul style="list-style-type: none"> <li>• Pesticides / Fertilizers</li> <li>• Weeding</li> <li>• Soil / Water</li> <li>• Sharing Machinery, services</li> <li>• Weather info</li> </ul> | <ul style="list-style-type: none"> <li>• Warehousing</li> <li>• Pests</li> <li>• Preservation</li> </ul> | <ul style="list-style-type: none"> <li>• Crop varieties, quantities planted</li> <li>• Timing of planting, harvesting</li> </ul> | <ul style="list-style-type: none"> <li>• Preservation</li> <li>• Climate Control</li> <li>• On-demand transport/selling services</li> </ul> | <ul style="list-style-type: none"> <li>• Sales</li> <li>• Payments</li> <li>• Quality control</li> <li>• Market prices</li> </ul> |
|--|--|--|--|--|---|---|

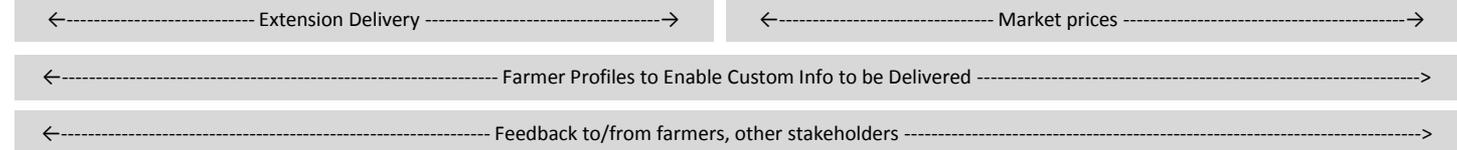
### TRANSACTIONS

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

- |   |  |  |  |   |   |   |
|---|--|--|--|---|---|---|
| <ul style="list-style-type: none"> <li>• Savings</li> <li>• Basic credit</li> <li>• Insurance premiums</li> </ul> | <ul style="list-style-type: none"> <li>• Merchant payments</li> <li>• Subsidies</li> <li>• Savings and layaway plans</li> <li>• Basic credit</li> <li>• Leasing</li> </ul> | <ul style="list-style-type: none"> <li>• Payments for</li> <li>• Info services                             <ul style="list-style-type: none"> <li>- Vaccinations</li> <li>- Certifications</li> </ul> </li> <li>• Salary Payments</li> </ul> | <ul style="list-style-type: none"> <li>• Warehouse receipts</li> <li>• Certifications</li> <li>• Additional Inputs</li> <li>• Loans</li> </ul> | <ul style="list-style-type: none"> <li>• Payments</li> <li>• Insurance Payouts</li> </ul> | <ul style="list-style-type: none"> <li>• Transport fees</li> <li>• Coop fees</li> </ul> | <ul style="list-style-type: none"> <li>• Payments from buyers to producers</li> <li>• Savings</li> <li>• Layaway</li> </ul> |
|---|--|--|--|---|---|---|

### 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

- |  |  |  |  |  |
|--|--|--|--|--|
| <ul style="list-style-type: none"> <li>• Seeds</li> <li>• Fertilizers</li> <li>• Counterfeiting</li> </ul> | <ul style="list-style-type: none"> <li>• Weather insurance</li> <li>• Better agriculture practices</li> <li>• Market Prices</li> </ul> | <ul style="list-style-type: none"> <li>• Traceability</li> </ul> | <ul style="list-style-type: none"> <li>• Traceability</li> </ul> | <ul style="list-style-type: none"> <li>• Traceability</li> </ul> |
|--|--|--|--|--|

# DIGITIZING THE AGRICULTURAL VALUE CHAIN | HOW



## PLANNING



## INPUTS



## ON-FARM PRODUCTION



## Storage



## POST-HARVEST Processing



## Transport



## ACCESS TO MARKETS

## APPLICATIONS

FarmBook Business Planner

mFarm

CocoaLink

iCow

CIAT (Colombia)

CHAI: Climate Change and ICT (Uganda)

MyAgro

Yelp for Cows

eVouchers Nigeria, Haiti

E-Verification, Uganda

Farm Radio Int'l (with mobile)

CropManager (Philippines)

Digital Green

Health Network International (HNI)'s IVR service

Hello Tractor (Nigeria)

Farmerline

One Acre Fund harvest loans, East Africa

Nataal Mbay, Senegal

Loop transport/selling service (India, Ethiopia)

Esoko market price service (Ghana, more)

FreshPro, Kenya

AgroInform with Central Asia Market Prices (Tajikistan)

←----- MOBILE MONEY PRODUCTS FOR SAVINGS, PAYMENTS, CREDIT, AND INSURANCE ----->

## EVIDENCE

**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:** Crowdsourced 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.

**Naatal 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

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!

