Diocese of Central Tanganyika

Dodoma, Tanzania

Airtight Underground Grain Storage

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Airtight underground grain storage

History and background to underground grain storage

Grain has been stored in underground pits in North Africa and the Middle East for thousands of years. It is currently a common practice in Sudan, Somalia and Ethiopia. In these countries underground pits are often outside, so are sometimes subject to moisture and security problems. But also in many African communities, they have been using large open traditional baskets for so long which now is not preferred because of storage pests and regular maintenance required.

How underground grain storage protects grain from insect attack

Grain is alive and uses oxygen to respire converting it to carbon dioxide. If an amount of grain is sealed in a container then the oxygen in the air within the grain will gradually be converted to carbon dioxide leaving insufficient oxygen for insects, such as weevils, to live. If such grain is also kept dry so that it is never has a moisture content of more than 12%, it can be stored for many years with very little deterioration.

How underground grain storage protects grain from insect attack cont'd

It is reasonably easy to seal grain from exposure to air when it is stored in a pit. A cover such as polythene sheet is placed on the top of the grain and a thick layer of soil (7cm-10cm) is placed on top of this to give a good air-tight seal. If there is a danger of moisture or termites entering through the walls or floor of the pit then polythene sheet can be used to protect the grain from these problems.

How underground grain storage protects grain from insect attack cont'd

The polythene sheet prevents moisture and termites entering the store

Rationale for underground grain storage in Dodoma

- Food shortages are frequent and the World Food Programme (WFP) has a base in Dodoma.
- High loses of (30%-40%) of grains to insect pests (weevils, moths, rodent, etc), in storage.
- Unplanned expenditure of grain during harvest period (exchanging grain for other items, social ceremonies, raw material for making local brew, selling of grain at very low prices, etc.)

Rationale cont'd

- Extensive use of polythene bags which do not last longer, expensive to buy and they are bought almost every year, do not store grains for long period before is attacked. The bags takes up space of a room of small farmer's houses.

Rationale cont'd

- Traditional large baskets are not well maintained, have open tops which means they are subject to rodent attack and contamination by dust and other materials unless a cover is used. Similar to polythene bags, the open basket takes up a large proportion of the area of a small house and few appear to be new so it is possible that the materials and skills required to make them may not be as readily available as they once were

Rationale cont'd

Rationale cont'd

- It was clear that a new system of grain storage was required and that it must be very low cost if was to be acceptable. It was felt that underground storage pits within the house had the right attributes so in October 2010 it was decided to conduct a small trial in 6 houses.

Phases of the grain storage trials in Dodoma

Phase I

- Started in 2010/2011 cropping season with training in 3 villages and 2 members (6 in total) from each village were selected to be the first to dig a pit in their homes.
- Only underground pits were trialed
- Pits were sprayed with a suitable insecticide and then plastered with cow dung, clay, ash and *neem* to prevent termite intrusion
- Polythene sheets were used to enclose the grain in the pit

Phases cont'd

Phase II

- Started in 2012/2013 – 2013/2014 cropping seasons
- Number of villages remained the same (3) but number of farmers was increased to 34 from 6.
- On top of underground pits, above ground airtight mud block vats were introduced
- Pits were no longer sprayed with insecticide as no termite damage was detected, instead plastering with cow dung, clay, ash and *neem* to prevent termite intrusion continued
- Polythene sheets were not used to enclose the grain in the pit

Results, Observations and farmer's preferences

- The only loss during phase I was when the roof collapsed over the pit due to heavy rain and some grain got wet but was quickly sold to make local brew. But also some loss at another farmer was due to rain blew in through the open window
- Grain was in perfect condition after storage of 6 – 9 months

Results, Observations and farmer's preferences cont'd

- In phase II, results and observations were not very promising:
  - Losses of some good proportion of grain to molding due to moisture were observed and reported. This was mainly due to exclusion of the polythene sheet in the system
  - Some contamination (soil, dust, etc) was also reported

Results, Observations and farmer's preferences cont'd

- Farmers preferred underground pits to above ground mud block vats because unlike the vats, the pits do not take up space in the room as once covered, the room gets back to regular use.
- Improved household food security
- Reduced losses to insect pests

