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**Backgrounder: Managing pests in stored maize**

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**Introduction**

***Why is this subject important to listeners?***

Because maize farmers should know:

* The pests that attack maize grains in storage and how to manage them.
* How to properly store maize grains to protect them from pest infestation and reduce the risk of damage.
* The products and natural substances to apply on maize grains to stop or reduce infestations.
* The recommended moisture content for storing maize to minimize pest infestation.
* The best storage containers to protect maize grains from storage pests.
* The best drying procedures to minimize pest infestation.

***What are some key facts about pest management in stored maize?***

* High moisture content in maize grains favours insect and fungal (disease) infestations in storage by encouraging fungal and insect infestation, which can even be a causative factor in human diseases such as cancer.
* Maize grains should be stored in a building without cracks where pests like larger grain borers or rodents can hide or enter the building. Cracks should be repaired or sealed.
* Storage facilities for maize grains should be treated with pesticides that kill or repel pests, either by fumigation or spraying.
* Maize storage facilities should be kept in hygienic conditions.
* Infested maize grains should not be mixed with fresh grains as pests can be transferred to and damage fresh grains.
* Using airtight PICS bags to store maize grains inhibits the survival of insects and fungi.

***What are the big challenges in managing pests of stored maize?***

* Farmers lack the knowledge on how to manage pests in stored maize.
* Many farmers cannot afford pesticides to manage pests in stored maize grains.
* Lack of storage facilities that effectively reduce the risk of damage from storage pests.
* Farmers are not familiar with the pests that attack their stored maize grains.

*For further information, see documents 1, 2, 3, 4, 5, 6, 7, 9, 10, 14, 15, 17, and 19.*

***Gender aspects of managing pests in stored maize***

* In Kenya and Malawi, women farmers who manage metal silos for storing maize have improved their standing in their communities and their self-esteem.
* In sub-Saharan Africa, female-headed households tend to experience lower postharvest losses across all crops, mostly due to quick adoption of improved storage technologies.
* In Kenya. women report that owning a metal silo reduces their labour burden since they don’t have to frequently treat their maize with pesticides. Male maize farmers no longer buy pesticides or bags to store their maize since metal storage silos save them money in the long run.
* In Kenya, women report improved health because they no longer use chemicals to treat their maize or consume maize contaminated with pesticides.

*For further information, see documents 8, 11, and 18.*

***Predicted impact of climate change on pest management in stored maize***

* In Kenya, the continued rise in temperatures and poor rains reduce yields and change the livelihoods of the over 85% percent of the country’s population that depend on maize as their staple food.
* Research shows that droughts due to climate change increase populations of maize pests and weaken the defenses of maize plants against pests.
* In Uganda, small-scale farmers sun-dry their maize, but unpredictable rains in the dry seasons are increasing postharvest losses from diseases and pests.
* Shorter rainy seasons are increasing pest and disease problems in maize.

*For further information, see documents 12, 13, and 20.*

**Key information about pest management in stored maize**

**Lesser grain weevil/rice weevil:** This weevil is considered the most destructive insect pest of stored cereals. It feeds aggressively on grains like maize, rice, sorghum, wheat, millets, barley, and legumes like lentils, peas, rye, beans, and cowpea. Infestation by the lesser grain weevil starts when maize grain moisture content drops to 18 to 20 percent. Infestations also occur when clean grains come into contact with infested maize grains. Infestation can also occur if the pest enters the store where maize grains are stored. In stored maize, infestation by the lesser grain weevil can cause losses of 30 to 40 percent of maize grain.

**Control**

* Farmers can use sticky traps to determine which areas in the store have the highest populations of lesser grain weevil.
* Farmers can control the lesser grain weevil by fumigating maize storage areas.
* A safe, effective way to protect maize grains is to store them in pest-proof hermetic bags or other airtight containers. This avoids using pesticides on grains, which may cause health issues.

**Larger grain borer/greater grain borer:** This dark brown to black, 4-mm beetle affects maize on the field just before harvest, when moisture content is at or below 18%, and also attacks stored maize. The larger grain borer (LGB) burrows into the grain and cob. LGB is prevalent in the maize farming regions of West, East, and southern Africa.

**Monitoring**

* Farmers should inspect stored maize grains weekly for signs of LGB infestation, looking

for holes and tunnels in maize grains.

* Farmers should also look for holes and cracks in storage facilities where adult LGB can hide.
* Farmers should remove infested grains from storage and destroy.
* Farmers can also use pheromone traps to monitor and trap adult LGB.

**Prevention**

* Farmers should plant maize varieties that are resistant to LGB.
* Farmers should harvest maize after it is physiologically mature\*.
* Maize stores should be cleaned before harvests.
* Remove infected maize crop residues and burn before storing new stock.
* Immerse sacks for storing maize in boiling water and dry to eliminate remaining LGB.
* In stores, rotate maize with legumes like beans and cowpeas or with vegetables.
* Thresh maize before storage, taking care to not break grains.
* Roofs for maize storage should be iron not thatch, as LGB can hide in thatch.
* To repel LGB, farmers can mix stored maize with dried lantana or eucalyptus leaves.
* To keep pest infestation levels low, do not keep maize grains for longer than three months unless they are stored in hermetic bags or metal silos.