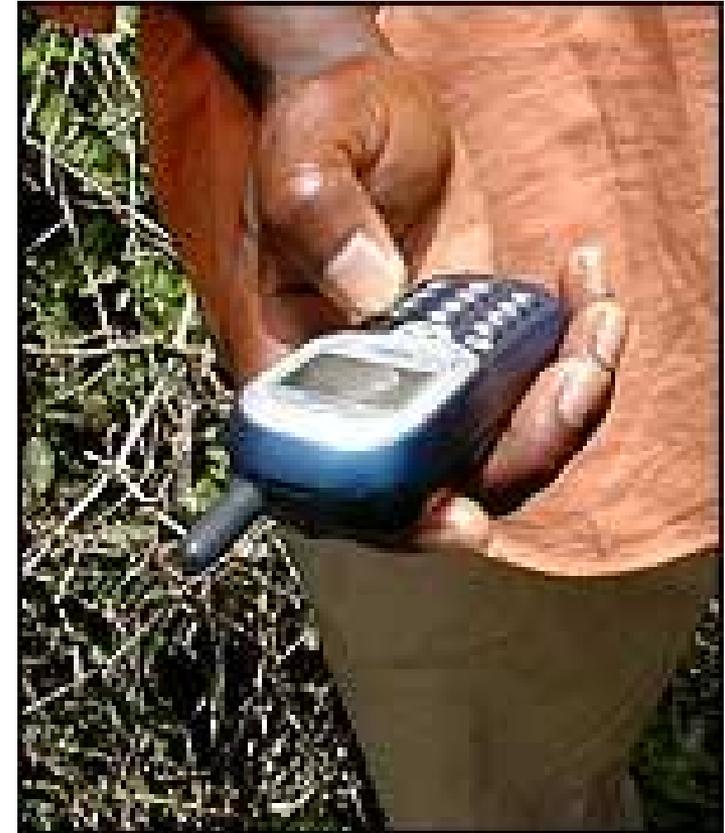
Sending simple SMS message reminders to do known tasks at the right time, increased yields by

**A 11 %**

**B 8 %**

**C 6 %**

**D 15 %**



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**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 %**





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## 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

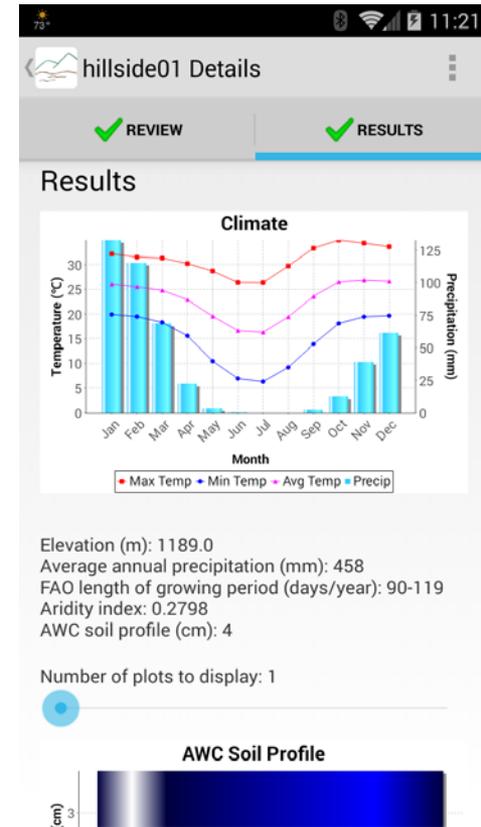
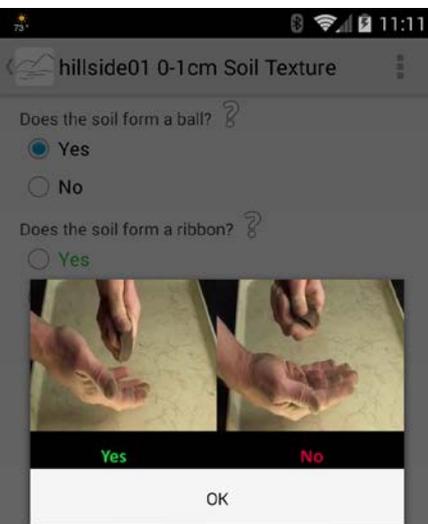
**Who Pays:** Application is free + paper 'app' available

**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)



# A QUIET APPLICATION

## 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.*



# MINING DATA .... to Adapt to Climate Change

**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!***

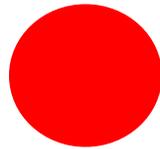
***Bad news: Such historic data all too rare – but will be easier in future***





