Decreasing Post-Harvest Losses Through Improved Grain Storage Education and Practices

Alena Whitaker[1], Rachael Barnes[1] , Liz Hada[1], Miriam Namata [2], Sandra Phephe[2], and David Mubiru[2],
[1]Iowa State University, Ames, Iowa, USA [2]Makerere University, Kampala, Uganda

Introduction

Globally, maize is a staple crop that provides a food source for hundreds of millions of people. Maize is a main ingredient in the school feeding programs at primary schools in the Kamuli District, Uganda. Pupils bring 4-8 kg of maize as their school fees each trimester. Proper storage and management of maize is essential to minimize the loss of quality and amount to insects and rodents between arrival and when it is consumed by pupils. (Fig 1)

Often, maize arrives at schools with a moisture content too high for storage without molding, already has signs of molding, and/or is infested with maize weevils. 2017 was unique. Delayed harvest, due to drought, reduced typical signs of mold or weevils, but increased moisture content (Fig. 2, 3, & 4). The high moisture content made drying necessary for safe storage and to allow the school to safely store over 700 kg of maize needed for the next school terms.

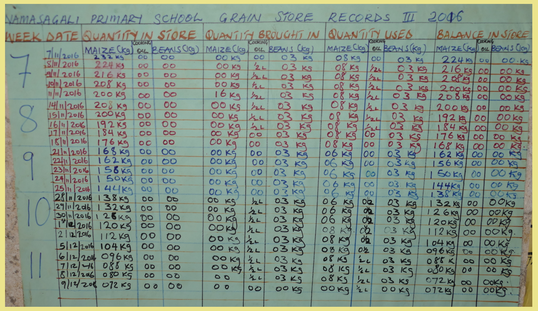
Properly drying grain and hermetically sealing containers, removing all oxygen, kills weevils, reduces insect damage, and prevents mold in maize. Improving post harvest storage may reduce post harvest losses, positively impacting nutritional food security.

Figure 1 (Left): Makerere University students and pupils at Namasagali Primary School clean maize brought as school fees prior to storage. Figure 2 (Right): A pupil arrives at school with maize to pay school fees. The agriculture teacher weighs and records the amount of maize contributed.

Figure 3 (Left): Maize with mold damage cause by poor drying methods. Figure 4 (Right): Maize that has severe weevil damage from poor storing practices.

Objectives:

1. Observe current mold damage of the maize
2. Implement new grain silos to increase the amount of maize hermetically stored.
3. Evaluate the current record keeping processes and recommend new practices.
4. Work with teachers to introduce safe storage and handling practices.



