

1. Moisture and temperature changes in stored grains, air movement inside the storage.

The migration of moisture in stored grain takes place due to change in temperature as per season i.e. winter and summer. One of the most important factors influencing storage life of the grain is moisture content. High moisture content and a warm climate promote mold growth, insect growth and increase rate of respiration of grains and due to this deterioration and losses of the stored grains takes place. Moisture migration takes place in stored bin even though the grains are stored at a desired moisture level i.e. safe for storage.

1.1 Air movement and migration of moisture inside storage bin in winter season

The grains after harvest in summer is stored in storage bin, grains become warm. When winter season comes, the atmospheric temperature is lowered down. The grain stored in summer is warmer than the atmospheric temperature. In this condition after passage of time the air at the surface of storage bin is cools because the outside temperature is lower than the temperature in the center of bin due to the grains are warmer. The cool air at inside surface of bin moves down along the edge of the bin, across the bottom and then upward near the center of the bin, where the air and grain are warm. The cool air moving through the center of the bin picks up moisture from the grains and moves across the top of the sides.

1.2 Air movement and migration of moisture inside storage bin in summer season

Winter season over and summer season starts, the atmospheric temperature is higher. The grain stored in winter is cooler than the atmospheric temperature. Such grain is stored, after sometime the temperature of air in the grain along the surface rises. The atmospheric temperature in spring and later on rises. As a result, air currents move top to bottom through the center of the bin because at top of the bin the grain is warmer due to higher atmospheric temperature. The hot air at inside top

surface of bin moves down at the center to the bottom of bin and then up ward near the surface edge of the bin, where the air and grain are warm. The hot air moving through the center of the bin picks up moisture from the cool grains and moves across the bottom of the bin. The moist air condenses due to cool grain and moisture accumulation at bottom. Because of increased grain moisture, spoilage takes place at bottom of the bin.

2. Traditional storages structures- (Bulk type)

In this types of storage structures the grain is generally stored in bulk. This types of storage structures having generally capacities between 1 to 50 tones. The storage of grain is generally done in one of the following storage structures in the different rural and urban region in bulk as well as in bag storage.

2.1 Morai type storage structure

Morai type of structure is used for the storage of paddy, maize and sorghum (jowar) in the rural areas. Its capacity varies from 3·5 to 18 tones. These structures are very similar to the shape of an inverted cone. They are placed on a raised platform supported on wooden or stone pillars. The improved type of structure consists of a circular wooden plank floor supported on pillars by means of timber joints. The planks are joined together with lap joints. All around the wooden floor a 22 gauge corrugated metal cylinder of 90 cm height is nailed to it. The edge of the cylinder is flushed with the bottom end of the floor. Inside the cylinder, 7·5 cm diameter ropes made of paddy straw or similar material are placed, beginning from the floor level up to a height of 90 cm.

2.2 Bukhari type storage structure

Bukhari type storage structures are cylindrical in shape and are used for storage of sorghum, wheat, padd, maize etc. Bukhari structures generally have capacities

between 3.5 to 18 tones, however, smaller capacity structures also exist. This may be made by mud alone or by mud and bamboo. The cylindrical storage structures are raised above the ground by wooden or stone platform. The floor of the bin is made either by timber planks.

The walls of structure are made of two sets of strong bamboo framework. The inter-space is filled with mud. The walls on both sides are plastered with mud. The roof is conical and made of bamboo frame-work and covered with paddy straw or similar other thatching material. The top of the conical roof is covered with 4 to 5 cm thick mud layer to provide additional protection from rains.

2.3 Mud Kothi (Mud bin)

This storage structures are quite common in rural areas for storage of grains and other seeds. The capacity of such storage structures varies from 1 to 50 tones. These are made from mud mixed with dung and straw. These Kothies are generally rectangular in shape but cylindrical Kothi is also common in some region. There are many sizes and dimensions of Kothi made for storing grains.

2.4 Bag Storage Structure

This structure generally used for the storage of 25 to 500 tons of grain. The length of the structure is about twice the width or greater than that. A typical floor plan of such a structure large enough to store about 6000 bags (500 tones) of grain. Bags of different capacities (35,50,75 and 100kg) with or without inside plastic lining are used. The standard size of a 100 kg bag is 100 cm x 60cm x 30cm. This bag can store 93 Kg of Wheat and 75 Kg of Paddy.

Bag storage	Bulk storage
Flexibility of storage	Inflexible storage
Partly mechanical	Mechanical
slow handling	Rapid handling
Considerable spillage	Little spillage
Low capital cost	High capital cost
High rodent loss potential	Low rodent loss potential
Re-infestation occurs	Little protection against re-infestation