

DAMAGE ASSESSMENT AT POST-HARVEST LEVEL

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Wheat production is concentrated in Punjab and Sind and only small quantities are grown in NWFP and Baluchistan. Wheat is procured during the months of April to August and it is moved to storage sites. Punjab has the greatest storage capacity, followed by Sind, NWFP and Baluchistan. The storage facilities are of various different sizes and designs. The predominant form is the house-type godown. Other designs include hemispherical shells, called bini shells, bins of concrete and bricks, and concrete and steel silos. In some areas grain is stacked in the open covered by tarpaulin sheets. Wheat is stored in storage sites from 2 to 12 months.

The usual vertebrate pests that cause damage and losses of stored grains are rodents and birds. The common rodent pests are roof rats (*Rattus rattus*) and house mice (*Mus musculus*). Other rodent species that may enter grain storage structures in Pakistan and consume and contaminate stored grains are the striped squirrel (*Funambulus pennanti*), desert jird or sand rat (*Meriones hurrianae*) and the Indian gerbil (*Tatera indica*). The major bird pest species found around grain storage are house sparrows (*Passer domesticus*) and domestic or wild rock pigeon (*Columba livia*). House sparrows can nest inside and outside the godown structures and fly in through open doors and unscreened windows. Pigeons rarely enter the structure, but are common outdoors, where they feed upon the spilled grain.

Rodent damage to stored food can occur in many ways. The animals not only directly consume the grains but also contaminate much more with their droppings, urine and hair. They also chew holes in bags which results in spillage which can become contaminated with rodent urine and droppings. In provincial grain storage centres the losses are very low i.e. less than 0.5% because of regular use of fumigants.

A. Damage Assessment in Godowns (Provincial and PASSCO)

In damage assessment methods at post-harvest level we will discuss only damage at storage level and in-field storage before threshing. To estimate storage losses due to vertebrate pests in public sector storage facilities, a survey of these sites was done during the period of January to June 1986 throughout Pakistan.

During this survey, sites were selected randomly and these sites were inspected. A survey form was used to record the observations and data collected (Appendix 1).

The general procedure used was to interview the person incharge to obtain the details of staff, operations, structural capacity and age. After collection of the information, a physical examination of several godown structures, looking for structural defects, grain quality, structure condition, and evidence of vertebrate pest infestations. The degree of infestation was determined from visible evidence, such as live or dead animals, fecal droppings, burrows, bag damage, etc. The definitions used to categorize grain quality, structure condition, structural defects and severity of rodent and bird infestations are given below:

1. Grain Quality

Excellent - Grain without insect damage, no impurities or seeds, and no broken grains.

Good - Grain without insect damage, mixed with some small amount of impurities or seeds, a few broken grains.

Fair - Slight insect damage, mixed with impurities and/or seeds, obvious broken grains, some rodent or bird fecal droppings.

Poor - Obvious insect damage, mixed with impurities and/or seeds, many broken grains, many rodent or bird droppings, moldiness.

2. Structure Condition (as judged from appearance on outside observation)

Good - No obvious defects visible.

Fair - Few defects visible, may or may not need repair.

Poor - Many obvious defects, in need of repair.

3. Structural Defects

Doors - Marked as defective if they allowed a gap large enough for rodents to enter the godown when closed. This was usually due to doors being bent out of shape, broken hinges, guard plates missing or actual doors missing.

Floors - marked as defective if they were cracked (more than 1 cm wide), floors had sagged or dropped, if they contained holes or rodent burrows, if grain was germinating in cracks. We did not count as defects the expansion joints in the floors unless more than 1 cm wide.

Windows - Marked defective if glass or screens were broken, torn or missing.

Walls - Marked defective if plaster or concrete had broken away from surface, or if they had holes or cracks.

Roofs - Marked defective if there were cracks and/or leaks, or with cracks in the joints between the pillars and roof.

4. Severity of Rodent Infestations

Few - One to 10 rodents (mice or rats) estimated per godown based upon abundance of fecal droppings, dead or live rodents seen and no evidence of bag damage.

Medium - Ten to 25 rodents estimated per godown, fecal droppings easily seen in spilled grain or in unswept areas, little bag damage, live or dead rodents seen, few rodent burrows outside godown.

Severe - Twenty five to 100 or more rodents estimated per godown, numerous fecal droppings and distributed everywhere, obvious bag damage (gnawed holes), live or dead rodents seen and/or numerous rodent burrows outside godowns.

5. Severity of Bird Infestations

Few - Few bird droppings or feathers found inside godowns, occasional sparrow or pigeon seen inside and/or feeding on spilled grain outside.

Medium - Ten birds or more seen inside godown, obvious bird droppings on bags or in grain, numerous sparrows and/or pigeons feeding outside.

Severe - Many birds (more than 50) flying inside and outside godown, many droppings and feathers throughout godown interior, presence of nests inside godown.