Results, Observations and farmer's preferences cont'd

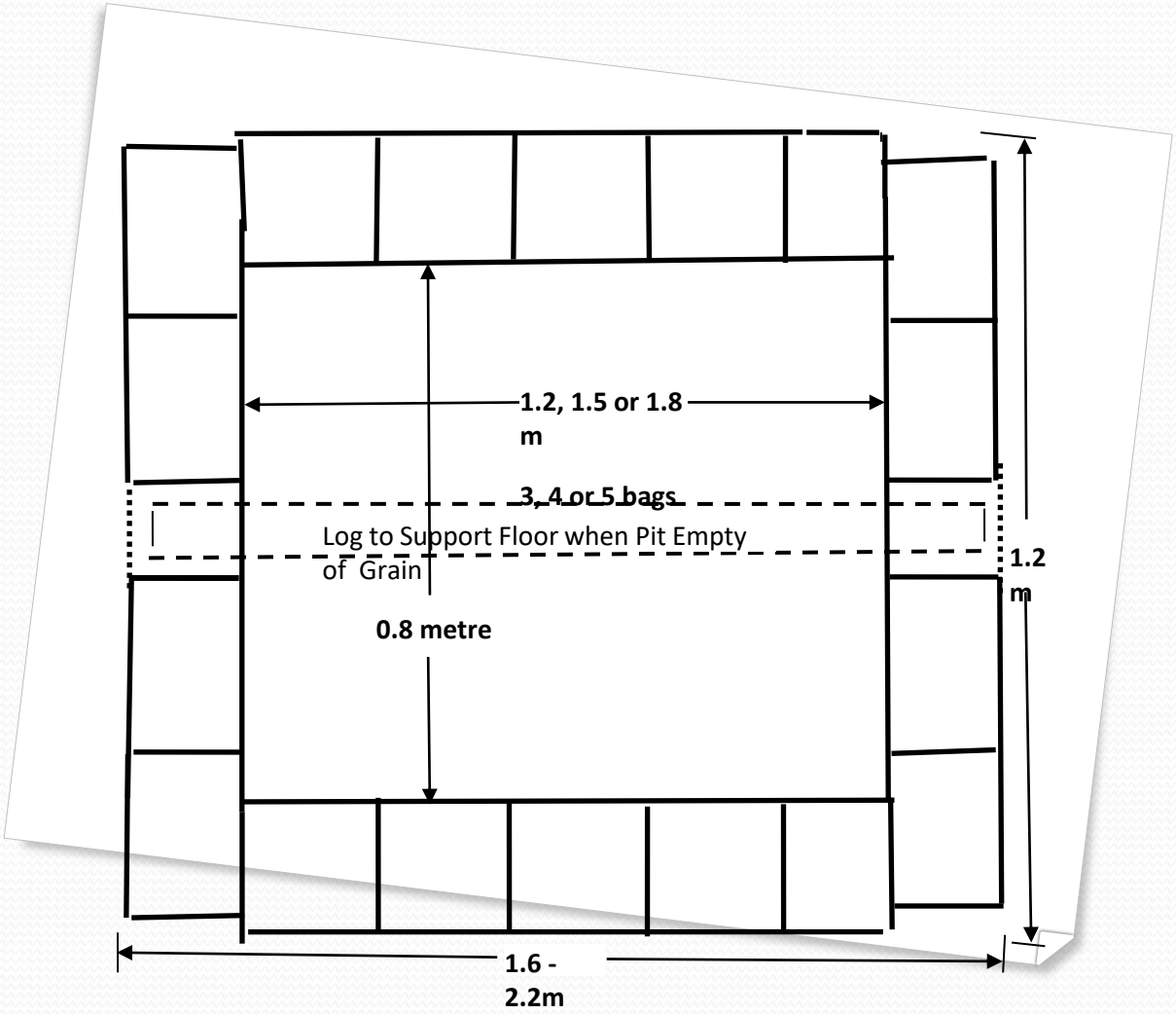
- Stores are timely opened –in January or February when food is needed for household members to gain strength to work on their own farms and not going out selling their labour
- In January and February food is always in short supply therefore any extra amount stored is sold at a higher price (market strategy)
- Reduced temptation to unwise utilization of grain on unplanned use of grain. "Grain is hidden away"

Procedures for construction of Airtight grain stores

- Layout making in a room which does not allow entrance of rain water (on top and side way)
- Construction of a pit
- Spraying with insecticides for avoiding termites intrusion
- Laying and setting a polythene sheet inside the pit
- Building a wall inside a pit using mud blocks
- First plastering of walls using the mixture of ash, clay cow dung's and grinded neem leaves.
- Second plastering to cover any crakes inside the store

Construction of Underground Airtight stores

1. Layout making in a room which does not allow entrance of rain water (on top and side way)



Construction of Underground Airtight stores cont’

2. Construction of a pit

Construction of Underground Airtight stores cont’

3. Spraying with insecticides for avoiding termites intrusion

Construction of underground cont’

4. Laying and setting a polythene sheet inside the pit

Construction of underground cont’

5. Building a wall inside a pit using mud blocks

Construction of underground cont’

6. Plastering of walls using the mixture of ash, clay, cow dung and grinded neem leaves.(First and second)

STORING GRAINS

- **Pouring grains in the ready made Undergroun d store**

STORING GRAINS CONT'

- **Pouring and Consolidating Soil to Cover and Seal the Pit**

(7cm-10cm)
Soil layer/cover

Advantages of Airtight underground grain stores

- To reduce the cost of buying nylons bags every year/season
- Food security in the household
- To control storage pests (removing air in the store which make them to die)
- To minimize the use of chemicals (pesticides) into the food grains
- To reduce the cost of buying pesticides for controlling storage pests
- Unplanned use of food

Challenges and the future promotion of air tight grain storage for Dodoma's farming households

Challenges

- It is usually a challenge to find a suitable system of storage within an existing house which has not been designed for pits and vats.
- Avoiding disturbing supporting posts within ***tembe*** houses
- Avoiding the possibility of rain entering the house through the roof or windows etc is also important.

Challenges cont'd

- Ensuring the polythene sheet is not damaged when being used to line a pit to be bricked or for any sheet that is needed to be used is important.
- The grains stored while already infested with pests are destroyed if inadequate amount of soil is placed on top.
- Insufficient drying of grains to reach their recommended moisture contents leads to moulding and lost of food.

The Future Promotion of Airtight Grain Storage in the Dodoma Area.

- An effective and low cost way of storing grain is the quickest and cheapest way to significantly improve the food security of farming households in the Dodoma Area.
- It will also improve incomes because any grain to be sold does not have to be sold immediately after harvest to avoid weevil infestation when prices are low. Selling can be delayed for some months when prices are likely to be much higher.
- The DCT with their partners are encouraging the households to have these stores and up to date there are 225 grain storages in different villages.

THE END

THANKS FOR YOUR ATTENTION