Assessment of on-farm storage of seed grains in dryland areas of Kenya in the light of grain market liberalisation

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Abstract

Retention of grain seeds by farmers in Kenya is not well documented. Nor have the effects of grain market liberalisation on seed storage been addressed. A survey was therefore done in different agro-ecological zones (AEZs) in dryland areas of Eastern Kenya, using participatory and individual interview methods Using a checklist, 9 groups and 18 individual farmers were questioned. Results revealed the importance of on-farm seed storage, irrespective of AEZ. Reasons given for use of own seed included faith in its quality, security, and lack of cash to buy certified seed, unavailability and adulteration of certified seed and drought tolerance of local varieties. Methods used to protect seed included insecticides, ash and botanicals, such as sodom apple. The effectiveness of botanicals requires verification. Sodom's apple was also used as a security measure to prevent seed consumption during famine periods. Maize market liberalisation had less effect on seed storage than on maize traded for food. Food maize was suitable for consumption but not for seed. Incoming food maize depressed local prices making it more affordable for consumers. However, lower prices made the production of locally grown maize uneconomic for producers. Farmers expressed the hope that ending the monopoly in production of seed and increasing competition between companies would improve the quality and availability of certified seeds.

Introduction

In Kenya, most grain seeds except maize are derived from previously harvested grains This is not unique in this country as Delouch (1982) showed that 80 per cent of seed planted in developing countries continues to be derived from the farmers own saved seeds. It has also been observed that majority of farmers who are resource-constrained or live in lower potential zones are left with little chance but use of own saved seeds. Wright et al. (1989) observed that local maize varieties were favoured more by farmers for their own use due to their superior storage characteristics compared to high yielding varieties. This observation is well reflected by farmers living in dryland areas of Kibwezi, Makueni and other low potential zones who are known to have retained some traditional maize varieties. These varieties have over the years been interplanted with certified seeds and their purities ought to be investigated. Knowledge of how these maize seeds and other grains have been retained from one season to the other is not well documented. Moreover, reliable information on storage practices of these grain seeds over time without loss on viability is again not documented.

It was therefore found important to carry out a participatory rural appraisal (PRA) to solicit and document farmers views on storage practices of own seeds and reasons behind this practice. The information gathered would be expected to come up with gaps that may require interventions from the researcher/extension staff to supplement or complement the farmers' seed storage practices.

Preliminary Surveys

A one-week preliminary survey was carried out in the month of August to map out the agro-ecological zones where group interviews would take place. This task was carried out in collaboration with field agricultural staff of Machakos, Makueni, Kitui and Mwingi Districts. A visit to Garissa to solicit views from Provincial Agricultural Officer was also planned The extension staff was to organise group interview of farmers within the selected agro-zone (AEZ) made up of about 15 individuals of mixed gender. Selection of individual farmer for interviews within the same zone to try to collate group interviews was done on ad hoc basis to try and eliminate bias.

Survey areas

Machakos/Makueni Districts mainly consists of hills and small plateau while Kitui is made of undulating plateau surmounted by ridges and hills. As shown in Figure 1, the following different agro-ecological zones (AEZs) were selected for the survey:

Districts divisions

Machakos – Kathiani (LH2), Kangundo (UM3) and

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Mwala (UM4)

Makueni – Kibwezi (LM5), Makueni (LM4)

Kitui – Kabati (UM3), Chuluni (LM4) and Yatta (LM5)

Mwingi – Ngunyi (LM4/LM5)

Zone classification was based on Ministry of Agriculture and Livestock Development and Marketing (MOALD&M) Farm Management Handbook of Kenya. The classification of these zones depends on meeting the temperature and water requirements of the main leading crops ie climatic yield potential. In specific terms these zones can be defined as follows:

Lower Highlands – The sub-humid wheat/maize-pyrethrum (LH2) and semi-humid wheat/maize-barley zones (LH3)

Upper Midlands – Semi-humid marginal coffee (UM3) to sunflower-maize (UM4) and livestock-sorghum zones (UM5)

Lower Midlands – Marginal cotton (LM4) to the semi-arid livestock millet (LM5)

The survey was carried out between 9/9/96 and 21/9/96.

For each agro-ecological zone a group of farmers were interviewed using the checklist and a minimum of two farmers randomly seen and interviewed individually on the farm. A total of 9 groups of farmers and 18 individual farmers were altogether interviewed. For group selection, the Division extension staff was requested to minimise bias by selecting any farmer within the AEZ and not necessarily the contact farmers. In certain instances, the extension staff since they had our schedule planned to slot us in groups that were meeting for other agricultural activities on the same dates.

