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# Stepping up Indigenous Knowledge and Technologies for Higher Women Incomes in Rural Tanzania:

## A Case of Food Processing and Storage


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# Outline of presentation

- Background
  - Introduction: Importance of IK & technologies
  - Statement of the problem
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- Literature Review
  - Economics of food processing and storage in Africa
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- Methodology of the study
- Results and discussion of findings
- Conclusion and policy implications

# 1. Background

## 1.1 Introduction

- IK and technologies affect human livelihood in various aspects/ways e.g. human health, agriculture, management of environment and natural resources, etc.
- Widely used in agriculture
  - ✓ timing of land preparation and planting or sowing
  - ✓ selection of planting materials and seeds
  - ✓ management of pests and diseases
  - ✓ managing the environment for sustainable crop cultivation
  - ✓ coping strategies to climate change
  - ✓ food processing and storage
- IK in food processing and storage is particularly useful for poor rural women whose livelihood is based on agriculture (Nwokeabia, 2006).

# Introduction (Cont'd)

- Storage success is based on the presence of safe and secure storage facilities at household level

**Table 1: Losses related to storage conditions in Tanzania (in percent of total maize losses)**

| Type of Loss | Type of farm scale | |
|---|---|---|
| | Small | Large |
| Lack of storage | 13 | 13 |
| Pest infestation | 40 | 50 |
| Poor quality of storage facilities | 23 | 25 |

**Source**: World Bank, 2009

# Introduction (Cont'd)

- The statistics above indicate the need for farmers to be provided with improved storage facilities

- According to Proctor (1994) traditionally established food storage facilities suit well this purpose.

# Introduction (Cont'd)

- The household food storage is normally accompanied with food processing
  - ✓Primary food processing
  - ✓Secondary food processing

- Rural women are also endowed with indigenous knowledge of storing food for value protection
- Storage additives:
  - ✓local herbs e.g. leaves, roots, bark and husks of particular plant species; chilli pepper, tobacco
  - ✓traditional inputs e.g. kitchen/wood ash; anthill soils, sand, goat/cattle dung ash

# 1.3. Statement of the problem

- Food processing and storage activities done by women in rural areas constitute a crucial IK that is transmitted from one generation to another. For a long time, such IK has been underutilized in many societies.

- Identifying and examining ways to scale up food processing & storage skills & technologies for better performance could motivate innovation, more production and increased food availability

- To this end, upgrading these to have adequate food processing and storage facilities in place enhances farmers' confidence in increasing agricultural production and improved earnings

# 1.4. Objectives of the study

## General Objective

- To uncover various IKs and technologies that are used by women for food processing and storage in rural areas focusing on ways to improve them for higher income and food security

## Specific Objectives

i. To understand indigenous knowledge applied in food processing and storage in rural areas

ii. To determine effect of indigenous food processing and storage technologies on the size of cultivated land and hence increased farm production and food security

iii. To analyse ways to improve indigenous food processing and storage knowledge and technologies for sustainable storage and flexibility in marketing of food crops

# 2. Literature Review

Qn: Why despite the presence of modern food processing & storage technologies small scale farmers still experience high food losses?

## 2.1. Economics of food processing and storage in Africa

- food crisis (mid-1970s) → PHL reduction
- approach used: technology transfer
- attained less efficacy, as the approach was not participatory (Pidatala and Khan, 2003).
- Farmers willingness to invest in a technology: expected benefits > costs → cost effectiveness matters
- Low adoption rates: high cost of capital that does not outweigh the value reduction from losses (Proctor, 1994; Kadjo et al., 2013).
- Misconception: high post harvest food loss is a justification for implementing a new technology

# Literature Review (Cont'd)

## 2.2. Food processing and storage interventions in Africa

- Ineffective Project Cases in Africa
  - ✓ the village Go-down project (1989) in Kilosa (Makalle, 2012)
  - ✓ concrete filled PVC pipes to raise mud granaries in Zimbabwe (World Bank et al., 2011)
  - ✓ metal silos project in Malawi, Uganda (Kapchorwa), Mozambique and Tanzania (World Bank et al., 2011)
  - ✓ manually driven maize shellers by FAO project in Tanzania (FAO 1997)
  - ✓ large scale gari processing machinery in Nigeria
  - ✓ program failures:
    - -Prevention of Food Losses Program initiated by FAO (1977)
    - -Global Post Harvest Forum (PhAction)

