Increasing Resilience Through Improved On-Farm Storage

Speakers

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Aviva Kutnick

Aviva Kutnick represents the United States Government on the AgResults Steering Committee. She currently serves as an Agricultural Development Officer in the U.S. Agency for International Development (USAID) Bureau for Food Security's Office of Market and Partnerships Innovation, which leads private sector engagement for the U.S. Government's global hunger and food security initiative, Feed the Future. A Foreign Service Officer with 10 years of experience in international private sector and agricultural development, she began her career as a Peace Corps Volunteer in Uzbekistan. Aviva holds a double Masters Degree in Economics and International Relations from Johns Hopkins School of Advanced International Studies (SAIS) and an undergraduate degree from the University of Maryland. Ms. Kutnick has worked and lived in Central Asia, the Caucuses, and the Middle East.
Parasto Hamed

Parasto Hamed is the Field Manager on the AgResults initiative with project management responsibilities for Kenya, Uganda and Zambia. She has a Masters in International Agriculture and Rural Development from Cornell University. She also graduated with a Masters in International Development from the London School of Economics and a Bachelors in International Relations from George Mason University. She previously managed USAID and Feed the Future projects in Ethiopia and Uganda, and has also worked on projects in Southern Africa, Egypt, Jordan and Iraq.
Betsy Ness-Edelstein specializes in the evaluation of agriculture, nutrition and microfinance programs. In her research of post-harvest loss challenges and solutions, she authored the Kenya country chapter of a report on high-potential intervention points for reducing post-harvest loss in African food systems for the Alliance for a Green Revolution in Africa (AGRA). For AgResults, she evaluates the Kenya and Uganda pilots. Ms. Ness-Edelstein holds an M.A. in development economics and international business from Tufts University’s Fletcher School of Law and Diplomacy.
Tulika Narayan

Tulika Narayan is an Agriculture and Development economist and co-director of the Policy Analysis Method Center at Abt Associates with over 15 years of experience conducting economic analyses to support agricultural and low-emissions development, as well as evaluations of international development interventions. She provides technical leadership to the AgResults evaluation, ensuring that all pilots are evaluated using the common theoretical framework and integrate quantitative and qualitative analysis. Narayan holds a doctorate in agriculture and natural resource economics from the University of Maryland, College Park.
Agrilinks Kenya On-farm Storage Presentation

January 2016
What is AgResults?

- **Overcome market failures** by offering results-based economic incentives ("pull" financing) to promote the uptake of new agricultural technologies and/or practices
- **Test the effectiveness and efficiency of pull mechanisms** in comparison to alternative development approaches

- **$118 million**, multi-donor initiative to Implement Pilots that Incentivize High-Impact Agricultural innovations in Three Areas

**Objectives**

**Food Security**
- Increased Yield
- Crop Loss Reduction

**Nutrition**

**Health**
- Improvements in Livestock Mgmt.

**Organization**

- The **Steering Committee** (SC) is comprised of representatives from the donor agencies and the trustee and is responsible for strategic oversight of the initiative
- The **World Bank** manages funds from the donors in its role as Trustee of the initiative
- **Deloitte** acts as the dedicated Secretariat managing the implementation of AgResults and is responsible for:
  - Each Pilot project runs with a competitively selected **Pilot Manager (PM)**, **Implementing Organizations**, and **Verifiers**
  - **Abt Associates** is the **Independent evaluator** responsible to measure AgResults’ impact
Existing AgResults Pilots

- **Nigeria Aflasafe™ Pilot**
  - Eliminating harmful toxins in maize

- **Kenya On-Farm Storage Pilot**
  - Expanding on-farm storage solutions for smallholder farmers

- **Uganda Legume Seeds Pilot**
  - Strengthening market for improved legume seed varieties

- **Zambia Biofortified Maize Pilot**
  - Tackling Vitamin A deficiency with biofortified Provitamin A maize

- **Newcastle Vaccine Pilot (on-hold)**
  - Increasing vaccination levels and creating market for vaccine delivery

- **Vietnam GHG Emissions Reduction Pilot**
  - Pioneering GHG-reducing and yield-increasing technologies

- **Brucellosis Vaccine Pilot (Global)**
  - Creating a low-cost, effective registered Brucellosis vaccine
What are ‘Pull Mechanisms’ and how do they differ from traditional aid?

