

# Transportation

Losses that arise during transportation occur mainly due to damage to the packaging, such as tears or rips in woven polypropylene sacking, resulting in spillage. For longer haul carriage, for example by rail or lorry to distant markets, other problems may occur including: water penetration or wetting and subsequent mould damage and mycotoxin contamination; insect or rodent pest infestation; changes due to the micro-climate as a result of moving grain from cool, high altitude to lowland, humid altitude; accidental contamination.

Care of grain must be of paramount importance no matter what type of transport system is used. Even the largest and most sophisticated means of transport, such as a ship bulk carrier, will require human intervention to make sure that grain quality does not suffer during the voyage or journey.

The most basic method of transport from farm to market is the head load. Women regularly carry water, fuel and grain on their heads. Although grain may well be exposed to the elements during carriage, the short duration of journeys means that little if any change in quality is experienced. However, if this head load is interspersed with travel on a bus or train then problems may occur particularly due to spillage.

Less arduous methods of delivering grain from the farm use animal or motor driven carts or more. Oxen are used in many parts of the world to pull carts, which may contain 2 tonnes or more of grain in sacks. Replacing the oxen with a motor driven vehicle such as a tractor will enable the load to be increased. However, both types of transport are relatively slow and only allow short journeys to be undertaken.

The short journeys made in the transport so far described do not allow time for biological deterioration to take place. However, once trucks

**FIGURE 12** Woman with head load of maize cobs on the way to market



**FIGURE 13** Ox cart (a) and (b) motor driven cart



(a)



(b)

are used to transport grain, journeys can be much longer and the effects of pests and diseases may become evident when the commodity is inspected on arrival.

Trucks transporting any grain or other food commodities must be clean. They must be swept free of dust and debris. Insects must be eliminated to ensure the new consignment is not subjected to infestation from residual populations. Bodies of trucks should be sprayed with a synthetic contact insecticide such as Actellic emulsifiable concentrate or wettable powder.

Loading the truck must be done with enough care to avoid damaging sacks. Woven polypropylene and paper sacks should not be handled with hooks as these easily damage the fabric resulting in spillage; it is not good practice to handle any type of sack with a hook. Loading should be done manually or using a small conveyor (Figure 14) Trucks must be loaded only to their stated capacity as overloading will make the truck unstable and likely to tip over, a not uncommon occurrence (Figure 15).

All commodities should be accompanied by documentation, which records the origin of the consignment and any pest management treatment that has been applied. This documentation will be especially needed where a consignment is to cross an international border; it is likely that phytosanitary and fumigation certificates will be required. However, this certification may also be required for internal grain movements, particu-

**FIGURE 14** Loading a truck



**FIGURE 15** Overturned truck



larly when grain has to be moved into and out of areas of quarantine. For example, in Tanzania, an outbreak of the larger grain borer, a major pest of stored maize, resulted in several areas of the country being quarantined, so that all movements of maize into or out of these areas were restricted. However, other crops that were not affected by this pest had to be treated with insecticide or fumigated, and proof of their being so was demanded at check points established along roads leading to the quarantined areas (Figure 16). Trucks approaching these checkpoints with documentation were stopped from entering or exiting, causing substantial financial penalties to the owners of both the commodity and the truck. In some cases the consignments were tempo-

**FIGURE 16** Checkpoints for stop and search, may require examination of documents



**FIGURE 17** Freight containers can be fumigated if they can be made gas tight. Sealing end ventilators on this container will be difficult



rarily confiscated and fumigated by government inspectors before being released back to the owner who bore the cost of treatment.

Open rail wagons should be treated in the same way as road trucks. Freight wagons that can be closed off can be fumigated if they can be made air tight (Figure 17). When empty, freight wagons must be thoroughly cleaned. Once the commodity has been loaded, preferably on pallets, tablets of aluminium phosphide, which release phosphine gas on exposure to air, should be placed under the pallets and the container then sealed. A fumigation will take 7 days or longer depending

on the temperature, during which time access to the commodity will not be possible. Fumigation can also be undertaken when the container is empty to disinfest the fabric, although this is generally unnecessary; it is however useful to disinfest bales of empty, used sacks placed in the unloaded container.

Grain carried in freight containers can also be fumigated whether transported by road, rail or sea. This is a practice that is becoming increasingly common, although the treatment frequently fails. Failures are due to the leakage of gas out of the container so that the concentration inside is insufficient to kill insect pests. Most containers, like rail wagons, have ventilation openings. These may be located at the top of the walls, sometimes in the roof, and more often in the floor. For a successful fumigation these ventilators have to be sealed to prevent gas leakage. This may be difficult to achieve, especially if the ventilators are difficult to access, either because the container is full or because their position under the floor makes them inaccessible. If the container cannot be adequately sealed, fumigation should not be attempted as to do so would be dangerous - personnel would be at risk from escaping gas - and ineffective because insects would not receive a fatal dose.