## A DIGITAL WEB ... ACROSS A MARKET SYSTEM

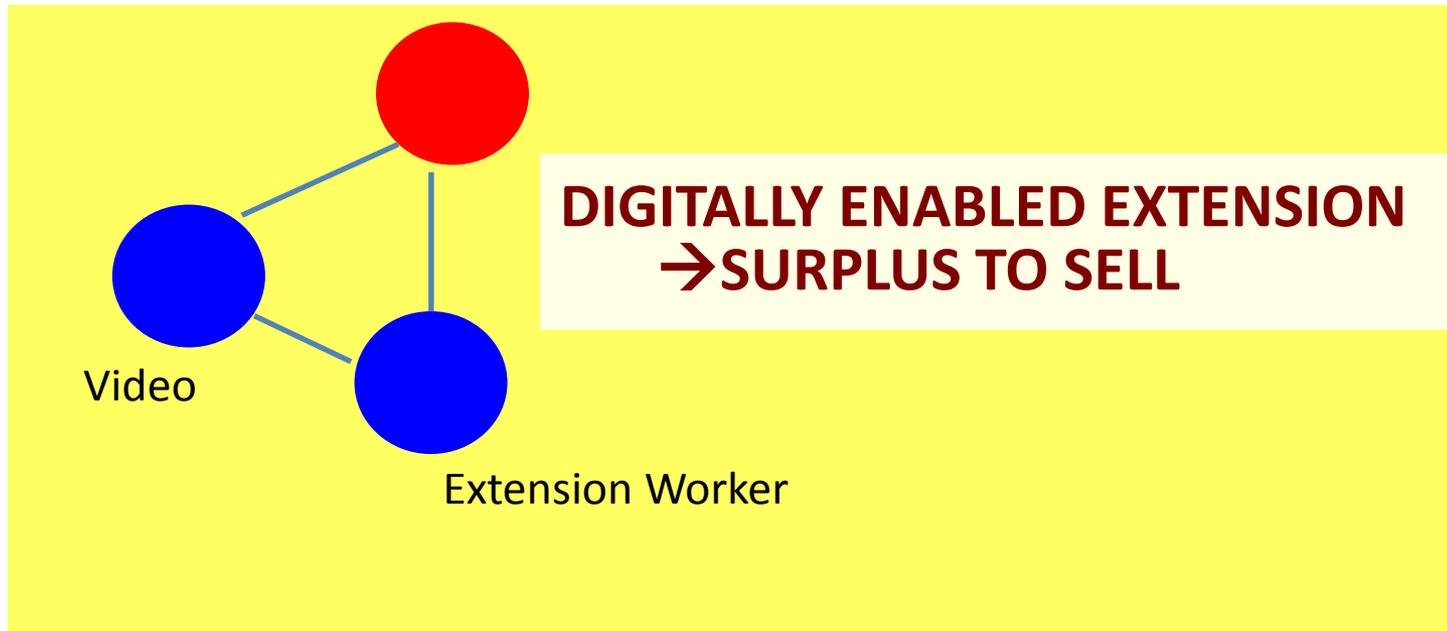
Farmer growing  
vegetables





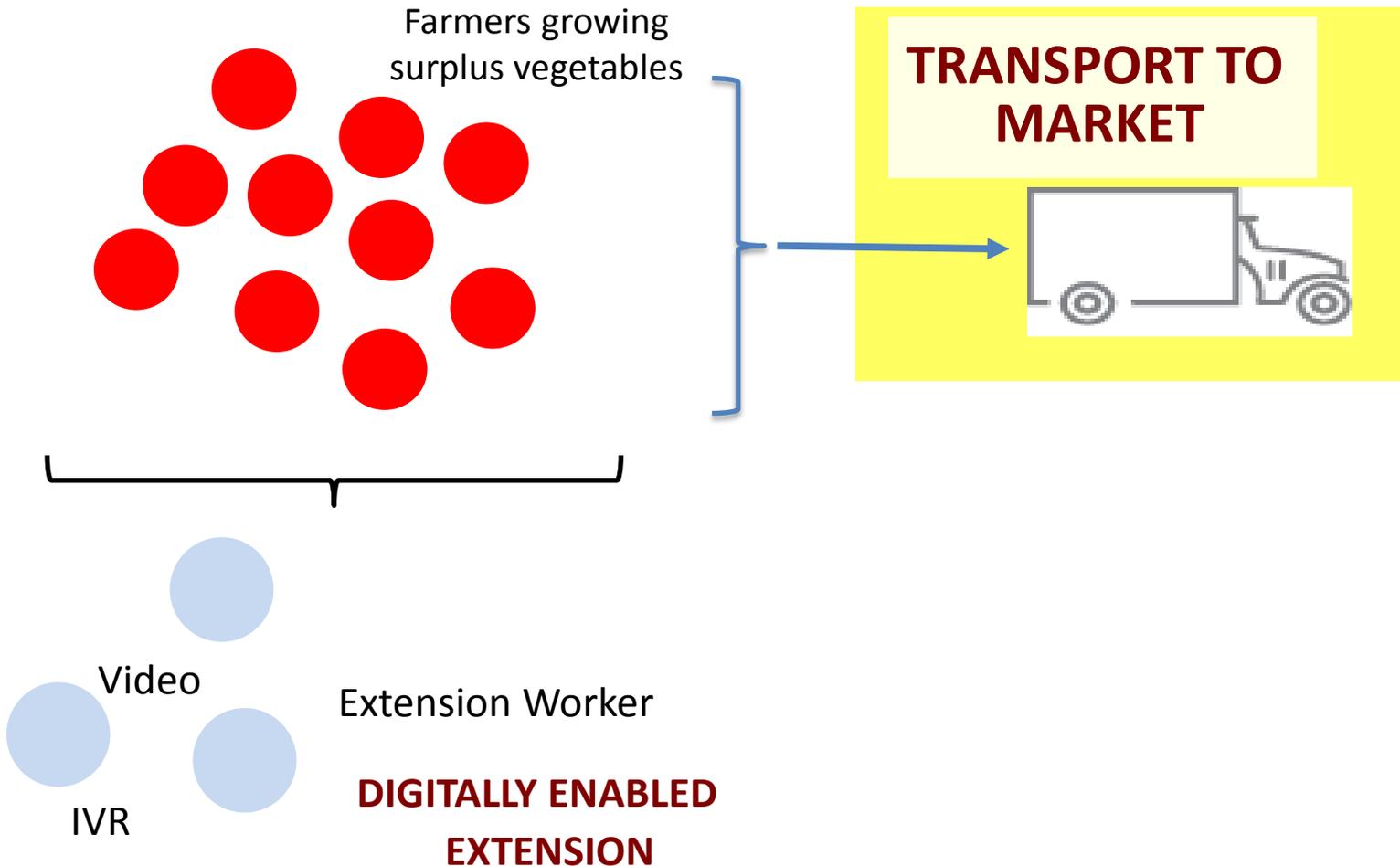
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Farmer growing more vegetables