“Pull” mechanisms incent market-oriented actors to invest in innovation where there are market failures and reward only those who are successful.

Contrasts with “push” mechanisms (e.g., grants), which finance solvers to accelerate R&D and lower costs before a product’s success can be determined.

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**Pull Mechanism Advantages**

- Pay only for results
- Tap top talent from out-of-discipline perspectives
- Stimulate private sector investment greater than the prize
- Shine spotlight on problem and opportunity
- Focuses participant and inspires risk taking
The Kenya On-Farm Storage Pilot uses a pull mechanism to address post-harvest losses of maize and grain by creating a market for on-farm storage solutions for SHFs

**Magnitude of Post-Harvest Losses**

- Post-harvest grain losses in Sub-Saharan Africa are estimated to be US$1.6 billion per year, which is 13.5% of the $11 billion grain market
- The Larger Grain Borer (LGB) and other pests cause substantial post-harvest losses that have a significant impact on small-holder farmer (SHF) food security. The Eastern Region of Kenya experiences particularly large losses from the LGB.
- Significant post-harvest losses caused by spoilage and pests

**Market Barriers for Storage Solutions**

- Low supply of technologically effective on-farm storage solutions suitable for Kenya
- Lack of SHF awareness of effective storage practices and their benefits
- Limited access to affordable on-farm storage solutions for SHFs
- High marketing and promotion costs associated with access to the SHF market

By offering $7.75M in prize awards to solvers that meet pilot sales thresholds, the pilot aims to:

- Increase the economic welfare of SHFs through improved access to affordable storage devices that minimize crop losses and increase SHF income and food security
- Help catalyze a sustainable market for SHF storage devices in Kenya
- Test an innovative model of engaging the private sector to serve smallholder needs, with potential future applicability to the delivery of other goods and services to SHFs
- Incentivizing the creating of new technologies and adapting existing technologies in a technologically agnostic framework

$7.75M
The Pull Mechanism incents the private sector to develop and promote storage solutions through award payments for achieving pre-determined sales thresholds.

**Pull Mechanism Structure**

The Pilot is separated regionally to meet the specific need to prevent LGB damage in the Eastern Region.

**Rift Valley Sales to Small Farmers**

**Pilot Mid-Point:** The first five Implementers to reach the 21,000 MT (Metric Ton) sales threshold of any single storage device will receive a USD $750,000 performance-based grant.

**Pilot End-point:** All Implementers that reach the 21,000 MT sales threshold of any single storage device type will share USD $1,000,000, proportionally distributed based on the capacity sold to SHFs.

**Eastern Region Sales to Small Farmers**

**Pilot End-point:** Implementers that reach the 21,000 MT sales threshold of any single storage device type that is LGB proof will share USD $3,000,000, proportionally distributed based on the capacity sold to SHFs.

**Pilot Areas of Operation**

- **Rift Valley Pilot**
- **Eastern Region Pilot**
- **Pilot Not Present**

![Map of Kenya showing participating counties](image-url)
The AgResults Kenya On-Farm Storage Pilot is testing and marketing diverse technologies

**Storage Standards**
- Easy to use and affordable for small holders farmers
- Solution eliminates pests within two to three weeks the of the grain being placed in the container
- No external infestation of pests during reasonable 4 to 6 month storage life
- No adverse effects to grain quality during storage

**Technologies Used**
- **Hermetically sealed bags**: Multi-layered, sealable bags that can store up to 90KG of maize (3 years)
- **Plastic Tanks**: Durable, affordable airtight plastic containers capable of storing more than 100KG of maize (10 years)
- **Metal Silos**: Large, sealable silos recently adapted for SHF use. Capable of storing up to 540KG of maize (20 years)
Sales began in May and are expected to conclude in July 2018. Final prizes for implementers will be awarded in 2019.