## Literature Review (Cont'd)

- Success stories of improved adaptation
  - ✓ granary made of burnt bricks with thatch roofing in Zimbabwe(World Bank et al., 2011)
  - ✓ sealed mud silos in some Northern districts of Ghana
  - ✓ hermetic plastic drums in Namibia, modified from '*mopane*' (World Bank et al., 2011)
  - ✓ ram press in Tanzania, 1986 (Hyman, 2005)
  - ✓ hammer mills and investments in dehulling equipment for processing sorghum flour in Botswana
  - ✓ small scale gari processing mechanization in Nigeria
  - ✓ small scale rice dryers and threshers in various parts of Africa

# Literature Review (Cont'd)

- The upshot of the reviewed literatures indicate that for successful adoption of storage technologies careful evaluation has to be made in terms of technical, economic, social and cultural aspects

- Understanding and utilization of indigenous knowledge, i.e. finding the best ways based on local innovation for farmers to manage their produce during post-harvest period (particularly processing & storage) will facilitate the attainment of not only income but also food security objectives, thus fostering industrialization on the other hand

# 3. Methodology and data

- Data type and sources
  - ✓Primary
  - ✓Secondary

- Survey Population
  - ✓ Dodoma (36)
  - ✓ Iringa (26)
  - ✓ Mbeya (41)

- Sampling procedure

# Methodology and data (Cont'd)

## ➢ Econometric Estimation

- Most of the literature use qualitative approach to studying IKs

- According to Grenier (1998), qualitative approach is mostly suited to studies pertaining to human behavior (action) which tends to be subjective and highly variable

- Both qualitative and quantitative approaches have been used in this study

## Methodology and data (Cont'd)

- Qualitative approach: aims to describe various rural food processing and storage technologies
- Quantitative approach: estimation of employment model
- Model specification is as follows:

$$logfarmsize_i = \beta_0 + \beta_{11} age_i + \beta_{12} accland_i + \beta_{13} mrtstatus_i + \beta_{14} edn_i + \beta_{15} nchild_i + \beta_{16} disstrgchoice_i + \mu_i$$

where $\beta_0, \beta_{11}, \ldots, \beta_{16}$ are coefficients, μ is an error term and;

logfarmsize =logarithm of size of farm
age =age
accland =access to land
mrtstatus =marital status
edn =education
nchild =number of children
disstrgchoice =dissatisfaction with storage choice

# 4. Results and discussion of findings

## *4.1. Descriptive statistics*

➢ Respondents Profile

- Age distribution
  - ✓average age = 42 yrs

**Table 5: Distribution of sample size according to age**

| **Age** | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70+ | **Total** |
|---|---|---|---|---|---|---|---|
| **Sample** | 19 | 28 | 30 | 13 | 7 | 6 | **103** |

Source: Survey Data

- Marital Status
  - ✓In marriage: 66%
  - ✓37% of married →hhd's
  - ✓In total, 57% were headed by women

# 4. Results and discussion of findings (Cont'd)

- ✓ Increased responsibility of rural women on household matters is also reflected by the role they play in making decisions pertaining to various aspects of farming

**Table 6: Decision making on various aspects of farming (%)**

| | Husband/ Male | Wife/ Female | Husband & Wife | Children & Wife |
|---|---|---|---|---|
| Food crops selling | 10.8 | 38.6 | 47.0 | 3.6 |
| Time to sell | 15.0 | 36.3 | 45.0 | 3.8 |
| Revenue keeper from sale of food crops | 16.3 | 67.5 | 13.8 | 2.5 |
| How revenue should be spent | 17.7 | 36.7 | 41.8 | 3.8 |