To check on the estimated sizes of the rodent infestations as given above, the godowns with the several estimated rodent infestations (low, medium, severe) would have to be trapped and animals captured and removed until no more captures could be made. These total animal counts would then be compared with the estimates to obtain a standard infestation rating.

B. Damage Assessment Methods in Wholesale Grain Markets

Rodent infestations in wholesale grain dealers shops generally are at serious levels. This is because there are usually no attempts made to control the rodent population so they are naturally at or near peak levels that can be sustained in the environment. Food supplies are virtually unlimited, so living space and animal numbers are the only factors limiting population size.

Damage assessment methods in wholesale grain markets must rely upon trapping and removal of some of the rodents and some measurement of activity of the population. Based upon these two, removal of some rodents and a change in activity, the original population can be estimated. Then, knowing how much grain an average-sized rodent consumes daily, the amount of losses from consumption can be estimated.

To carry out this procedure, inked or chalked tracking tiles are set first for one night in 8 to 10 shops that are to be trapped. These are scored positive or negative (Fig. 1) the next day. Then traps are set for 6 to 10 nights and as many rodents as possible are removed. The number captured daily is recorded. After 6 to 10 days, trapping is finished and again tracking tiles are set for one night.

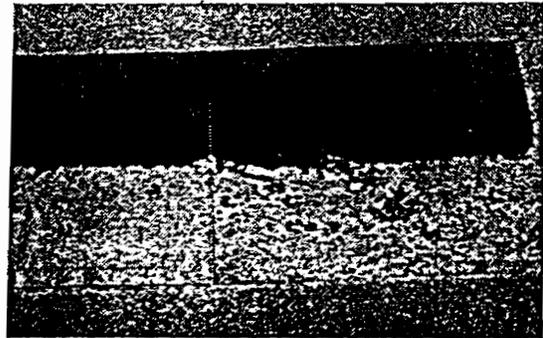


Fig. 1. Rodent footprints on tracking tiles

The rodent population is estimated in two ways: 1) from the change-in-ratio (CIR) of positive tiles before and after removal trapping; using the number of animals removed as part of the calculations, and 2) from the regression of cumulative captures on daily captures, estimating the population where the regression line intercepts the x-axis. The estimated population is then multiplied by the amount of grain a roof rat eats daily to obtain the amount of grain lost in the 8 or 10 shops per day. The amount lost in one year is 365 times the daily loss.

C. Damage Assessment Methods at Farm and Village Level

The losses of stored grains at farm and village level are carried out as given above, using tracking tiles and removal trapping. The main rodents found living in farm structures in Pakistan are roof rats. House mice constitute a small proportion of the animals trapped inside structures and the Indian gerbil, *Tatera indica*, occurs as a peri-domestic species around outbuildings. Losses of stored

foods are calculated from the estimated number of rodents in each farm structure, using the average daily consumption of grain by roof rats and house mice as the amount of food lost.

D. Damage Assessment Methods in Field Post-Harvest

When wheat or rice is bundled and left in the field to dry before threshing, losses can occur due to rodents and birds feeding on the bundles. Losses of this kind are difficult to measure since it may be very severe in one field and very little in another. Losses would have to be measured in many fields (100 or more) to cancel out these extreme values. Panicles would have to be taken from bundles exposed to rodent and bird attack and from those bundles protected from attack. The differences in weight between protected and unprotected panicles would represent the loss. The actual loss of entire panicles would have to be accounted for also.

VERTEBRATE PEST SURVEY OF FOOD STORAGE FACILITIES

Appendix-1

District _____ Town _____ Date _____

Name and Address of Facility _____

Govt. Private Other

Manager's Name/Person Contacted _____

Number of Employees/Titles _____

Pesticide Application: fumigant Used _____

Schedule of Treatments _____ Frequency of Inspection _____

Any Other Control Methods: Traps Predators Barriers Other .

Training Needs: Present Refresher Training Given: Yes No

Schedule of Training _____ Duration of Training _____

Godown No. _____ Stored Food _____ Quantity _____ mt. Duration _____ mo.

Quality: Excellent Good Fair Poor Bagged Bulk

Bulk under tarps outdoors Bagged under tarps outdoors Egged outdoor uncovered

Structural: Type of structure _____ Age _____ Capacity _____

Structural condition: Good Fair Poor

Structural Defects: Yes No Doors not fitting Floor cracked/broken

Wall cracked Windows unscreened/broken Leaking Roof Grilled doors

Vertebrate Pest Problems: Yes No House mice Roof rats Other rodents

Pest Birds Other vertebrates (Cats, dogs, bats, etc.)

Severity of infestation: Rodents: Few Med Severe Birds: Few Med Severe

Evidence: Droppings Live or dead animals Burrows outside Burrows inside

Kinds of damage: Food consumption Contamination Bag damage Structural

Remarks: _____