- **Sales Period Begins:** May 2015
- **LGB Testing Results:** March 2016
- **Sales Period End:** July 2018
- **Implementers’ Payout #1:** Rift Valley
  - $750,000 to first five product categories to reach 21,000MT minimum threshold
- **Implementers’ Payout #2:** Rift Valley and Eastern
  - $1M and $3M split proportionally in Rift and Eastern Regions, respectively, for those that meet the threshold
- **2015**
  - **Sales Audits Begin**
  - **Sales Audit #2**
- **2016**
  - **Demographic Survey**
  - **Sales Audit #3**
- **2017**
  - **Mid-Pilot Market Survey**
  - **Sales Audit #4**
- **2018**
  - **Sales Audit #5**
  - **Final Sales Audit**
- **2019**
  - **End-of-Pilot Market Survey**
The Kenya On-Farm Storage Pilot has developed a multi-step sales verification process to account for Implementer inability to report end-user sales

Limitations that Impact Sales Verification

- Due to diversity of distribution channels, implementers are unable to disaggregate sales to specific consumer types, in particular the AgResults smallholder farmer.
- Moreover, multi-layered distribution and sales networks makes product tracing impossible, without significant investment of time, money and other resources.
- As a result, a multi-step sales verification methodology has been developed to determine market share at the district level.

<table>
<thead>
<tr>
<th>Verification Method</th>
<th>Purpose</th>
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<tbody>
<tr>
<td>A. Implementer Total Sales Reports</td>
<td>Allows estimation of total sales by Implementers.</td>
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<tr>
<td>B. Sales Audits</td>
<td>Verifies total sales numbers reported by Implementers.</td>
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<td>C. Rural Household Livelihood Survey</td>
<td>Provides information on the number of SHFs in each community, which the Census does not report.</td>
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<tr>
<td>D. Mid-pilot Market Share Survey of Small and Medium Farmers</td>
<td>Provides market share data for each Implementer, which will be used in estimating their sales to SHFs at the mid-point of the Pilot.</td>
</tr>
<tr>
<td>E. End-of-pilot Market Share Survey of Small and Medium Farmers</td>
<td>Provides market share data for each Implementer, which will be used in calculating their sales to SHFs at the end of the Pilot.</td>
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Milestone and End-of-Pilot Prize Determinations

Use survey-determined market share of smallholder farmers per storage device to extrapolate to Implementer companies’ reported total sales for threshold enforcement and Rift Valley’s mid-pilot prize as well as end-of pilot prize allocations.
### What is the expected impact of the Kenya On-Farm Storage Pilot?

#### Expected Pilot Impact

- Reach approximately **480,000 smallholder farmers** and generate at least **172,000 MT of adjusted storage capacity** for grain in the Rift Valley and Eastern Region.
- Generate **US$14M** in smallholder benefits from the storage of grain, the sale of crops in higher-priced market periods, and the reduced need to buy grain for household consumption.
- Enable Implementers to test products and marketing strategies that can be used for distribution of storage solutions.

#### Smallholder Farmer Impact

- Improved storage capacity will allow SHF farmers to retain maize and avoid selling immediately after harvest, when prices are lowest
  - Research shows that the difference in price of selling at farm-gate and buying back from the retail market as soon as a month later is often $150-$200 MT
  - Improved storage capacity will lead to increased food security and reduce expenditure on maize during non-harvest periods
- Safely stored, non-contaminated maize will demand a premium price in the market, growing farmer incomes
- Access to on-farm storage not only reduces post-harvest losses, but incentivizes farmers to increase production
- Effective storage methods eliminates the need to dust stored grain with pesticides reducing adverse effects on farmers’ health

#### Aflatoxin Reduction

- On-farm storage technologies limit aflatoxin contamination of maize. Airtight storage technologies limit oxygen and prevents aflatoxin from building up by suppressing the development of *Aspergillus flavus*.
- Reduced aflatoxin contamination will result in higher quality maize and improved health outcomes among SHFs
External Evaluation
AgResults Kenya On-farm Storage Pilot

Betsy Ness-Edelstein
Abt Associates

January 21, 2016
Answer 7 core evaluation questions:

- What is the impact of AgResults on **private sector involvement** in the development and uptake of on-farm storage?
- What is the impact on **smallholders’ uptake** of on-farm storage?
- What is the impact on **smallholders’ incomes**?
- What is the impact on demand for derivative products? *(not relevant for Kenya pilot)*
- What evidence exists that the AgResults pilot will be **sustainable** in the medium to long term?
- What is the scale of the effect on private sector investment and uptake, and on the **cost-effectiveness** of AgResults as an approach?
- What **lessons** can be learned about the design and implementation of agricultural pull mechanisms?
AgResults external evaluation

