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Assessment of Maize (*Zea mays*) seed Storage Techniques in West Guji Zone Southern Oromia, Ethiopia

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The results of storage techniques assessment used by farmers for maize seed in West Guji Zone in three districts on different demographic characteristics households shows different outcomes on storage techniques effects and its quality preservation. Sem-structured questioners were used to collect pertinent information on farmers' maize seed storage techniques and quality preservation from 300 households randomly selected. From survey result the participation of female headed household in agriculture production activities was very low in study areas whereas male headed household participation was 80%, 85% and 79% in Bule Hora, Abaya and Galana respectively. Extension service is the major sources of information in study areas for maize production practices. District bureau of agriculture the only means of formal seed sources, as a result farmers were used seed from informal sources of their own saved, relatives, market, and Neighbors. A different varieties utilized by communities such as Pioneer, BH540, BH660, local varieties and MH140. Most of farmers in study areas don't separately store their seed from grain, those store separately use different storage structures such a; hanging on fire places, Gotera in or outside home and sack. Farmers were believed hung on fire places are more effective to keep seed quality but suffered from insect pest damage. Insect pest and disease are the major challenges they faced in storage and they are control by storing seed after dry and clean storage for those repeatedly used storage.

Keywords: Maize, West Guji Zone, Southern Oromia and Storage techniques

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INTRODUCTION

The practice of seed collection and storage is the begging of human being civilization with agricultural transition of human being from hunter-gatherer to stable agrarian oriented-life (Jeffrey H, 2004). The importance of seed storage has been recognized ever since humans began to domesticate crop plants. Maize is popular crop in Ethiopia and its production covers 90% parts of the country cultivable land. In Ethiopia 80% of population are primary producers and consumers of maize (Alemu et al., 2008). A Seed of maize safely stored for 8-9 months, in areas farmers' planting maize once a year ((Wambugu et al., 2009) and farmers store their seed in traditional storage. Successful seed storage is a key to farmers' seed security and also, enables communities to generate income through selling seeds (Wambugu et al., 2009). A (Kapur et al., 2011) cited in (Abass et al., 2014), states Post-harvest losses in Africa estimated up to 20 - 40% which occur at different production stage that start from

field, during processing and in storage and reducing post-harvest loss by half can play a great role in improving food security. Farmers store their maize seed in different forms; ears with cobs or grains placed in plastic containers (jerry can), placed in pots, hung above fire places with cobs; usually in their kitchen, and store underground in pit, use gottera in and outside home (Murdolelono B and Hosang E, 2009). During survey conducted farmers respond that due to shortage of formal seed supply farmers consume seed from their own storage and faced different challenges of storage problems. Despite importance of maize in country as well as at study areas, the study on storage techniques and its effect on seed quality is overlooked and there is scarcity of information and its impact on seed quality (Bishaw, 2004). Therefore, the study was conducted with the objective of assessing types of storage techniques used by farmers and to identify the most effective one to preserve seed quality.

MATERIALS AND METHODS

Description of the Study Areas

The study was carried out in three Maize producing Districts of West Guji Zone; Bule Hora, Galana and Abbaya during 2016 cropping season. Bule Hora is the administrative town of the zone and about 467Km far away from capital city of the country Finfine in South. It receives a bimodal rainfall (Lemessa, 2003; Amsalu and Adem, 2009). The climate is semi-arid and arid with average annual rainfall 350-800mm and average annual temperature 19-29^{o}C, staple crops like coffee; Enset (false banana), khat (a mild narcotic plant), Potato, Onion, tomatoes, Cabbage, Pepper, Garlic, Maize, Wheat, Haricot bean, and Teff (Eragrosit teff) are major crop produced in zone (West Guji Zone Agricultural offices, 2016).

Sampling Procedures

Purposive sampling procedure was followed to select maize producing administrative Districts with the maize producing farmers are sampling unit. Bule Hora, Galana and Abbaya Districts were selected purposively on the area coverage and promotion of new maize technologies based information sources from Zonal Agricultural office. A total Nine PAs were selected by systematic sampling after taking information about their maize production potential from Districts Agricultural offices and then Peasant Association identified and clustered as (Low, Medium and High). Maize producing farmers were identified and listed in consultation with development agents (DAs) and Peasant Association leaders (PAL). A total of 1500 maize producing farmers were identified and listed from all Peasant Association selected for study. Using simple random sampling techniques 20% of farmers were selected for interviews on demographic characters of farming activities, for sources of labor, seed and information for farm practices, storage techniques and storage problems and its control. Enumerators were trained on objective and content of interview for a day

Methods of Data Collection

Primary and secondary data was used in this study where, Primary data collected through household interview and observation of farmer's practices and secondary data was from report, published and unpublished data about the study area.