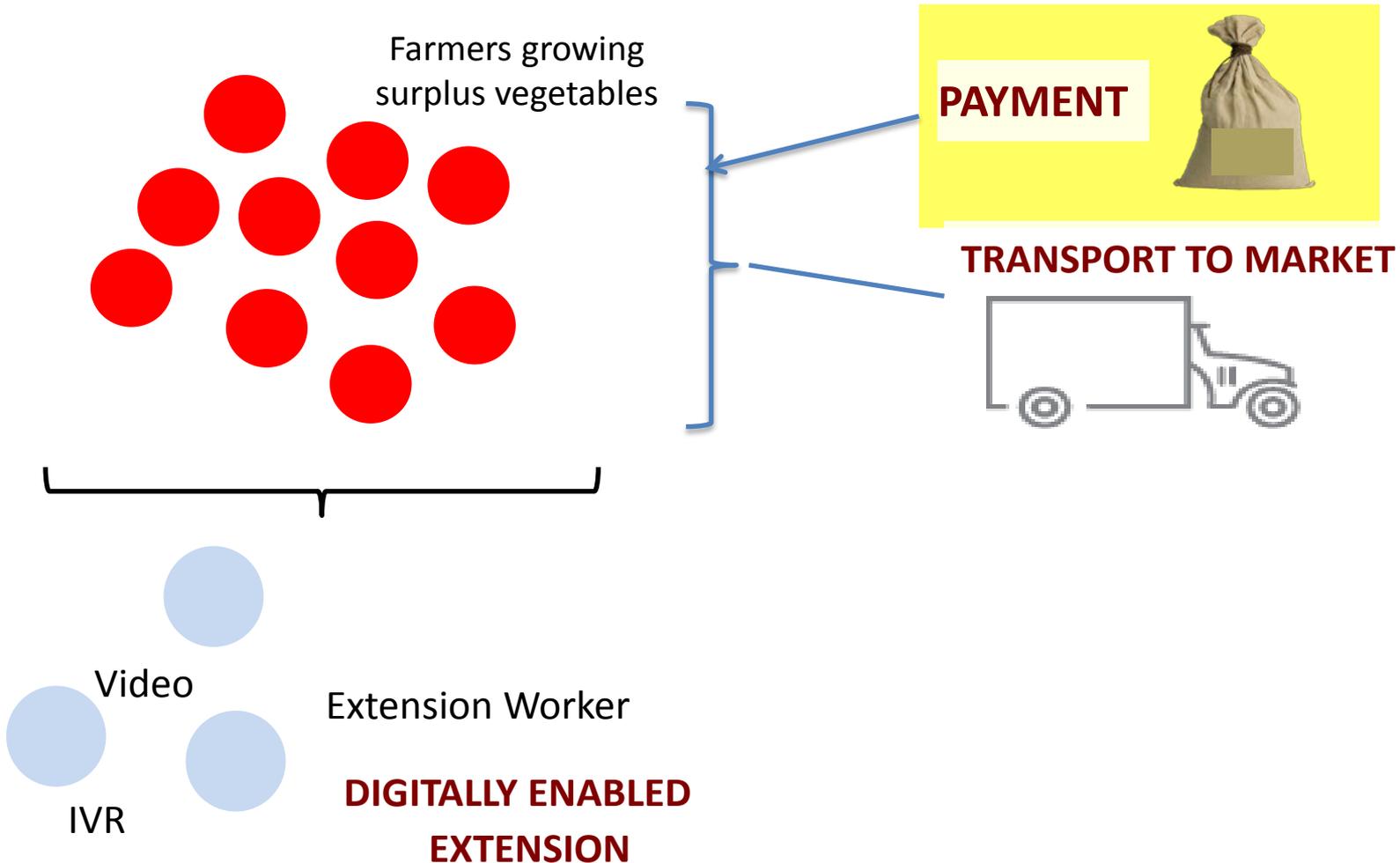


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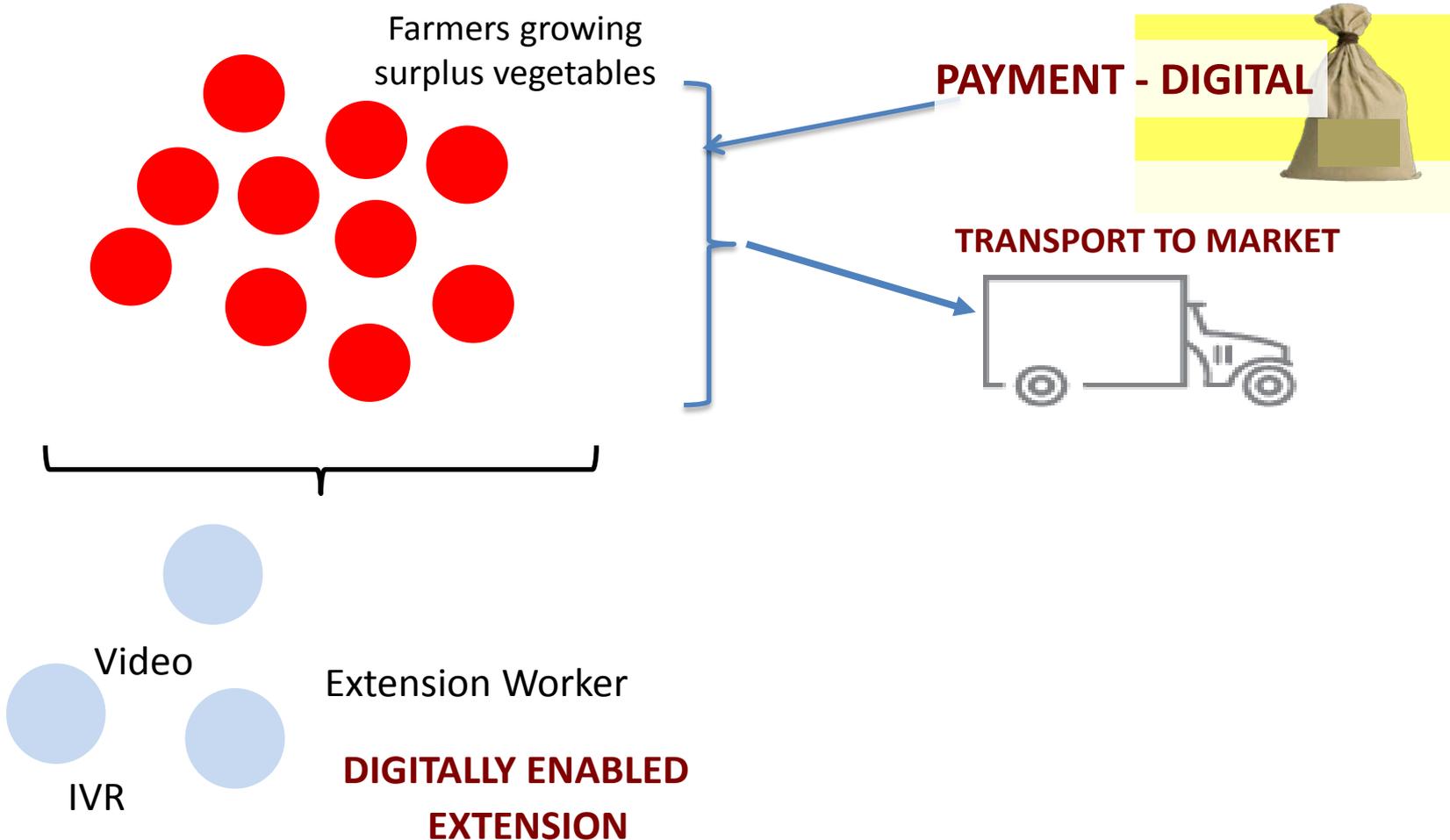


