Reducing Post Harvest Losses with training and low cost technology: A RCT with small scale farmers

Martin Chegere, Håkan Eggert and Måns Söderbom

Corresponding author’s email: chegeremartin@gmail.com

November 8, 2017
Research Question and Method

- **Research question:**
  - Are training and the use of hermetic bags technology for maize storage by smallholder farmers economically effective?

- **How do we answer:**
  - Random assignment of 21 villages to two treatments and the control group
  - Measure the economic impact of interventions on post-harvest physical loss reduction, physical qualities and market price
  - Conduct a cost-benefit analysis for the interventions

- **Findings:**
  - Both have significant effect in reducing storage losses
  - “Training and hermetic bags”: improved quality, market price and cut down storage protection cost
  - Both are economically feasible
Introduction...

- Increasing concerns on food situation in SSA
  - Rapid population growth
  -Persistently low agricultural productivity
  - Food price volatility

- Solution:
  - Expanding and intensifying food production

- Limitations:
  - Limited land and water sources
  - Increased weather variability
  - Difficulty in adapting to climate change
  - Post Harvest Losses
Introduction...

- Post Harvest Losses (PHL): Loss in food grain between harvest-the moment of human consumption.
- PHL of grain in SSA: 10-20%; equivalent. $ 4 bil. annually (World bank 2011).
- Reduction of PHL can complement efforts to address food security challenges
- 50% of $ 940 bil. to eradicate hunger in SSA by 2050 be directed to PHL reduction (FAO-World Bank, 2012)
Motivation...

- Traditional storage cannot guarantee protection of stored products
  - Introduction of the Large Grain Borer in the 1980s
  - Changes in normal weather patterns: moisture content; survival of fungi and weevils

- Consequences:
  - High Post harvest Loses of cereals
    - Undermined food security
  - Sell output immediately after harvest to avoid losses
    - Low market prices for the grain produced
    - Seasonal food shortages
    - Fail to use the harvest as collateral to access credit
    - Susceptible to high food price risks (Saha and Straud 1994)
Previous Interventions

- The Government efforts: construction of community warehouses
  - Available warehouses 1,260 vs actual demand 11,000
  - Many of the warehouses are not accessible:
    - Poor condition
    - Mis-use

- Use of metal silos
  - hermetic technology: introduced to farmers in Africa last decade
    - Effective in controlling maize weevils and the LGB without any pesticide (De Groote et al., 2013; Tefera et al., 2011).
  - BUT
    - High start-up cost
    - Permanently occupy the space whether they are used or not
    - Cannot be easily saved in the bedroom to ensure safety

- Alternative: Low cost hermetic bags technology
Experimental Design

- **Sample:** Two-step random sampling
  - 21 villages
    - Maize is the main crop produced by the villagers
    - Maize is the main staple food in the village
  - 20 households from each village: 420 maize producing households

- Randomization done at village level: two treatments, one control

- **Two treatment groups:**
  - “Training and hermetic bags” treatment: Trained on post harvest management practices and received hermetic (airtight) bags. 6 villages (120 subjects)
  - “Training only” treatment: Trained on post harvest management practices but were not given hermetic bags. 6 villages

- The control group continued with the business as usual. 9 villages
Implementation

- Baseline survey June-July 2015
- Intervention was done in July 2015
- Content of training covered:
  - Time to harvest;
  - Requirements during the Harvesting Process;
  - Processes after Harvesting: Sorting; Drying; Shelling;
  - Storage and storage structures
- The training sessions lasted for about 90-120 mins.
- “Training and hermetic bags”: provided with hermetic bags and trained on using them.
Previous Studies

- On-station trials (De Groote et al, 2013; Baoua et al, 2014; Ng’ang’a et al., 2016).
  - Effective in controlling infestation, grain damage and weight loss.
  - Economically beneficial if they last for at least three years
- On-farm trial (Ndegwa et al., 2016)
  - Grain damage: 14% in the control; 4% in the treatment;
  - Weight loss: 1.7% among control farmers; 0.4% in the treated group. 
  - Economic if: the bags is used for at least four months per season, the bags last for at least four seasons
- We provide training to farmers before giving bags.
- Consider a longer period; use self-reported estimates
- Consider Benefits beyond PHL reduction and the additional costs
Results

- Both interventions have significant effect in reducing storage losses.
Qualitative impacts

- **Size and Shape**
  - Control
  - Treatment

- **Taste**
  - Control
  - Treatment

- **Aroma**
  - Control
  - Treatment

- **Colour**
  - Control
  - Treatment
Results...

- Training: IRR=14%
- Training + Bags: IRR=35%
Conclusions

- Reduction of Post Harvest Losses can complement efforts to reduce food security
- Economically feasible for small-holder farmers to adopt PHL mitigation technologies
- The introduction of airtight bags should be accompanied with training on post-harvest management.
  - Training of farmers has likely no negative side-effects
  - Subsidized large scale distribution of hermetic bags may have unintended effects.
THANK YOU