

5.1.3 Barn, Shelf and Pit

These are mostly used for root and tuber crops. Barn and shelf could be suitable for onion & carrot. Barn, shelf and pit are recommended for cassava, yam and cocoyam. They are affected by environmental conditions.

Pit/ underground structure is the commonest storage recommended for root crops such as cassava and yam tuber. The walls of the pit are lined with nylon or straw. The products are properly packed in the pit and insulated from each other with saw dust. Pit storage conserves the moisture of stored product. It is advisable to store cassava in the pit with its stem. Bruised tubers and cassava must not be stored in pit. Tuber crops are highly perishable. Underground storage is therefore a short-term

Shelf is an improved storage for root crops. Root crops could be stored on shelf for a longer time, though moisture loss is much. Shelf is mostly made of wood or metal. Individual shelf has up to 5 rows. The rows must not be overloaded and proper air circulation must be ensured. Shelf could also be adapted for the storage of onion.

5.2 Modern Storage Structures

Modern storage structures are mostly used for medium or long term and medium or large scale storage.

These include:

- Improved crib
- Ware house
- Silo/ Bin
- Controlled atmosphere storage system
- Refrigeration
- Cold storage
- Evaporative coolant system (ECS)
- Hermetic and nitrogen storage systems

5.2.1 Improved Crib

Improved crib storage has recently gained research interest because of its potentials. The traditional crib storage has been improved. We have the conventional crib storage made of improved material such as sawn wood, iron, wire mesh, galvanized sheet, plastic roof and treated

bamboo. The conventional crib has adequate aeration, retarded mould growth and insect infestation and the roof considerably protects stored crop from direct rainfall. Conventional cribs have increased capacity and could store up to 15 tons of cob maize. It is therefore, used for medium scale storage. The long side of the crib should face the windward direction for proper aeration. However, the performance of the conventional crib is not optimal during the raining season. This is because it is exposed and the performance is affected by the climatic conditions. Improved crib structure is an improvement over the traditional crib in terms of design, capacity, construction material and performance. It has upgraded the traditional crib to medium scale storage. Each unit can accommodate 10-20 tons

An improvement over the conventional crib storage is the 'In-bin' crib. The storage chamber of the In-bin crib is not directly exposed. It is enclosed in a metal bin. This crib utilizes a suction fan to ensure adequate air circulation. This crib is known to prevent product from being contaminated with dust and particulate material. Moisture build is also reduced during the raining season. This crib is however still experimental. However, it has not being commercialized.

5.2.2 Warehouse

Ware house is used for medium but mostly large scale storage for bagged or piled/ bulk products such as grains, flour, etc. Wooden pallets are used for staking. Material handling and ventilation equipments are essential. Prevention of roof leakage and water infiltration through the floor are most essential. Water proof materials are used for flooring & proper drainage important.

Bagged products are normally stored in the warehouse. Occasionally, bulk materials are also stored in the warehouse. Modern warehouse are provided with material handling equipment especially when bulk materials are stored. Leaking roofs and cracked walls must not be allowed in warehouse. Bagged product are properly stacked on wooden platforms. Effective spacing requirement for warehouse storage is 1.7m^3 for one ton of grains. However, some allowances should be provided for stacks (platforms) and ventilation. Some warehouses are provided with aerators. The floor of warehouse must be well above the ground level to prevent flooding and a solid foundation must be provided. Water proof materials could be constituents of the

foundation. This is to prevent water seepage. The floor should be provided with a proper drainage.