

# Creating an enabling environment

## GOOD HUSBANDRY

The essence of minimising losses is to ensure that the rail wagon, truck, store or mill are clean and in good condition. It is essential that good hygiene is practised and 'equipment' well maintained.

Dirt and dust help pests to survive. They provide food for insects and rodents, and because they absorb moisture from the air they can cause the moisture content of grain and feed to increase and lead to mould and mycotoxin development. Dirt and dust will also interfere with the action of any pest control treatment and in particular, will reduce the effectiveness of any solid formulations of insecticide that are applied.

So the truck, container or store must be swept regularly. But this is not enough. Pests hide in places that are difficult to access. They live in heaps of empty sacks or in piles of old, disused boxes and similar containers. Rats often hide in rubbish, which accumulates against the walls of stores, either inside or outside the store (Figure 3). They also hide at the back of grain stacks, especially if the sacks are leaning against or are close to a wall.

**FIGURE 3** Sacks piled up against store make excellent harbourages for rodents and insects



It is therefore absolutely essential that these obstructions are removed from around the store and from sidings where rail trucks are left. The ground must be kept free of vegetation. Heaps of empty sacks should be removed from the main grain or feed store and kept in a separate area, as should pesticides and tools. If sacks have to be stored in the main store they should be moved frequently so that the area can be cleaned. Any rubbish that collects must be removed and burnt, buried or taken away for disposal.

Cleanliness will be helped if the store is in good condition. A badly repaired and maintained store or freight container will leak when it rains and may result in the grain becoming wet and then mouldy. If rain entering a store comes into contact with aluminium phosphide tablets during a fumigation it is quite possible that the tablets will ignite and cause a fire. An accident of this nature occurred in Mpanda in Tanzania in 1985 when half of the store building fabric (concrete) and many thousands of tons of maize and casava that were being fumigated were destroyed.

Holes in the walls and doors will allow rodents and birds to enter. Cracks and crevices in the fabric of buildings will allow dust to accumulate and will provide harbourages for insects. Walls and floors must be repaired or made good where necessary. Trucks must not be permitted to be driven inside a store if the floor has not been designed to take the weight as it will crack and break up.

Machinery in flour and feed mills must be kept swept and brushed regularly and routinely. At frequent intervals, areas in buildings must be cleaned to remove waste from machinery, especially where access is difficult. Flour beetles, which feed especially on milled cereal products, are able to hide and accumulate in and around milling machinery, conveyors and hoppers that

**FIGURE 4** Badly broken floor allows dust and insects to accumulate



are not easily inspected and cleaned. Where this is the case it may be necessary to shut down the building for a period to carry out a whole building fumigation. This will necessitate either completely enclosing the building within a fumigation sheet, possible if the building is small, or more commonly, sealing it so that it is gas tight. Sealing doors, windows and ventilators to make the building gas tight is usually very difficult to achieve, especially in developing countries where the mill has not been purpose built. It is usually more appropriate to clean the building as thoroughly as possible and then to spray the fabric with a synthetic contact insecticide; any commodity, flour or feed, can then be treated quite separately.

Open trucks and rail wagons should be covered with tarpaulins when carrying grain or grain products to prevent wetting by rain, access by pests and theft.

New sacks are often reserved for high quality products such as coffee and cocoa, whereas second-hand sacks are used for carrying cereals, pulses and animal feed. Sacks may be reused several times and with each occasion the fabric deteriorates further. Woven polypropylene sacks are particularly vulnerable and should not be used more than three times. Sacks should be repaired, and stitched as necessary between use. Empty sacks can also provide hiding places for insects

and should be fumigated, sprayed with a contact insecticide spray or boiled in water before use. Boiling sacks is convenient when small numbers are involved, perhaps an amount that would be handled by a small trader. This method is cheap and environmentally neutral – assuming there is no shortage of water – but the sacks will need to dry thoroughly before use.