Data Analysis

Data collected during survey were analyzed using descriptive statistics (percentile) by statistical package for social sciences (SPSS) version 20.0 software.

RESULT AND DISCUSSION

The result and discussion described below is the assessment made on maize storage techniques and farmers perception about storage techniques used to store their seed and keep its quality.

Demographic Characteristics of Household

House hold characteristics were distribution based on sex, age, family size, education level and etc... The total respondents of 300 households were consulted and interviewed in three districts of study, and male headed household share a great role and female headed household participation low; 20%, 15% and 21% in Bule Hora, Abaya and Galana districts respectively (Table 1). From the survey result, it is understood that economic position of female headed households characterized by shortage of labor, land, limited access to information and required inputs, and other cultural influences. Inline of this study, a research conducted in central Ethiopia reveals that men have an overall responsibility and decision-making regard to agriculture production activities whereas; women give their opinion(Stroud and Mekuria, 1992) and Tiruneh et al., 1999) found that the decision to grow improved Bread wheat varieties is a joint decision by over half of male-headed households in Central Ethiopia. The age differences of household have impact on agricultural activities and final product output of the farm. The study undertakes different ranges of age

Table 1. Percentage of Household Characteristics in Districts of Study Areas (N = 300)

Characteristics	**Location (%)**		
Sex	Bule Hora	Abaya	Galena
Male	80.00	85	79
Female	20.00	15	21
Total	100	100	100
Age			
15-20	0.00	0.00	0.00
21- 25	9	7	2
26-30	25	31	32
31-35	54	45	57
>35	12	17	9
Total	100	100	100
Family size			
< 3	10	15	13
4-6	65	61	67
7-9	20	22	19
>9	5	2	1
Total	100	100	100
Education level			
Uneducated	4	2	2
Primary	12	21	23
Secondary	78	62	71
College	6	5	4
Total	100	100	100

groups and the study result reveals that the participation of households for farm activities at both i.e.; high and low extremes age groups are low in all districts whereas highest percentages of work performances were recorded at age group of 31-35 in all districts of the study(Table 1). The result of this study shows that as age increase to Maximum range, working performances of households increase and other study descried the age difference group of household affect adoption of maize technology (Ouman et al., 2014). A household with large number of family size expected to have high and great opportunities for work performances. The current study result shows that the highest percentages of respondents at all study districts were concentrated at family size of 4-6 (Table 1). In another way a large number of families were effective in adoption of new technology and performances of agriculture activities (Table 1). Inline of current study (Walelign, 2008) states that new technology adoption were increases when size of household increases. Education is a driven force for access to information and decision making to adopt new technology and farmers with highest educational level were show their willingness to accept and endorse new technology. In all districts of study, the result for educational level shows that respondents with secondary education share highest percentages (Table 1). In most agricultural studies, education was taken as an important explanatory factor that positively affects the decision of households to adopt new agricultural technologies (Asfa and Adimassie, 2002) and also, (Nagash, 2007) reported that farmer educational level influenced the adoption of new agricultural technologies.

Information sources for maize production

In study areas farmers use information from different sources where extension services is the main sources and Neighbors and other farmers was the additional sources of information for maize producing farmers. In line of this study a frequent contact with extension agents expose farmers for new technologies and make easy for application of new technology (Ouman et al., 2014). A farm operation of maize production like; land preparation, sowing, weeding, harvesting, threshing, winnowing, storage and marketing are majorly carried out by family labors (data not displayed) and methods, time and frequency of farm operation has its effect on yield potential and seed storage life.

Storage structures used by farmers

In study areas farmers were used different storage structures to keep quality of their for next planting

Table 2. Storage Techniques and Varieties used by Respondent Farmers

Characteristics	Location (N = 300)		
Storage types	Bule Hora %	Abaya %	Galana %
Hanging on fire	35.71	33.33	32.86
Sack	24.28	16.67	17.14
Gotera	40.00	50.00	50.00
Problem in storage			
Insect pest	79.28	65.55	87.14
Rodent	25.00	23.33	30.00
Disease	65.71	59.11	82.86
Storage control			
Not known	0.00	0.00	0.00
Store dry seed	81.43	71.11	61.43
Clean storage	18.57	28.88	38.57
Fumigation	0.00	0.00	0.00
Dusting or spray	0.00	0.00	0.00
Varieties utilized			
Pioneer	57.14	61.11	35.71
BH540	35.71	44.44	64.28
BH660	64.28	77.78	50.00
MH140	21.43	26.67	28.57
Pioneer	57.14	61.11	35.71