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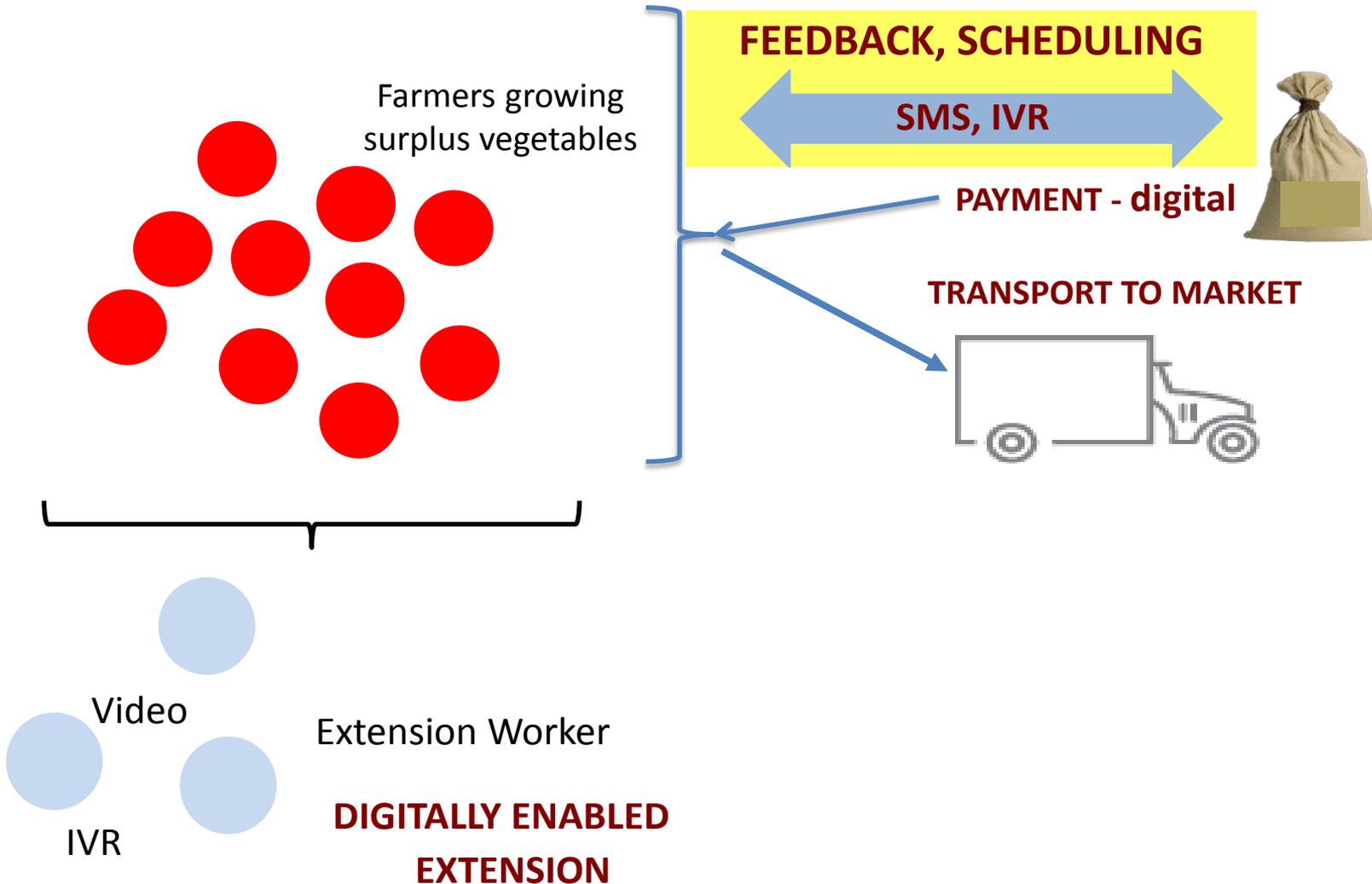