*Source: Survey Data*

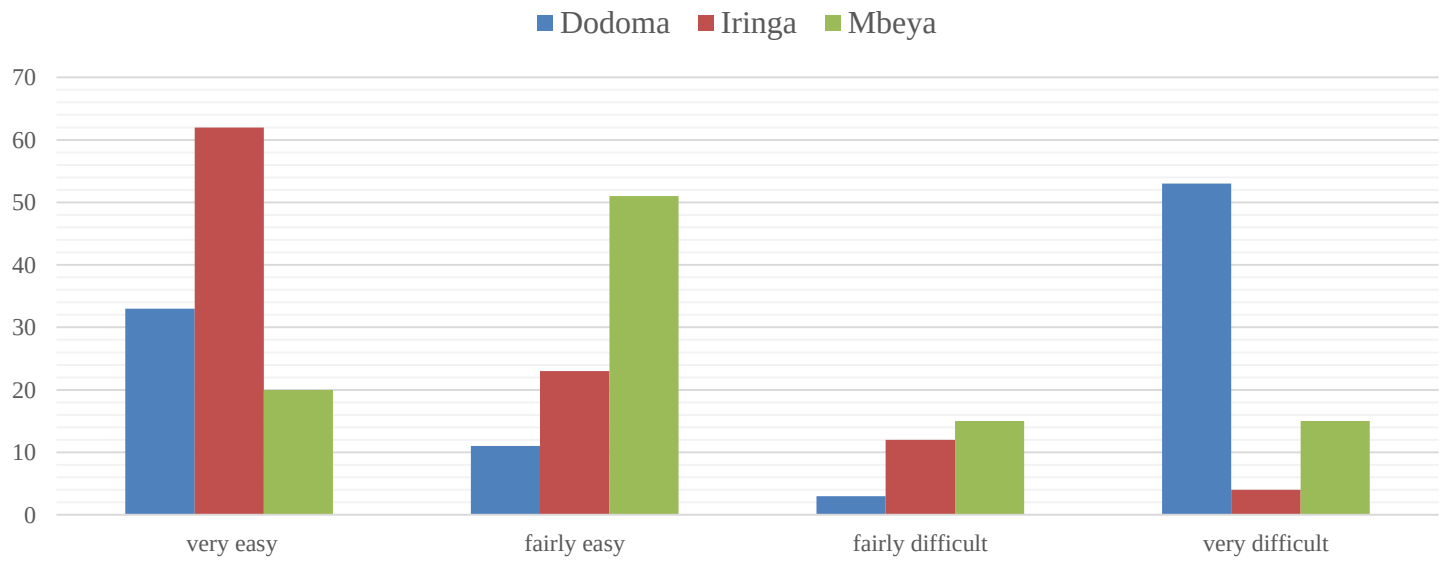
- Education level
  - ✓ No formal education: 38%
  - ✓ Primary education: 57%
  - ✓ Secondary education: 4%
  - ✓ Tertiary education: 1%

# 4. Results and discussion of findings (Cont'd)

## ➢ *Farm Level Characteristics*

- Average farm size: 4 acres
- Land accessibility:
  - ✓Relative ease in Iringa & Mbeya

**Figure 2: Percentage distribution of access to land by region**



# 4. Results and discussion of findings (Cont'd)

- IKs in food processing: mostly primary

**Table 7: Primary food processing methods**

| Method | Sample crops | Mechanism/Operationalization |
|---|---|---|
| Threshing | Groundnuts, Beans, Sorghum, Paddy, Sunflower, Millet | -Hitting with sticks |
| Winnowing | Beans, Sorghum, Paddy, Sunflower, Millet | -Through throwing the grain into the air using a sieve/winnower<br>-Falling the grains from the air using a basket |
| Shelling | Maize | -Manually using hands<br>-Hitting with sticks |
| Peeling | Cassava, Sweet Potatoes, Peas | -Using hands and knife |
| Drying | Cassava, Groundnuts, Maize, Paddy, Sunflower, Vegetable, Eggplant | -Exposure to sunlight by spreading in a thin layer or on the ground<br>-Sweet potatoes and cassava after being cut into small pieces and soaked are then exposed to sun<br>-Vegetables (such as *mchicha*) are partially boiled before being exposed to sun<br>-Eggplant after being peeled and cut into small pieces, is then rinsed with water and exposed to sun for drying |

- Use of grinding stone, *luwala:* finger millet, groundnuts

# 4. Results and discussion of findings (Cont'd)

*Figure 3: A research assistant with a woman who is processing cassava (peeling) for storage*