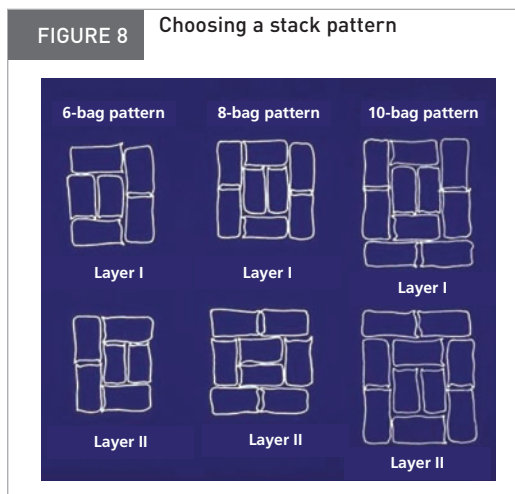
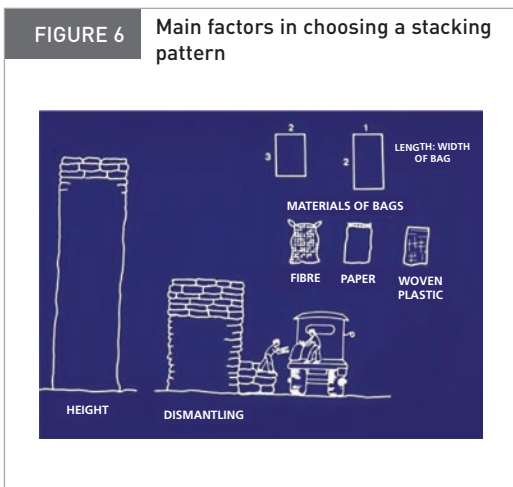
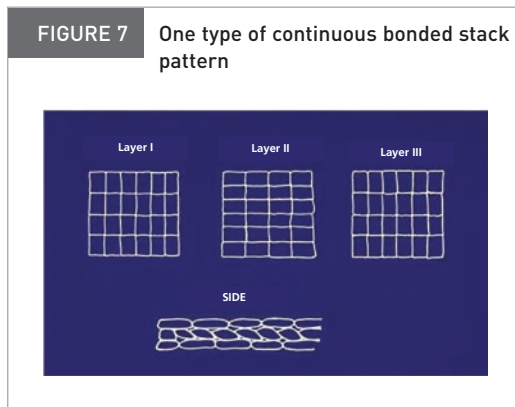
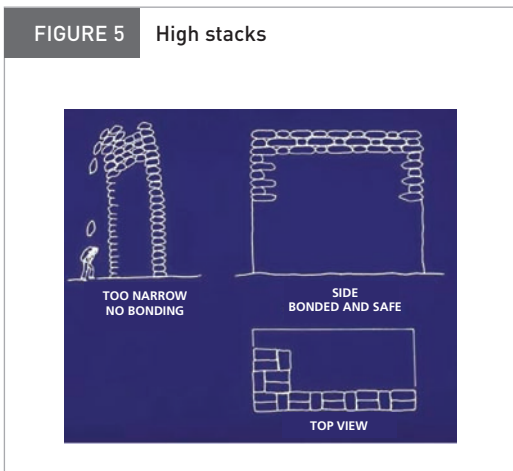
## STOCK MANAGEMENT

### Stacks

Store keepers must be able to make plans and decisions regarding the management practices to be introduced into the store, mill or godown. To achieve this it is essential that the quality of the commodities be continually assessed by inspecting them at regular intervals. Inspection will only be effective if there is access to as much of the stock as is possible. Of course, it is not practical to break down stacks to scrutinise bags kept in the middle of the stack, but it should be possible to view the commodity at all sides of a stack and in the uppermost layers.

Bag stacks should be built 1 m clear of all walls, buttresses and roof supports. If more than one stack is built the gap between stacks should also be 1 m. The tops of stacks should be clear of the roof and roof supports so that it is possible for a person to pass easily around all sides and over the top of each stack. This space is essential not only for inspection but also for fumigation or other pest control work.

Grain and grain products in jute, hessian or woven polypropylene sacks should not be stacked directly on the floor. They should be stacked on a moisture-proof floor covering, such as polythene sheeting, or on dunnage such as wooden pallets, poles or timber. Stacks must be built in an orderly manner that allows inspection. Badly built stacks, or ones that are too high, may collapse and injure people, causing damage to the commodity or to the fabric of the store (Figure 5). Stacking against walls will prevent inspection and may cause structural damage to the walls.



Stacks in contact with the roof may cause solar heat to be transmitted to the commodity.

Stacks may be built up in many different patterns (Figure 6). Larger stacks, which are completely bonded, may utilise the basic 3 or 5 bag design as shown in Figure 7. Smaller stacks are better constructed with a larger basic unit of 8 or 10 bags as shown in Figure 8. The pattern used to construct the stack will be determined by the size of the sacks themselves, especially the ratio of length to width, the overall stability required and ease of dismantling (Figure 9). Stacks built with a 3-bag basic unit will be quick to dismantle; one side can be removed whilst leaving the remainder intact, but are relatively unstable.

