EAGC

EASTERN AFRICA GRAIN COUNCIL

BEST PRACTICES IN CLIMATE CHANGE MITIGATION AND ADAPTATION IN THE GRAIN VALUE CHAIN

Climate & Development Knowledge Network

This work was carried out with the aid of a grant from the Ministry of Foreign Affairs of the Netherlands and the International Development Research Centre (IDRC), Canada, as part of the Climate and Development Knowledge Network (CDKN) Programme. The views expressed herein do not necessarily represent those of the Ministry of Foreign Affairs of the Netherlands, or of the International Development Research Centre (IDRC) or its Board of Governors, or of the entities managing CDKN.

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FORWARD

With many farmers in Sub-Saharan Africa being particularly vulnerable because of high reliance on rain-fed agriculture instead of irrigating, after the March-April-May and October- November-December season, the weather becomes too dry to support growing crops. On the other hand, every year, farmers need to produce enough food from their harvests to feed their families in between cropping season as well as strive to achieve a surplus for trade to generate some income to improve their livelihoods. On the positive side, in some of the cropping seasons, farmers have enough grain left over to sell as income, but when crops fail, some families often experience a "food shortage" period of meal skipping and substitution until the next harvest season.

As time goes by, therefore, every year has its challenges primarily attributed to climate change, with farmers now facing greater difficulties from three main threats. Extreme weather, for instance, has been manifesting in several ways -- droughts, floods, severe storms, among others. Such weather events are expected to increase in frequency as the Earth's atmosphere continues to warm. The scientists state that farmers in Eastern and Southern Africa are already experiencing the effects where a case in point in 2016, the region saw the most severe drought in decades, which dramatically reduced harvests and left many households hungry.

Pests and diseases have been another main threat to farmers where changes in temperatures and moisture conditions have been noted to allow crop diseases and pests infestation into new areas. Recently, Sub- Saharan Africa has been witnessing the spread of fall armyworms, an invasive caterpillar that can devastate maize yields when left unchecked. Even though we are unsure of the cause of this outbreak, some scientists have linked its spread with climate change.

Thirdly, average global temperatures are expected to rise over the coming decades resulting in hotter temperatures in the long term, leading to desertification and smaller harvests in Sub-Saharan Africa. As such, farmers in Sub-Saharan Africa will need to be exposed to the best practices in crop production and postharvest management as an effort towards maximizing yield for them to reap the most out of their hard work on the farms. A lot of stakeholders and institutions have invested in research on these best practices. However, the information is available in bit and pieces, and so far, no one-stop point at which farmers can get the consolidated information to inform effective action and adoption.

This publication focuses on centralizing the information on the ten best practices in climate change mitigation and adaptation for increased crop production and reduction of postharvest losses among grain value chain stakeholders. It heavily borrows from EAGCs expertise in facilitating an Efficient, Structured, Inclusive and Profitable Grain Trade in Eastern Africa and beyond as well as from other think tanks in the industry to ensure that the information is availed in one communication piece to guide the grain value chain stakeholders. The publication will be widely utilized to build the capacity among the three million smallholder farmers that EAGC works within the Eastern Africa region, over 600 business in the grain value chain who are members of EAGC as well as the grain value chain industry as a whole. It is expected that the knowledge, technologies and innovations herein will contribute towards a positive change in building climate-smart grain value chains in the grain sector.

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ACKNOWLEDGEMENT

EAGC would like to thank the following for making this publication possible

- Grain value chain stakeholders who participated in the value chain needs assessment conducted by EAGC in 2020 which identified the best practices in this publication as very key aspects in developing climate-smart value chains.
- Climate Development & Knowledge Network (CDKN) for providing core financial support to EAGC.
- The IGAD Climate Prediction and Application Centre (ICPAC), Kenya National Disaster Management Authority (NDMA) and Uganda Ministry of Agriculture, Animal Industry and Fisheries (MAIFF) for the partnership and contribution of knowledge and expertise during the value chain needs assessment which led to the identification of the various key practices discussed in this publication.

INTRODUCTION

Climate change, food security, economic development and environmental degradation, and climate change lie at the heart of many fundamental global challenges faced by the human population. The most crucial humanitarian goal is feeding a world population projected to expand beyond nine billion persons by 2050. To meet the ever-increasing food demands associated with the growing population and income levels, total food production of 50 per cent or more will be crucial. Agriculture employs 2.6 billion people worldwide and accounts for 20 to 60 per cent of the gross domestic product of many developing countries, forming the backbone of rural economies, contributing to local employment, and ensuring food security for poorer populations.

Climate change has lately disrupted food availability, reduced access to food, and affected food quality. For example, projected increases in temperatures, precipitation patterns, changes in extreme weather events, and reductions in water availability have been resulting in reduced agricultural productivity. Therefore, it is important that stakeholders in the agricultural value chains embrace best practices in climate change mitigation and adaptation to develop climate-smart value chains.

In the grain sector, climate change has had detrimental impacts on the environment resulting in Post-Harvest Losses of grains estimated at 30-40% globally through increased infestation by storage insects, growth of moulds /mycotoxins and accelerated rotting of grains leading to poor quality of stored grain. According to Suleiman & Laswai (2018), climate change favours the growth and development of toxigenic fungi and increases the population dynamics of the stored insect pests.