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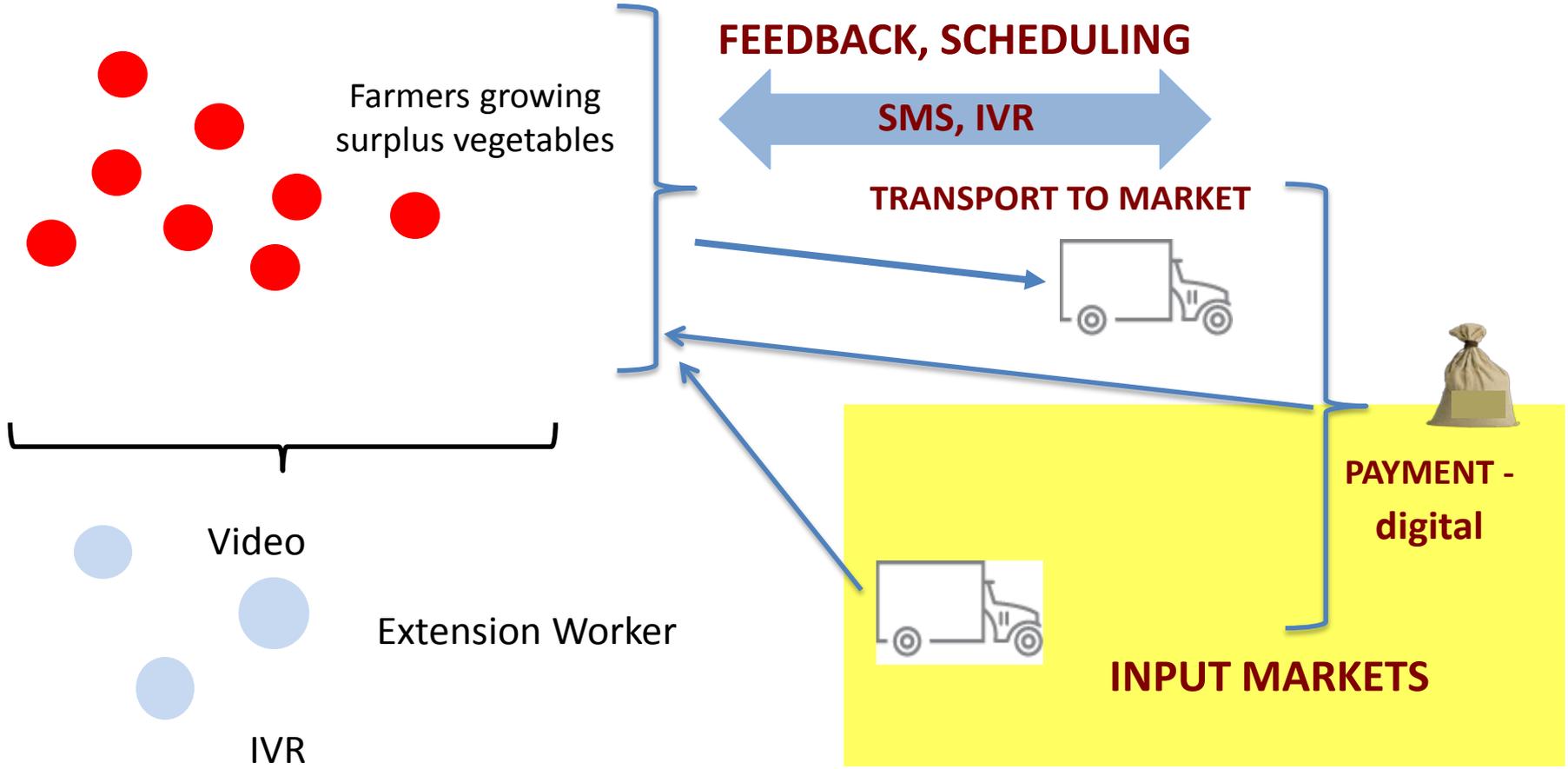