# 4. Results and discussion of findings (Cont'd)

*Figure 4: Drying of vegetables before storage for durability*

# 4. Results and discussion of findings (Cont'd)

*Figure 5: Sun drying by spreading on the ground*

# 4. Results and discussion of findings (Cont'd)

## ➢ *IKs in food storage*

- Mostly traditional, with sacks/bags widely in use

**Table 8: Commonly used food storage structures**

| ***Storage facility*** | ***Adoption (%)*** | ***Duration of Storage (Months)*** |
|---|---|---|
| Granary (*Kihenge*) | 4 | 7 |
| Sack/bag | 95 | 9 |
| Aerial/ceiling: hanging from tight lines above fire places | 1 | 6 |
| Underground storage | 3 | 7 |
| Clay pots/baskets/plastic tins | 3 | 8 |

**Source: Survey Data**

# 4. Results and discussion of findings (Cont'd)

*Figure 6: Maize stored in a granary*

# 4. Results and discussion of findings (Cont'd)

- Food storage is for multiple purposes

**Table 9: Household food storage reasons**

| Purpose of storage | Dodoma | Iringa | Mbeya |
|---|---|---|---|
| Food for household | 100.0 | 100.0 | 100.0 |
| Seed for planting | 84.9 | 34.8 | 59.3 |
| To sell at higher price later | 39.4 | 43.5 | 55.6 |
| To meet future cash needs | 15.2 | 73.9 | 59.3 |
| Others | 9.1 | 0.0 | 0.0 |

Source: Survey Data

# 4. Results and discussion of findings (Cont'd)

- Storage additives to protect food from damage

**Table 10: Food storage protectants used in surveyed areas**

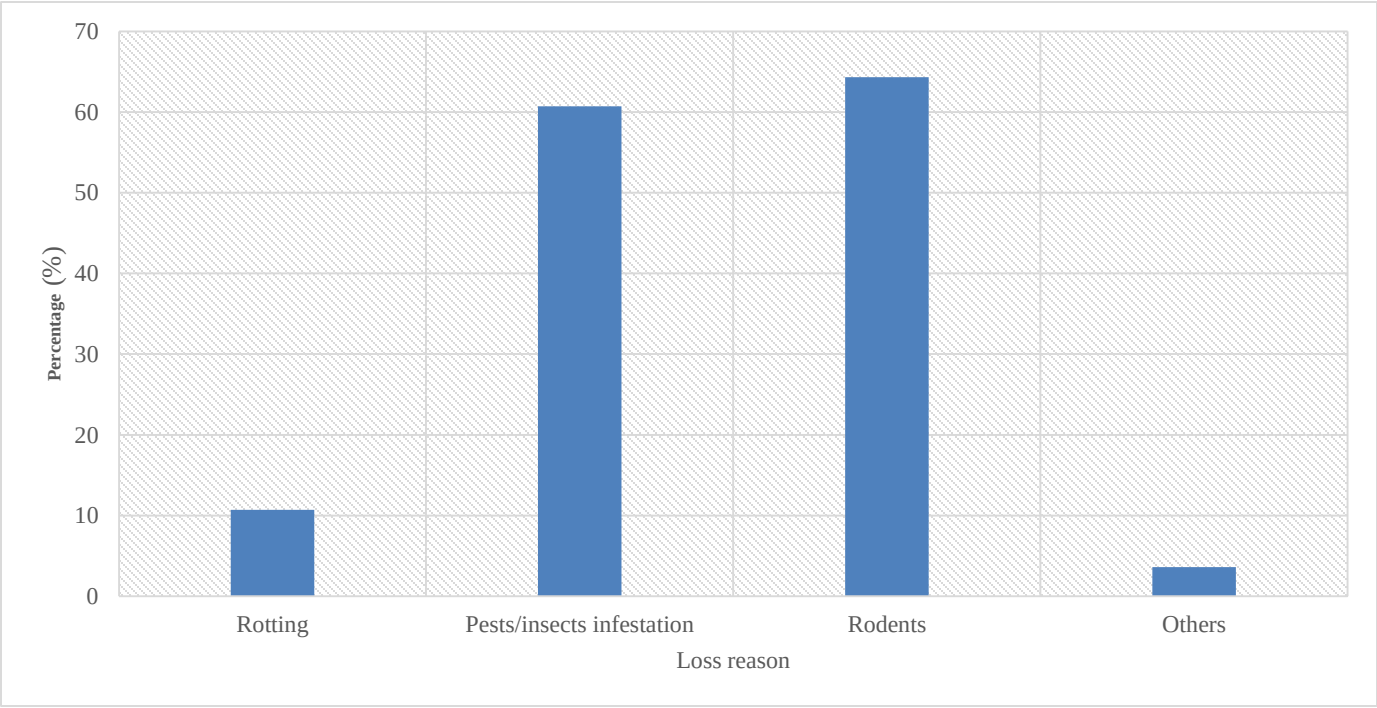
| | ***Storage Protectant*** | | | |
|---|---|---|---|---|
| ***Storage facility*** | **Artificial/Industrial Chemicals (Spraying/Dusting)** | **Neem Leaves (mwarobaini)** | **Cowdung/Ashes/ Magadi** | **Smoking** |
| Granary (*Kihenge*) | ✓ | 0 | ✓ | 0 |
| Sack/Bag | ✓ | ✓ | ✓ | 0 |
| Aerial/Ceiling | 0 | 0 | 0 | ✓ |
| Underground Storage | 0 | 0 | 0 | 0 |
| Clay pots/Baskets/Plastic tins | 0 | 0 | 0 | 0 |

