Assessing the impacts of postharvest storage technology on household food security: Experimental evidence from Uganda

Oluwatoba J. Omotilewa*
Purdue University
Department of Agricultural Economics
oomotile@purdue.edu

Jacob Ricker-Gilbert
Purdue University
Department of Agricultural Economics
jrickerg@purdue.edu

Herbert Ainembabazi
International Institute of Tropical Agriculture (IITA), Kampala, Uganda
Alliance for a Green Revolution in Africa (AGRA), Nairobi, Kenya
ainembabazi@gmail.com

Gerald Shively
Purdue University
Department of Agricultural Economics
shivelyg@purdue.edu

*Corresponding author

Selected Poster prepared for presentation at the 2017 Agricultural & Applied Economics Association Annual Meeting, Chicago, Illinois, July 30-August 1

Copyright 2017 by Oluwatoba Omotilewa, Jacob Ricker-Gilbert, Gerald Shively, and Herbert Ainembabazi. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided this copyright notice appears on all such copies.
Assessing the impacts of postharvest storage technology on household food security: Experimental evidence from Uganda

Oluwotabo J. Omotilewa, Jacob Ricker-Gilbert, Herbert Ainembabazi, Gerald Shively

1PhD Candidate, 2Associate Professor, 3Professor; Purdue University, USA
3Economist, Alliance for a Green Revolution in Africa (AGRA), Nairobi, Kenya.

Introduction

Many poverty alleviation and development programs implemented in sub-Saharan Africa (SSA) focus on increasing agricultural production and smallholder productivity, frequently by encouraging smallholder farmers to increase their use of improved seed varieties and chemical fertiliser (Everson & Gollin, 2003). Often, however, these programs ignore what happens to output in the post-harvest season. Because the softer kernel high-yielding hybrid maize varieties commonly promoted in the region offer less natural protection to storage insect attacks relative to the lower-yielding traditional varieties, smallholder farmers and households face a rational decision between high-yielding maize varieties that can store carry storage risk and the lower-yielding traditional maize varieties that are less valuable to storage (Ricker-Richter & Jones, 2015; Sheahan & Barrett, 2017).

Data and Sampling

We use a multi-level stratified sampling approach.

Objective and Contribution

This study has two broad objectives:

• To test whether there is a causal relationship between access to improved postharvest storage technology and improved inputs (maize seed and fertilizer) use.

• Explore some potential causal pathways (storage decisions and postharvest losses reduction) through which access to improved storage technology may influence adoption of improved maize varieties provided there is a linkage from the first objective.

We make three contributions to literature:

• We fill a policy research gap for SSA by estimating causal relationship between improved storage technology and improved input adoption and intensity.

• We use randomized controlled trial (RCT) to make causal inference. This is the first study to do so in a developing country context. RCT gives internal validity to our causal effects.

• We use a large sample (nearly 1,200 smallholders) experimental panel data with broad geographic scope given that a subsample of being nationally representative of maize-producing households in Uganda. This confirms external validity on our study and results should be generalizable to similar populations elsewhere.

Maize Production & Postharvest Storage

Maize yield is, on average, estimated at 1.5 MT/ha. It remains low due to low uptake of improved varieties and inorganic fertilizer use. Moreover, lack of access to improved storage technology may prevent households from investing in high-yielding varieties due to storage risk (Dorcon & Christiaensen, 2011).

Distribution of storage technologies by smallholders at baseline

<table>
<thead>
<tr>
<th>Storage Technologies</th>
<th>Season 1, 2014 (%)</th>
<th>Season 2, 2013 (%)</th>
<th>Sample Average (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woven polypropylene bag</td>
<td>7.2</td>
<td>7.5</td>
<td>7.9</td>
</tr>
<tr>
<td>Heaped in house</td>
<td>10.7</td>
<td>10.7</td>
<td>10.7</td>
</tr>
<tr>
<td>Granaries</td>
<td>7.7</td>
<td>8.1</td>
<td>7.9</td>
</tr>
<tr>
<td>Private off farm store</td>
<td>1.8</td>
<td>1.9</td>
<td>1.8</td>
</tr>
<tr>
<td>Open-air hanging</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Hermetic (drum/sole/jerry can)</td>
<td>0.8</td>
<td>0.6</td>
<td>0.7</td>
</tr>
<tr>
<td>Metal jerry can</td>
<td>0.3</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Hermetic bags</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Others</td>
<td>6.8</td>
<td>6.8</td>
<td>6.8</td>
</tr>
</tbody>
</table>

Potential Causal Pathways:

We used a randomized controlled trial to investigate the impacts of improved technology on smallholder households’ decisions to adopt high-yielding maize varieties. Our results indicate that:

Causal linkage exist between postharvest technology and improved (high-yielding) maize varieties adoption.

Access to hermetic storage bags:

- Increased the adoption and intensity of improved maize varieties by 10 percentage points.
- Increased duration of stored maize for consumption by 20 percent.
- Reduced total storage loss by 67 to 90 percent.

We recommend that development agencies, researchers, and policy makers promoting improved seeds in SSA should consider postharvest storage as a complementary intervention.

Conclusions and Policy Implications

References


Acknowledgments

The authors gratefully acknowledge funding from the Bill and Melinda Gates Foundation under the Purdue Improved Crop Storage (PICS) project. We also acknowledge supplementary funding for post-intervention survey from the Borlaug LEAP program funded by USAID. The opinions expressed herein or remaining errors are solely the responsibility of the authors.