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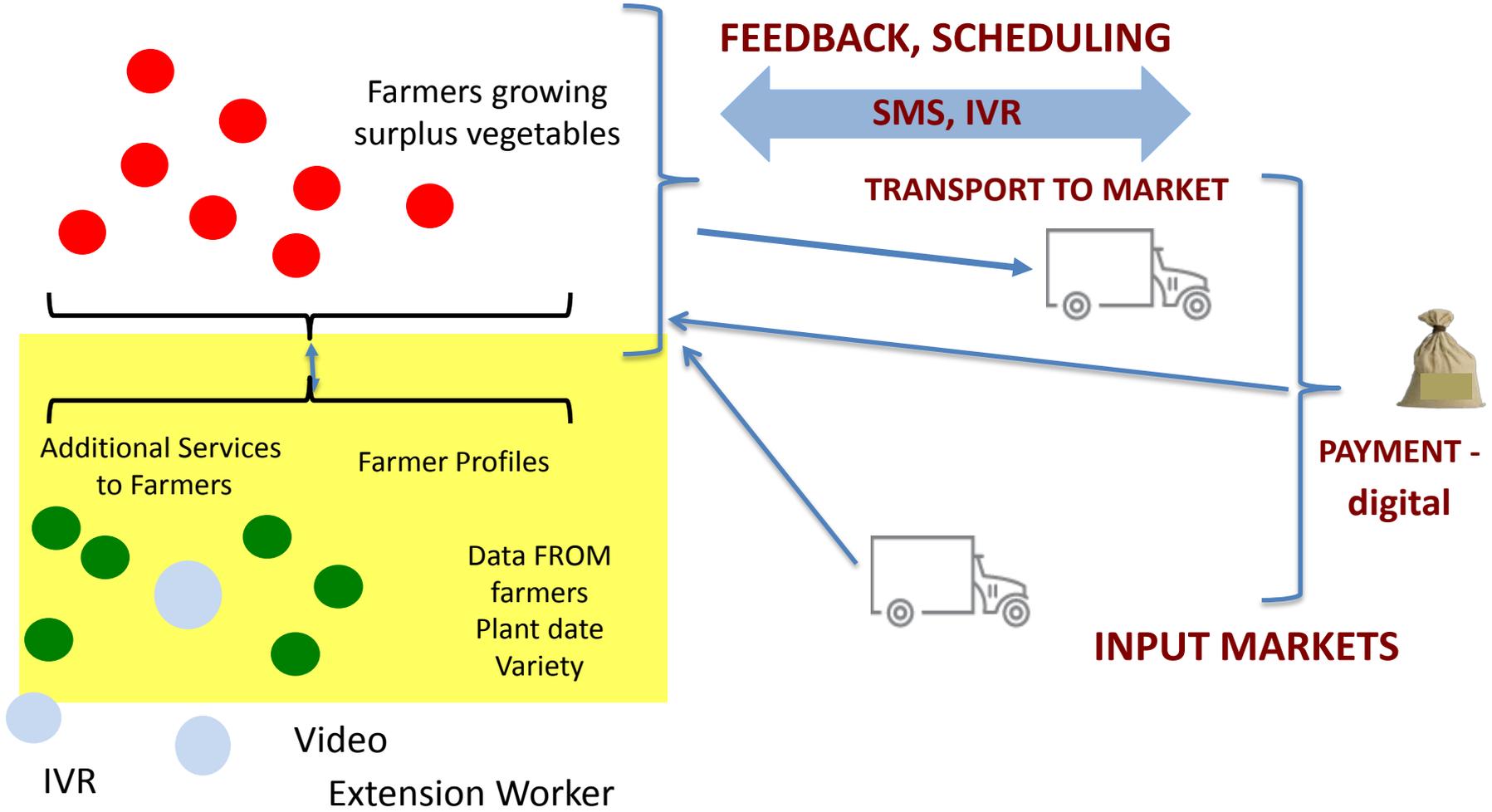