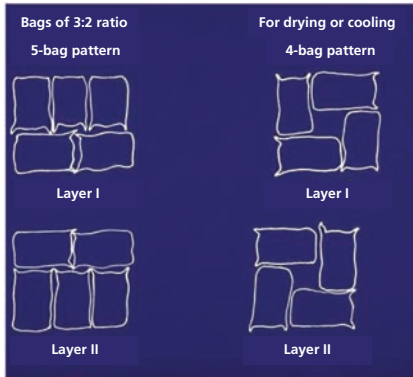
To be built safely, high stacks must have a sufficiently large number of bags to be stacked; the stack must be well bonded. The more bags there are in a stacking pattern the better should be the bonding and stability.

The main factors that influence the choice of a stacking pattern are:

- Height of the stack
- Ease of dismantling
- Ratio of length to width of bags
- Material the bags are made of (fibre, paper, WPP)

A stacking pattern with great stability is one in which each bag in each layer is bonded into neighbouring bags so that there are no continuous vertical sacks or divisions between sacks.

The pattern chosen will be a compromise

**FIGURE 9** Special stacking patterns

between safety and convenience in stacking and dismantling. To increase safety, patterns of 6, 8 or 10 bags can be used, but only if the ratio of bag length to width is 2:1.

If the ratio of the length to width of the bags is 3:2 (not 2:1) then the 5 – bag pattern can be used. If the bag requires cooling or drying then the 4 – bag pattern will be better.

Paper and polypropylene sacks are more difficult to stack properly than jute sacks because there is less friction between them. Corners are the least stable areas of stacks and care must be taken to ensure they are safe. It is better not to have vertical sides but rather to have sides sloping inwards from the base upwards, this improves stability. Such a design will also facilitate access to the top of the stack.

If space allows, it is better to keep commodities separated in different stacks, as it is to keep different types of sacks or containers separated.

### Inspection

The purpose of inspection is to gather information about the store and its contents so that decisions can be made regarding procedures needed for quality maintenance. In essence, inspecting will allow the storekeeper to decide if and when to carry out pest control. It will also make the manager aware of the progress of the commod-

ity whilst in store, and its shelf life. Inspection must be accompanied by effective record keeping so that the history of the commodity can be followed. Record keeping will inform the storekeeper of when the commodity was received and what pest management practices have been carried out. Record cards must be attached directly to the stack to avoid any possible ambiguity. It is good practise to keep a record card even if only one small stack is in store as this will enable the owner to remember details about the commodity. Figure 10 shows an example of a stack record card and inspection report.

Inspections must be done regularly and not less than once a week, irrespective of the size of the store or of its contents. They should include a complete walk around the store both inside and outside, around the stock, including food and non-food items. Where appropriate, a torch should be used to examine dark areas and those in shadow, gaps between stacks and between bags.

The inspector must look carefully for:

- signs of pest infestation, including live insects, rodent droppings, rodent urine trails;
- dampness;
- mould damage;
- spillage;
- contamination of sacks by foreign matter such as oil, fertiliser, pesticide;

**FIGURE 10** Stack record card

Stack No.: _____				
Commodity: _____				
Date	In	Out	Balance	Signature
<i>On reverse side</i>				
Date	Treatment given			By whom

- roof leaks and other structural faults;
- theft or other security problems.

Insects accumulate in cracks and crevices, along sack stitching and where sack surfaces make contact. If the presence of insects is suspected in a sack this can be confirmed by agitating the bag, when adults will move to the upper surfaces. If the storekeeper has access to a sampling spear, this can be used to collect samples from a number of sacks to check whether insects are present. The condition of pest control measures such as rodent bait traps and proofing which might be disturbed by loading and unloading, should be noted and rectified if necessary. Assessments of fumigation and/or contact insecticide application should be made. Any structural damage should be made good as soon as possible.

Rodents can leave many different signs of their presence. Many species prefer to use familiar,

safe routes when moving around so that they repeatedly run across the same ground compacting it and leaving it dust-free. As they move rodents leave behind greasy smears from their fur as they brush against surfaces. The damage caused by biting can also be easily recognised; rodents tend to remove the germ from maize so creating a half-moon shaped cavity in maize grain. Similarly, burrows or holes are also indicative of rodents gaining access to particular areas. Rodent urine can be often spotted when it forms pillars as the animals frequently urinate on the same spot. The presence of rodents can be detected by footprints left in a fine sprinkling of flour over the sack surfaces. Perhaps the most reliable and simplest way to detect their presence is to look for droppings. Figure 11 illustrates some of the signs to look for when inspecting for rodents.

FIGURE 11 Signs of the presence of rodents



droppings



damaged box



damaged sack



urine pillars



footprints



damage to structures



damage to cable