Since there were a lot of similarities in most of the issues (points) covered in the checklist an attempt has been made to tackle each issue as a sub-title in all the agro-ecological zones.

This report summarises information gathered during the survey combining views expressed in the groups as well as that derived from individual farmers.

Survey Findings

Cereals and pulses grown in AEZs

The common cereals found in surveyed areas in order of importance were maize, sorghum and millet. Certified seed maize consisted of 511 and 512 in higher areas of Machakos District. For other AEZs Katumani and Makueni composites were commonly grown alongside local varieties referred to as 'kikamba', 'kinyalili', 'kinyanya' etc in local dialect. For pulses, beans, cowpeas, pigeon peas, dolichos and field beans (small quantities) were grown mainly for food and cash. Green grams was mainly grown for cash.

For the purpose of this report these crops will be divided broadly into individual cereal and pulse crops for discussion. Own maize storage seemed to have generated a lot of information from enthusiastic groups and will be highlighted in this report.

Maize

Identification and selection for own seed

Even though there were a few differences in maize seed selection the common practices within the various groups were:

- To identify and mark in the field early maturing plants with big cobs. This is done by cutting the tussle or tying leaves around the cob for ease of identification.
- Others select only big cobs from the 2nd and 3rd node of maize plants The cobs have also got to be healthy and full of grains. A common observation within all the groups except in Mwingi was that only middle grains in the cob were used as seed. Unlike the others, farmers in Mwingi use all the grains on cob.

Reasons advanced for use of middle grains by various groups were:

- Grains at the tip has little water while the one at the base has taken excess water Middle grains has optimum amount of water.
- Grains at the top and base are not vigorous in growth and ends up with poor quality stems and tiny grains
- Top layers has small seeds that produces small and weak stems while base layers are compact thereby affecting the endosperm resulting with production of weak stems Selection of these seeds was either done in the field during harvesting or in store.

How are these seeds processed and stored

The common practice within the groups was to dehusk cob maize, shell, treat and store. A few farmers were found to be practising the traditional method of hanging husked cobs on top of the fireplace to reduce pest attack through smoking However, this was only currently occurring in areas free of larger grain borer (LGB) Prostephanus truncatus (Horn)

After shelling, the seeds were stored in bags, pots, gourds or plastic containers. These are eventually placed in houses or outside stores. Sisal and jute bags are preferred than polypropylene ones due to grain heating in the latter. Gourds corked and sealed with cowdung can store seeds clean for a duration of 6 months to 1 year without any treatment.

Some farmers also use seed dressers such as murtano, marshall during storage or before planting

Who Manages Seed Storage

Women are mainly the ones involved in the management of seeds. One of the factors that has attributed to this bias is due to most men being away from homes either in towns or elsewhere eking out a living for their families.

In situation where the couples are on the farm, both are

involved in this activity. In one instance a farmer informed us that in selection of maize seed, the husband has finally got to give the final word before shelling and storage commences.

When did own seed begin? Has it increased or decreased and if so why

Own maize seed storage is as old as most of the farmers can remember. They found their ancestors carrying out the practice which they have also embraced. To most of the farmers, this has evolved as one of their traditional or cultural practice within the household farming system.

Some groups insisted that the practice have decreased due to frequent famine within these areas forcing them to purchase seeds from markets or government handouts Others said that the practice had increased owing to the high cost of certified seeds which has become unaffordable.

More reasons cited for the increase or decrease of own seed storage are similar to the ones expressed in the sub-subject of '*Reasons for use of own seed storage compared to certified seeds*'

Reasons for use of own seed storage compared to certified seeds

The following are the unranked but similar reasons put forward among the groups for continued use of own seeds:

- trust, yield and profit
- security-available during onset of rains
- timely planting not affected
- certified seeds unavailable when required-results in late planting eg GTZ project in Mwingi is proposing a project to use a few farmers to bulk Katumani and pulse seeds, sell to stockists who would eventually seed dress and resell them to the rest of the farmers.
- do not trust certified seeds due to adulteration-Have experienced instances particularly after the famine of early 1990s when they were supplied certified seed different from that indicated on the packages. These seeds were meant for high potential areas making the farmers to lose the whole crop NGOs had supplied these seeds. Government should take deterrent measures to avert this recurring problem.
- lack of cash to buy certified seeds
- local varieties yield better than composites
- local variety more drought resistant
- not seriously attacked by insects as makueni and katumani composites
- not destroyed by squirrels as composites
- must at all times replenish own seed even after famine irrespective of the cost or distance covered to get it

Source of funds to purchase seeds

In case of famine most farmers consume maize meant for seeds, and are later forced to sell their livestock to get cash for the procurement of local and certified seeds. Others depend on remittances from working husbands and/or children and hired labour. In highland areas eg Kangundo or irrigated areas of Kibwezi , they source funds through the sale of horticultural crops.