# A DIGITAL WEB ... ACROSS A MARKET SYSTEM



**DIGITALLY ENABLED EXTENSION**

# A DIGITAL WEB ... ACROSS A MARKET SYSTEM



## 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

### PRINCIPLES FOR DIGITAL DEVELOPMENT

The following set of principles represents a concerted effort by donors to capture the most important lessons learned by the development community in the implementation of technology-enabled programs. Having evolved from a previous set of implementer precepts endorsed by over 300 organizations, these principles seek to serve as a set of living guidelines that are meant to inform, but not dictate, the design of technology-enabled development programs.

- ONE: DESIGN WITH THE USER**
  - › Develop context-appropriate solutions informed by user needs.
  - › Include all user groups in planning, development, implementation, and assessment.
  - › Develop projects in an incremental and iterative manner.
  - › Design solutions that learn from and enhance existing workflows, and plan for organizational adaptation.
  - › Ensure solutions are sensitive to, and useful for, the most marginalized populations: women, children, those with disabilities, and those affected by conflict and disaster.
- TWO: UNDERSTAND THE ECOSYSTEM**
  - › Participate in networks and communities of like-minded practitioners.
  - › Align to existing technological, legal, and regulatory policies.
- THREE: DESIGN FOR SCALE**
  - › Design for scale from the start, and assess and mitigate dependencies that might limit ability to scale.
  - › Employ a "systems" approach to design, considering implications of design beyond an immediate project.
  - › Be replicable and customizable in other countries and contexts.
  - › Demonstrate impact before scaling a solution.
  - › Analyze all technology choices through the lens of national and regional scale.
  - › Factor in partnerships from the beginning, and start early negotiations.
- FOUR: BUILD FOR SUSTAINABILITY**
  - › Plan for sustainability from the start, including planning for long-term financial health, e.g., assessing total cost of ownership.
  - › Utilize and invest in local communities and developers by default, and help catalyze their growth.
  - › Engage with local governments to ensure integration into national strategy, and identify high-level government advocates.
- FIVE: BE DATA DRIVEN**
  - › Design projects so that impact can be measured at discrete milestones with a focus on outcomes rather than outputs.
  - › Evaluate innovative solutions and areas where there are gaps in data and evidence.
  - › Use real-time information to monitor and inform management decisions at all levels.
  - › When possible, leverage data as a by-product of user actions and transactions for assessments.
- SIX: USE OPEN DATA, OPEN STANDARDS, OPEN SOURCE, OPEN INNOVATION**
  - › Adopt and expand existing open standards.
  - › Open data and functionalities, and expose them in documented APIs (Application Programming Interfaces) where use by a larger community is possible.
  - › Invest in software as a public good.
  - › Develop software to be open source by default with the code made available in public repositories and supported
- SEVEN: REUSE AND IMPROVE**
  - › Use, modify, and extend existing tools, platforms, and frameworks when possible.
  - › Develop in modular ways favoring approaches that are interoperable over those that are monolithic by design.
- EIGHT: ADDRESS PRIVACY & SECURITY**
  - › Assess and mitigate risks to the security of users and their data.
  - › Consider the context and needs for privacy of personally identifiable information when designing solutions and mitigate accordingly.
  - › Ensure equity and fairness in co-creation, and protect the best interests of the end-users.
- NINE: BE COLLABORATIVE**
  - › Engage diverse expertise across disciplines and industries at all stages.
  - › Work across sector silos to create coordinated and more holistic approaches.
  - › Document work, results, processes, and best practices, and share them widely.
  - › Publish materials under a Creative Commons license by default, with strong rationale if another licensing approach is taken.



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## 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 %**





## EVIDENCE!

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## EVIDENCE!

A simple lay-away saving service in West Africa is helping farmers

**WHY SUCH IMPACT?** by helping them access inputs, resulting in yield increases of

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





# FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative

## DISCUSSION

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