Timing of evaluation activities

- Evaluation design: 2013
- Baseline: 2014 / 2015
- Endline: 2019
- Cost-effectiveness analysis/synthesis: 2020
- Sustainability analysis: 2020

Kenya
Economic perspective: addressing market failures

Smallholder constraints:
- Awareness
- Liquidity and access to credit

Firm constraints:
- High risk investment

- Low demand for OFS
- Missing market of OFS
- Weak institutions and policy environment

Low supply of OFS

AgResults
## Development hypotheses

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<tr>
<th>Impact on market (firms)</th>
<th>Impact on smallholders</th>
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<tr>
<td>• Invest in product development and marketing</td>
<td>• Gain awareness of post-harvest loss issues and on-farm storage technologies</td>
</tr>
<tr>
<td>• Create/strengthen distribution networks</td>
<td>• Purchase on-farm storage technologies (especially better-off smallholders)</td>
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</table>
| • Continue to market and sell OFS technologies after the pilot concludes | • Experience reduced food insecurity  
  o Fewer/shorter lean periods  
  o Maintained food stocks  
| | • Ingest fewer pesticides |
| | • No short term change in maize sales pattern  
  o Timing of maize sale  
  o Prices received  
  o Production |
Evaluation design: market impact

Structure, conduct, performance framework

- **Situation**
  - Regulatory conditions
  - Underlying supply & demand
  - Firm perceptions of the market

- **Strategy**
  - Procurement, distribution, merchandising
  - Organization of transactions
  - Relationships with other firms

- **Structure**
  - OFS movement through value chain
  - Number and types of market actors
  - Volume and share transacted by different actors
  - Predominant production and marketing modalities

- **Performance**
  - Product cost, quality, and accessibility of OFS
  - Extent to which market resolves underlying problem targeted by AgResults
Evaluation design: smallholder impact

Short interrupted time series

Outcomes of interest (awareness, adoption, food security)

- Pre-intervention
- Pilot start
- Treatment effect
- Post-intervention

Years:
- 2011
- 2013
- 2015
- 2017
- 2019
- 2021
Baseline findings

Market Impact

- Strong expected willingness to engage in market
- Current and anticipated firm strategy: distribute through farmers’ organizations & commercial distributors
- Focus on established/high-potential markets
- Possible preference for Rift Valley over Eastern
- Private sector may not reach most disadvantaged buyers, including women
## Baseline findings

<table>
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<td>- Uptake and awareness are low, even among products already on market</td>
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<tr>
<td>- Slight upward trend over time in both regions for all on-farm storage combined (PICS, GrainPro, Metal Silos, etc)</td>
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From intervention to impact

What we’ll be looking for at endline

- Will private sector successfully address smallholder awareness and financing constraints?
- Will smallholders use new technologies properly and effectively?
- Can the pilot reach disadvantaged groups?
- Smallholders are consumption-oriented; sales are motivated by cash needs and trader timing. Will there be an impact on maize sale timing? On maize revenue?
## Early lesson learning

### Understand key market failure(s)
- Anticipate market failures the pull may not address
- In Kenya, private sector interested but daunted by upfront investment

### Target private sector firms able to address constraints
- Access to financing
- Ability to market and distribute new technologies
- Ability to address smallholder constraints (awareness, financing)

### Development impact vs. market impact
- May be hard to reach poorest beneficiaries given competing interest in developing a sustainable market for new technologies
- Recognize trade-offs between development impact and market impact

### Design right incentive
- Adequate to attract private sector participation
- Cost-effective
- Directly linked to desired impact

### To push or not to push?
- Natural tendency to add push elements. But is it needed?
- Pilot manager performance should be judged by successful pilot management, not sales or impact
Thank you!
Top Take-aways

1. There may be a need for both pull and push mechanisms to reach the poorest beneficiaries. When promoting new technologies, there may be trade-offs between development impact and market impact. Projects need to find the balance that helps meet stated objectives.

2. The process of verifying sales and impact in a complex market system is challenging. Verification may require a multi-step process that culminates in a determination of the outcome.

3. Effective pull mechanisms rely on creating the appropriate incentives to attract private sector participation while remaining cost-effective and directly creating the desired impact.
Questions and Answers
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