Occasionally, prolonged droughts do occur leaving most farmers with no source of cash to purchase seeds. The government and Non Governmental Organisations (NGOs) therefore stepped in to donate seeds to needy farmers. The social set up between the communities also allows those without own seed to solicit some from relatives and neighbours.

Pests attacking seeds during storage

Weevils and moths are the commonest pests infesting stored seeds. From their description *Sitophilus* species and the larger grain borer cause a lot of damage not only to seed maize but also that meant for food.

The farmers also indicated that LGB also referred to as 'tutu' (mill grinder) was also capable of attacking smoked maize unlike other insect pests they had lived with.

Rats were rated as the next problem in maize destruction after the insect pest followed by squirrels and finally theft.

Control methods. Are they effective

Most groups interviewed claimed that they use storage chemicals and even mentioned the common ones being used as malathion and actellic super (pirimiphos methyl/ permethrin)

Cultural methods such as the use of ash and smoking is commonly practised except in LGB infested areas due to its ineffectiveness.

Chillies are also used to preserve stored seed. Besides protecting grain against insect pests, chillies also prevents rats from attacking seed grains.

In Chuluni Division, the farmers use sodom apple/chillies powder concoction which they claimed effectively controls insect pests, rats and squirrels. In addition this concoction serves as a security measure since nobody can consume these seeds even during famine due to presence of sodom apple which is considered toxic. Similarly, seed dressers are also used by certain farmers for same purpose of seed security.

Botanical plants used for control were mexican merigold to repel insects and lantana camara dust (from ground leaves) admixed with grain.

For the control of rats, traps and cats were commonly used. Poison baits though used by a few farmers were less preferred due to accidental poisoning of non-targeted animals eg chicken.

What are the constraints to seed storage. Rank them Where are pests ranked

Although there was a bit of variation in ranking of these constraints in various groups visited depending on AEZs, overall, insect pests were highly ranked in all the groups followed by rats/squirrels/monkeys, termites and finally famine.

Is use of own seeds versus certified seed grains due to lack

of information dissemination from extension staff, media, neighbours or others

Awareness on the use of certified seeds is available from extension staff of MOALD and stockists but owing to prohibitive prices, farmers resort to the use of own seeds.

In addition, they put more trust to their traditional varieties. Again, Katumani and Makueni composite lack at certain times of the year, thus, not dependable.

Any role by weather in determination on use of own seed

The general agreement between various groups was that local variety is more droughts resistant compared to composites. To avoid the risk of losing a crop in case of less rain than expected, most farmers divide their farms such that in one part they grow katumani which matures faster (security crop preceding famine), then local and Makueni in the other due to their higher yields.

Any role of grain seed market liberalisation on use of own seed

The area under study is a food deficit one with little surplus since most farmers grow maize for subsistence. Liberalisation of grain market both as food or seed may not have much effect on growth of maize in the area.

Besides, the communities within the AEZs covered claimed that they prefer the varieties grown within as they produce better 'muthokoi' (staple food from maize) than incoming maize.

Moreover, maize from outside these Districts can only be used for food but not seeds since its sourced from high potential maize growing areas However, they expressed their hope that competing grain seed companies would be welcome as most of them have lost confidence with current certified seeds due to the adulteration of the early 1990's.

With or without certified seeds they claimed that they would continue using their own seed for the various reasons given before.

* Group interviews in Mwingi brought to light that the farmers of Ngunyi Division have not been growing maize except for the last two years. Their main food crop were sorghum, millet and cowpeas.

Sorghum and millet

Seed selection

For sorghum, big panicles with big grains are selected while for millet big heads are picked. Other farmers do not select but use a portion of the harvested produce for seed

Pest control and storage

Similar protectants as those discussed in maize are used except sodom apple powder. Smoked panicles or heads above the fireplace can remain even 2 years without any insect damage according to farmers' observation over the years.