season; like jute bags, hang on fire places, gottera in and outsides home, sacks and pit. A few farmers store their seed separately from grain where, most of them are store in the same materials with grain**.** Gotera in and outside home have a great roles in all study districts but farmers believe hanging on fire places is keeping seed quality (Table 2). In Ethiopia about 30% of population living below the national poverty line, 44.2% of children under age five suffering from stunting and 82% of population living in rural areas ((Kapur et al., 2011) where the country record annual GDP of 7% ((Friedlingstein et al., 2014) and there is post-harvest loss. The different circumstances of country related with issue of food insecurity definitely calls improvement of post-harvest storage. Inline of this study most of the developing countries farmers store their grain in simple granaries constructed from locally available materials like maize straw, split bamboo/simple turning trees, sacks and pots (Hella et al., 1999) and a study were conducted in kenya reveals that farmers store maize seed in a room of living house, metal silo and traditional storage structures (Nduku et al., 2013) and another study also dictates that farmers use different storage structures like metal bin, plastic sack, super grain bags, earth pot or bin and improved crop storage ((Wambugu et al., 2009). Even though the farmers believe hanging on fire places keep the maize seed quality, the result of survey shows that farmers utilize gotera in and outside homes were shares highest percentages (Table 2). Gotera construction and management has different form at individuals' level.

Common Problem in storage

Farmers store their produces for a maximum of a year but, in case of a seed purpose they store only for a one season in study area. During storage the farmers faces different storage problems that affect quality of their seed and among this challenges farmers faced in storage Insect pests' ranks number one in all districts of the study, whereas disease also influential nearly too insect pest damage (Table 2). A prior study revealed that insect pest were the principal threat for stored maize with losses ranging from 18% for shelled maize, to 20 % for stored cobs and 27% for stored and shelled cobs (Gueye et al., 2013). In study areas farmer believe hung on fireplaces most effective storage techniques to keep seed quality but, in opposite of this study, other study reveals that the highest insect damage recorded on a seed hung on fireplaces (Wambugu et al., 2009). The issue of post-harvest loss influences farmer's varieties preferences as improve varieties boost production but more susceptible to storage pests and choosing traditional variety lower yield but less vulnerable to pests in storage (Ricker-Gilbert and Jones, 2015)

Storage Treatment

Farmers treat their maize seed by drying seed before store and cleaning storage structures, if same previous storage were used. According to the respondent storage infestation by insect, rodents and disease reaction and

they show fewer tendencies to control their product in storage containers and they use same containers repeatedly and they did not care for storage environment, this might be one cause of storage problems as it was observed during survey. In parallel to present study for a storage period longevity seed should be dried to optimum moisture level, less than 12%, cleaned thoroughly and free from trash, insect and microbial damage (K. Parimala *et al*., 2013) and other study dictates farmers treat their maize seed by commercial insecticides or insecticides and also different storage problem resolving methods used by farmers rodenticides, selling produce, traditional storage protectants like neem leaves (Azadirachta indica), pepper (Piper guineense), ash, ash mixed with sand, kerosene, smoke or manure are used (Hell et al., 2000).

Seed Varieties used by Respondent Farmers

During 2016 cropping season farmers produce different varieties of maize but a majority of them did not name varieties on their farm and call landraces. Despite the long list of maize varieties nationally released for different agro-ecological condition, a farmer doesn't identify their preferred varieties due to lack of adaptability information and their awareness. From the varieties utilized by farmers in study areas Pioneer, BH540, BH660, local varieties and MH140 are identified during survey (Table 2). A shortage and low quality formal sources seed distribution were understood and sometimes farmers' savers from crop field failure, as result farmers utilize local landraces which stored under their own storage in study areas. Seed field inspection at different growth stage of plant by regulator body during process of seed production save farmers from purchase of poor quality seed (Setimela and Kosina (ed), 2006) and in contradict to this study other study reveals that about ninety two percent of respondent utilize improved maize seed with fertilizer (Ouman et al., 2014)

Farmers seed sources

Farmers of study area grow diverse crop types for domestic circumstances of such provision of household food security. The alternatives sources of seed for a mix of crops grown are challenging and complex decision-making processes. From the survey made during study the formal sector, through bureau of agriculture contributes about 68.57%, 61.11% and 71.67%, in Bule hora, Abaya and Galana Districts, respectively (data not displayed). Increased demand of seed sources not satisfied by formal seed distribution. Therefore, farmers used informal sources from their own saved seed, market, relatives and Neighbors. This result confirmed with other study that, 80% of the farmers save their own seed for planting while few depend on neighbors, market, and formal seed sector (Mathenge et al., 2012).

CONCLUSION AND RECOMMENDATION

The study was conducted in west Guji Zone Southern Oromia, with objective assessing types of storage techniques used by farmers and to identify effective storage techniques in preservation of seed quality. The survey result reveals that female's household participation in decision making regarding agricultural activities is low. An extension service is the main information sources of maize production in study areas. Hanging on fire places, sack and gotera in or outside homes are the storage techniques or structures used by farmers and they are believe hanging on fire places is keeping maize seed quality , if seed stored for one season. Insect pest and disease are the major challenges of storage and control those problems by drying seed before storage and keeping storage clean for repeatedly used storage. Therefore, from this study pre-storage condition of seed and storage construction to make clear experiment, loss estimation and economic visibility analysis needs the feature attention.