NAMASAGALI PRIMARY SCHOOL GRAIN STORE RECORDS III 2016

WEEK	DATE	QUANTITY IN STORE		QUANTITY BROUGHT IN		QUANTITY USED		BALANCE IN STORE	
		MAIZE (Kg)	BEANS (Kg)	MAIZE (Kg)	BEANS (Kg)	MAIZE (Kg)	BEANS (Kg)	MAIZE (Kg)	BEANS (Kg)
7	11/1/2016	233 KS	00	00	00 KS	00	03 KS	224 KS	00 KS
	13/1/2016	228 KS	00	00	00 KS	24	03 KS	216 KS	00 KS
	14/1/2016	216 KS	00	00	00 KS	24	03 KS	208 KS	00 KS
	18/1/2016	208 KS	00	00	00 KS	24	03 KS	200 KS	00 KS
	19/1/2016	200 KS	00	00	16 KS	24	03 KS	208 KS	00 KS
8	21/1/2016	200 KS	00	00	00 KS	24	03 KS	200 KS	00 KS
	15/1/2016	200 KS	00	00	00 KS	24	03 KS	192 KS	00 KS
	16/1/2016	192 KS	00	00	00 KS	24	03 KS	184 KS	00 KS
	23/1/2016	184 KS	00	00	00 KS	08	03 KS	176 KS	00 KS
	1/2/2016	176 KS	00	00	00 KS	08	03 KS	168 KS	00 KS
9	21/1/2016	168 KS	00	00	00 KS	08	03 KS	162 KS	00 KS
	22/1/2016	162 KS	00	00	00 KS	06	03 KS	156 KS	00 KS
	23/1/2016	156 KS	00	00	00 KS	06	03 KS	150 KS	00 KS
	24/1/2016	150 KS	00	00	00 KS	06	03 KS	144 KS	00 KS
	25/1/2016	144 KS	00	00	00 KS	06	03 KS	138 KS	00 KS
10	28/1/2016	138 KS	00	00	00 KS	06	03 KS	132 KS	00 KS
	27/1/2016	132 KS	00	00	00 KS	06	03 KS	126 KS	00 KS
	29/1/2016	126 KS	00	00	00 KS	06	03 KS	120 KS	00 KS
	1/2/2016	120 KS	00	00	00 KS	08	03 KS	112 KS	00 KS
	2/2/2016	112 KS	00	00	00 KS	08	03 KS	104 KS	00 KS
11	5/2/2016	104 KS	00	00	00 KS	08	03 KS	096 KS	00 KS
	6/2/2016	096 KS	00	00	00 KS	08	03 KS	088 KS	00 KS
	7/2/2016	088 KS	00	00	00 KS	08	03 KS	080 KS	00 KS
	8/2/2016	080 KS	00	00	00	08	03 KS	072 KS	00 KS
	9/2/2016	072 KS	00	00	00	00	00 KS	072 KS	00 KS

Figure 5: Record storing chart at Namasagali Primary School, similar charts were made for Nakanyonyi Primary School.

Figure 6 (Left): Existing grain silos used at the primary schools. These metal silos hold 250-500kg. The silos hold large quantities but are difficult to hermetically seal, increasing the risk of weevil infestation. Figure 7 (Right): ISU-UP implemented new maize silos at primary schools. The new silos hold 350 kg and can be hermetically sealed. The top lid is closed with a clamping ring/GI latch to lock. At the bottom, there is a small outlet with cap that has an O-ring seal.

Materials/Methods:

1. Distributed new silos at the schools
2. Dried, cleaned, and weighed maize before hermetically storing. (Fig. 7)
3. Distribute hygrometers to measure relative humidity and trained teachers.
4. Use a hand-held moisture meter to accurately measure water content of maize.
5. Observed current maize receiving, use. and record keeping practices and interview teachers to understand barriers to reducing post harvest losses.
6. Assessed mold damage in 10 samples of maize from an old silo, counted 100 kernels and visually assessed mold damage.

Results

1. Over 1,300 kg of maize was cleaned and safely sealed in new grain storage silos at Nakanyonyi and Namasagali Primary Schools.
2. New record keeping charts were introduced at Nakanyonyi Primary School to enhance their maize store management (Figure 5).
3. Mold in maize is a continual problem for the schools.
4. The grain storage team met with teachers to discuss the health concerns with consuming mold in the school lunches as well as the importance of proper drying. (Figure 8).
5. Teachers were introduced to a hygrometer, where they can take the relative humidity to ensure the maize is being stored in ideal conditions.

Figure 8 (Right): Student at Namasagali Primary School eating their lunch, one main ingredient is maize. Figure 9 (Left): Moving maize from the drying tarp to be cleaned sieved, weighed, and hermetically stored.

Conclusions and Recommendations

With the delayed harvest season in 2017, the grain storage team had the unique opportunity to be present at the schools during the maize collection process. It was beneficial to be there at this time to review proper drying, cleaning, and storing techniques with the school administration and grain storage managers. The new grain silos will be influential in increasing the quality of maize being stored and will hopefully reduce weevil infestation. Enough maize was safely put in storage to last near two terms for the school feeding program. For the future, we need to continually educate teachers about the moisture content in maize and the importance of ensuring dry maize is placed in storage otherwise molding may occur. Additionally, the Iowa State Uganda Program should continue to follow up on the silos to see if they are still hermetically sealed until the maize is needed to use.

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