Insects attacking sorghum similar to those described in maize. Both cereals are stored in bags, outside stores 'kiinga', gourds and other containers

It is important to mention that the amount of sorghum and millet grown in areas where the PRA took place has drastically reduced due to labour constraints. The children who used to scare away birds are no longer at home but in schools Unless most farmers are encouraged to grow the crop so as to apportion loss due to birds, its unlikely the production will rise.

Pulses

Beans

Seed selection: Different varieties of beans were found in various AEZs such as GLP 11, rosecoco, mwitemania, nyayo etc. Selection of these bean varieties varied from one area to the other. Some were found:

- harvesting big plants with big pods separately, spreading them on the ground and carrying out further selection of big healthy grains.
- selecting big grains with uniform colour in all the varieties.
- after harvest, select disease free, big long pods.
- not selecting but threshes and uses part of the harvest for seeds.

Beans uncommon in Mwingi District.

Pest control and storage: Protectants used are similar to those outlined for maize in the sub-subject of 'Control methods. Are they effective?'

Storage is also similar to that described under maize in the sub-subject of '*How are these seeds processed and stored?*' except smoking. Farmers in Kathiani Division do not see any justification for chemical usage as quantities of beans are too low. Besides, being a high altitude area bean bruchid is not a big problem.

Pigeon peas and cowpeas

Seed selection: For pigeon peas, they identify early maturing plants which are then marked Those with long pods and not less than 6 grains are harvested separately for seeds. During winnowing, lighter grains are blown away by winds thus leaving the healthy heavier ones which are stored as seeds.

In cowpeas all the varieties (K66, M66 etc), longer pods with 16 or more grains are selected. In Yatta Division, farmers do not carry out any selection.

Pest control and storage: Bruchids are the major pests. The grains are protected from these pests using storage insecticidal dusts.

Many farmers claimed that storing both grains in chuff after winnowing confers protection until seeds are required for sowing. Cowpeas are also stored in pods which drastically reduces bruchid attack.

Storage of these grains is similar to that described in the sub-subject of '*How are these seeds processed and stored?*' except smoking on top of fireplace.

Views from Garissa Provincial Director of Agriculture

Maize hybrid such as 511 and 622 are the recommended varieties grown under irrigation around Garissa Pwani hybrid are also grown. These varieties are mainly sourced from Drought Recovery Programme, thus no need for own seed storage. In southern parts of Garissa and Wajir Districts, there are communities who are semi-agriculturalists and pastoralists. They preserve their maize by hanging it unhusked inside houses.

Sorghum grown under rainfed condition is stored unthreshed 2 metres under the ground in pits for food as well as seed.

Conclusion and Recommendations

This survey clearly documents the importance of own seed storage within the communities under the study area irrespective of the AEZs The value they attach to their own seeds be they cereals or pulses demonstrates the understanding gained over the years on how to reduce risks arising from unpredictable weather conditions in these arid and semi-arid areas. A good example of this is in maize where the groups interviewed indicated that they plant different maize varieties ie certified and local in different plots to avert total crop failure In case of very short rain period, they can harvest katumani variety whereas with rains interspersed with dry spell local varieties would survive. This shows the innate cultural experiences acquired over time that ought to be highlighted.

Adoption of insecticidal usage besides other cultural practices was found to be more pronounced in Kathiani, Kangundo, Mwala and Kabati.

Another aspect is the various ways they have adopted in the control of insect pests without using conventional insecticides The effectiveness of these methods have not been verified nor the toxicity of some of the natural products like sodom apple. This is an area that would require further assessment or investigations particularly on residues of sodom apple because even though they indicated that its use was to prevent consumption of these grains during famine, some farmers do wash and consume them in case of prolonged famine.

On-farm trials combining farmers methods of protection and conventional ones to show the most effective protectants for seed grains would be important. Based on results coming out of these trials, demonstration on the farms would help the farmers to make a choice on the one(s) to use depending on their resources.

Improving on storage methods to meet the farmers needs should also be looked into with inputs from the farmer, researcher and the extension staff.

Through the integration of these post-harvest methods on seeds, the farmer may finally be able to maintain clean viable seed grains from one season to the other and avoid problems of late planting as among one impediments to the farming system.

Future Research

i) Verify the effectiveness/toxicity of some of the natural grain protectants that are currently being used by farmers compared to conventional ones

ii) How to improve on-farm grain seed storage in view of increasing quality and viability.

iii) Carry out this work in form of adaptive research involving all stakeholders.

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