REFERENCES

Abass, A.B., Ndunguru, G., Mamiro, P., Alenkhe, B., Mlingi, N., and Bekunda, M. (2014). Post-harvest food losses in a maize-based farming system of semi-arid savannah area of Tanzania. *57*, 49–57.

Alemu D., Mwangi W., Nigussie M., and Spielman J. (2008). The maize seed system in Ethiopia: Challenges and Opportunities in Drought Prone Areas.

Amsalu, A., and Adem, A. (2009). Assessment of Climate Change-Induced Hazards, Impacts and Responses in the Southern Lowlands of Ethiopia. In Forum for Social Studies and Cordaid, Addis Ababa

Asfa, A., and Adimassie, A. (2002). The Role of education on the adoption of chemical fertilizer under different socioeconomic environments in Ethiopia.

Bishaw, Z. (2004). Wheat and Barley Seed Systems in Ethiopia and Syria.PhD .Thesis Wageningen University.

Friedlingstein, P., Andrew, R.M., Rogelj, J., Peters, G.P., Canadell, J.G., Knutti, R., Luderer, G., Raupach, M.R., Schaeffer, M., Vuuren, D.P. van, et al. (2014). Persistent growth of CO_2 emissions and implications for reaching climate targets. Nat. Geosci. *7*, 709–715.

Gueye, M.T., Goergen;, G., Ndiaye, S., Asiedu;, E.., Wathelet;, J.., Lognay;, G., and Seck;, D. (2013). Efficiency of traditional maize storage and control methods in rural grain granaries: a case study from

Senegal. Tropicultura *31*, 39–46.
Jeffrey H (2004). Seed Processing and Storage. Principles and practices of seed harvesting, processing, and storage.
Hell, K., Cardwell, K.F., Setamou, M., and Poehling, H.-M. (2000). The influence of storage practices on aflatoxin contamination in maize in four agroecological zones of Benin, west Africa. *36*, 365–382.
Hella, K., Cardwella, K.F., Setamou and, M., and Poehling, H.. (1999). The influence of storage practices on aflatoxin contamination in maize in four agro-ecological zones of Benin, West Africa. 2000, *36*.
Kapur, D., Lewis, J.P., and Webb, R.C. (2011). The World Bank: Its First Half Century (Brookings Institution Press).
Lemessa, D. (2003). Ethiopia: Heavy rains in Borana and Guji Zones of Oromyia Region cause critical and potential water problems,. In Forum for Social Studies and Cordaid, (UN OCHA emergencies for ethiopia)
Mathenge, P.W.., Auma, E.O., and vanRheenen, H. van (2012). Constraints to On-Farm Maize (Zeamays L.) Seed Production in. Western Kenya. ISRN Agron.
Murdolelono B, and Hosang E (2009). Effect of Storage Techniques on Quality of Maize Seeds of Lamuru and Local Varieties in East Nusa tenggara1). 11.
Nagash, R. (2007). Determinants of adoption of improved haricot bean production package in Alaba Special woreda, Southern, Ethiopia. (Haramaya University), p.
Ouman, J., Eric E. Roos, and Patrick Mbataru (2014). Drivers of adoption of Improved Maize varieties in Moist Transitional zone of Eastern Kenya. Www.liste.
Ricker-Gilbert, J., and Jones, M. (2015). Does storage technology affect adoption of improved maize varieties in Africa? Insights from Malawi's input subsidy program. Food Policy *50*, 92–105.
Setimela, P.. and, and Kosina (ed), P. (2006). Strategies for Strengthening andScaling up Community-based Seed Production. DF CIMMYT.
Stroud, A., and Mekuria, M. (1992). Ethiopia's Agriculture Sector an overview. CABI Wallingford UK 9–27.
Tiruneh, A., Mwangi, W., Verkuijl, H., and T, T. (1999). Gender differentials in adoption of Improved wheat varieties in Ada, Lume and Gimbechu woredas of the central highlands of Ethiopia. CIMMYT 31–38.
Walelign, G. (2008). Determinants and role of farmers' seed and seedling multiplication in the SNNP region seed system. MSc Thesis Haramaya Univ. 68.
Wambugu, P.W., Mathenge, P.W., Auma, E.O., and Rheenen, H. van (2009). Efficacy of traditional maize (Zea mays L.) seed storage methods in western Kenya. Afr. J. Food Agric. Nutr. Dev. *9*.
Nduku;, M, T., De Groote;, Hugo and Nzuma;, and M, J. (2013). Comparative Analysis of Maize Storage Structures in Kenya. CIMMYT.