Source: Survey Data

# 4. Results and discussion of findings (Cont'd)

- Food loss from storage:
  - ✓mainly caused by rodents and pests/insects infestation

*Figure 7: Farmers reported food losses*



# 4. Results and discussion of findings (Cont'd)

Figure 8: Damaged maize from storage

# 4. Results and discussion of findings (Cont'd)

## 4.2 Regression Results

- Assumption: if a particular farmer reported a food loss then is due to poor storage infrastructure

**Table 11: Regression results of employment model**

| Variable | Coefficient | Robust Std. Err. | P-Values |
|---|---|---|---|
| *age* | 0.00026152 | 0.0052791 | 0.961 |
| *mrtstatus* | 0.32657193* | 0.1345515 | 0.017 |
| *edn* | -0.07750317 | 0.1625508 | 0.635 |
| *nchild* | 0.30182096* | 0.1403690 | 0.034 |
| *accland* | -0.04790627 | 0.1561152 | 0.760 |
| *disstrgchoice* | -0.37221404* | 0.1533397 | 0.017 |
| *_cons* | 0.87596429** | 0.2968106 | 0.004 |

Source: Survey Data

legend: * p<0.05; ** p<0.01

# 4. Results and discussion of findings (Cont'd)

## ➢ Suggested improvements by farmers for better storage facilities

**Table 12: Respondents suggested improvements for better food storage**

| Suggested improvements | Suggested Storage facility | | Percentage (%) |
|---|---|---|---|
| Provision of safe and secure storage facilities | Use of drums | 19.1 % | 55.8 |
| | Hermetic storage bags | 13.2 % | |
| | Use of *vihenge* | 10.3 % | |
| | Others | 13.2% | |
| Manufacture of effective storage protectants | *-Nil-* | *-Nil-* | 32.4 |
| A method that does not require to put/add artificial protectants | *-Nil-* | *-Nil-* | 11.8 |

**Source: Survey Data**

## 5. Conclusion and policy implications

- This study surveyed a total of 103 rural women smallholder farmers in Iringa, Mbeya and Dodoma
- In the course of nurturing the family and catering for household needs, rural women apply IKs
- Rural women are endowed with various food processing and storage indigenous knowledge and technologies
- Most of them acquired food processing and storage IKs and technologies from the elders suggesting that documentation is crucial

## Conclusion and policy implications (Cont'd)

- Food processing technologies are manually centered and tiresome, suggesting that advancement to some simple machines can help in reducing women's workload

- Provision of training on processing of food crops such as sweet potatoes, cassava and vegetables could foster marketing opportunities

- Food storage technologies are more of traditional, capable of storing the food crops for less than a year

- The poor state of storage facilities is a disincentive to increased farm production

## Conclusion and policy implications (Cont'd)

- To foster increased farm production and increased food security for rural households then innovative improvement of indigenous farmers' storage facilities could be a good starting point, since they are relatively inexpensive as their construction is based on local materials
- Upgrading to safe and secure storage facilities such as hermetic structures would be quite effective following farmers' suggestions
- We see that utilization of IK promises to be a future success of interventions in the agricultural sectors
- Establishment of organizing framework for various IKs in the country could facilitate innovation for the attainment of desired outcomes

*Thank you for listening!*