**Control**

* Place sticky traps in areas at high risk from LGB.
* Sun dry and sieve maize grains before packing with a 1-2 millimetre sieve that separates insects and grains.
* Farmers can use metal silos, hermetic bags, or other airtight containers to store maize.
* Applying an ash-chili mixture to grains will kill LGB.
* Apply a kilogram of diatomite powder per bag of maize grains to kill LGB.
* Mix finely crushed laterite soil with stored maize grains to kill LGB.

**Maize weevil/greater grain weevil:** This snouted yellowish-reddish and black, spotted pest is 2.5-4 millimetres long with a dark brown coat and four reddish spots on its wings. It attacks stored maize by burrowing into the grains and laying eggs that hatch into larvae. Infested maize grains have large holes. When populations are low, the weevil is hard to detect since it spends most of the time inside the burrowed maize grain.

**Monitoring**

* Farmers should sample stored maize grains at two-week intervals or more frequently to check against infestation.
* Farmers should look for maize grains that have large holes with irregular edges and a weevil with a 1-millimetre snout. After weevils mature to adulthood, they can be seen on the surface of maize grains with flour from the burrowed grains on their body.
* If farmers find adult weevils on cobs, they should harvest early in order to minimize field infestation, provided that maize is physiologically mature.

**Prevention**

* Farmers should seek advice from agronomists on maize varieties that are tolerant of maize weevils.
* Farmers should harvest their maize once it matures, then sort and store only weevil-free cobs.
* Farmers should store only well-dried maize grains with less than 14% moisture content.
* Store in clean storage facilities and repair or seal any crevices, cracks, holes, or gaps, since weevils and other pests can enter there.
* Spray storage areas 4-6 weeks before storing maize grains to kill weevils from previous harvests.
* Shell, dry, and sieve maize grains to remove dust and insects before storage, and burn infested residues.

**Control**

* To protect maize grains from weevils, treat them with wood ash or rice husk ash. Apply 0.5-1 kilogram of rice husk ash per 100 kilograms of grains, and 1 kilogram of wood ash per 100 kilograms of maize.
* Sun-dry infested maize grains for three days to kill weevils. Sieve to remove adult weevils and burn all weevil-infested crop residues.
* Store maize grains in undamaged or airtight sacks such as hermetic bags.
* Farmers can use chemicals, Ocimum kilimandscharicum plants, or neem oil to repel or kill weevils.
* To trap weevils, farmers can place sticky traps in the part(s) of the storage where weevil numbers are high.

**Angoumois grain moth:** This small, yellowish or straw-coloured moth is nearly a centimetre long with a half-inch wingspan. The larvae prefer to feed on damp grains and infest maize grains in the field before harvest. Adult Angoumois grain moths (also spelled “Angomois”) lay eggs outside the grain kernel. When they hatch, the larvae bore into and feed on the grain. When larvae mature to adulthood, they fly out through the hole in the maize grain kernel, though adults do not feed on grains. Besides maize, the Angoumois grain moth infests oats, barley, rice, pearl millet, rye, sorghum, and wheat. Maize grains are often treated with chemical dust as a preventive measure. Otherwise, the Angoumois grain moth can cause losses of up to 70%. The adult Angoumois grain moth flies around grain stores and is found in all sub-regions of Africa sub-regions.

**Control**

* Farmers can eliminate the Angoumois grain moth by fumigating the storage area, which kills the larvae, pupae, and adult moths. Farmers can use chemical fumigants, and burning chili peppers near the storage area may be effective at repelling Angoumois grain moths.

**Rodents:** Rodents such as mice and rats cause more damage to stored grains such as maize than insect pests. They also damage maize crops in the field.

**Control**

* Farmers can use traditional mouse traps to trap both mice and rats.
* Farmers can also introduce cats when there are large populations of rodents.
* If farmers store maize in raised granaries, they should attach rat guards to the poles supporting the granary so that rodents can’t jump in. In order to exclude rats, the guards should be a minimum of 90 cm off the ground.
* Farmers can control rodents by using poisoned bait. However, in this case, farmers should not keep cats, since cats may die or be severely affected by eating poisoned bait or eating rats that have ingested poison.
* Repair or seal cracks in walls or spaces around doors of storage buildings where rodents can enter.

*For further information, see documents 1, 2, 3, 4, 5, 6, 7, 9, 10, 14, 15, 17, and 19.*

**Definitions**

*Fumigation*: A method of pest control that involves suffocating insects with gaseous pesticides in a room or storage facility.

Physiological maturity: In grains, this is defined as the time when dry matter accumulation in the kernels or seeds ceases; in other words, when the grain stops "filling."

**Where can I find other resources on this topic?**

*Documents*

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