Additionally, the grain sector value chain has been faced with climate change-related challenges from farm to fork. This is because the sector players lack information, especially with regards to climate change. Grain farmers produce the same food crops that were being produced several years back without considering climate change, which has increased the demand for the production of climate-friendly crops to realise better yields and better incomes to improve their livelihoods. Access to credit among the farmers, especially women farmers, has been very low, while the financial institutions, on the other hand, have shied away from providing grain production and trade financing due to lack of information on weather and climate change for informed trade financing decisions for the sector. As a result, the sector has limited investment due to the weather and climate-related risks associated with grain production, storage and marketing, such as warehousing, value addition and processing.

This publication aims at addressing these challenges by availing the much-needed information to promote the application of best practices in grain production, PostHarvest Management and market access for food security. It will provide solutions to the key stakeholders whereby adopting best practices, grain farmers, including women, will use appropriate seed and agricultural inputs to produced better quality and quantity of grain. Besides, they will use climate information to prepare the land and plant at the right time. Financial institutions will make informed grain sector financing decisions where women farmers will be able to access credit or crop insurance to increase grain production. Similarly, to promote best practices in grain storage, the publication is expected to promote investment in climate-smart storage facilities and infrastructure such as warehouses. EAGC will aim to certify these warehouses so that all the grain aggregated and stored in the facilities meets the EAGC standards to fetch better prices compared to poor quality grain. This will in turn, promote structured grain trading systems, increased investment, including women operated certified warehouses.

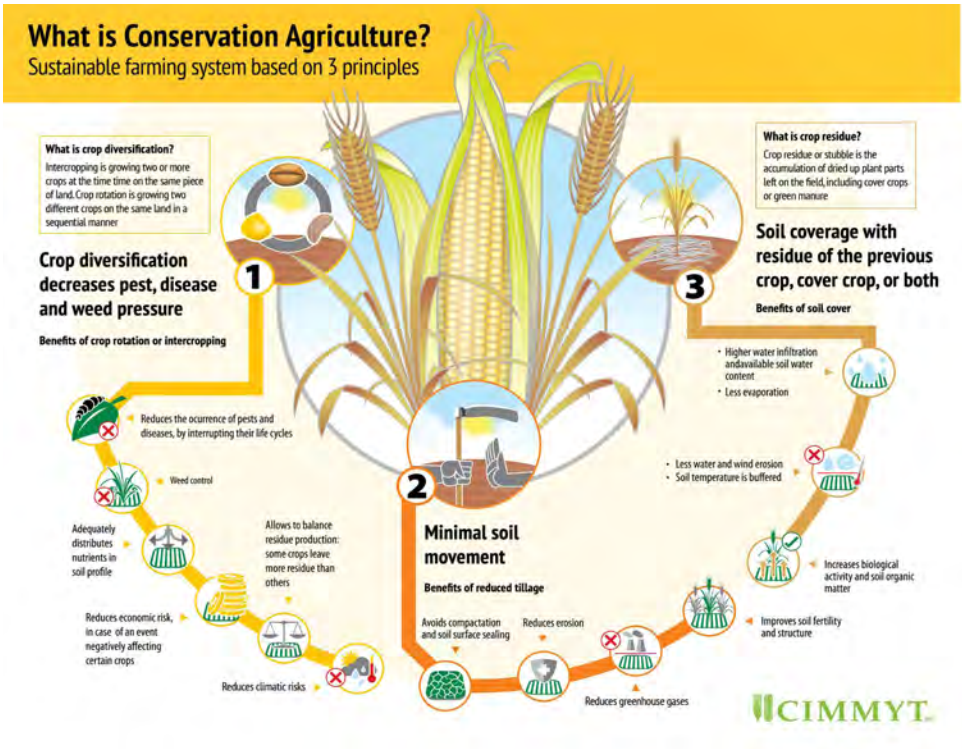
EAGC, in partnership with The Climate and Development Knowledge Network (CDKN) have therefore developed this booklet as a guide to agricultural stakeholders, with a bias to the grain value chain actors on TEN best practices in climate change mitigation and adaptation.

CHAPTER ONE

Climate Smart Grain Farming Methods

Conservation Agriculture (CA)

Conservation Agriculture is a farming system that promotes minimum soil disturbance (i.e., no tillage), maintenance of a permanent soil cover, and diversification of plant species. It enhances biodiversity and natural biological processes above and below the ground surface, which contribute to increased water and nutrient use efficiency and to improved and sustained crop production.



Challenges in adopting CA

CA provides many benefits for farmers and the environment, farmers can face constraints to adopt these practices. Wetlands or soils with poor drainage can make adoption challenging. When crop residues are limited, farmers tend to use them for fodder first, so there might not be enough residues for the soil cover.

Benefits of Conservation Agriculture

- Zero-tillage farming with residue cover saves irrigation water
- It gradually increases soil organic matter and suppresses weeds,
- CA reduces costs of machinery, fuel and time associated with tilling.
- Leaving the soil undisturbed increases water infiltration, holds soil moisture and helps to prevent topsoil erosion.
- Conservation agriculture enhances water intake that allows for more stable yields in the midst of weather extremes exacerbated by climate change

Important guide to farmers on CA:

- To initiate conservation agriculture, appropriate seeders are necessary, and these may not be available or affordable to all farmers.
- Conservation agriculture is also knowledge intensive and not all farmers may have access to the knowledge and training required on how to practice conservation agriculture. Finally, conservation agriculture increases yields over time but farmers may not see yield benefits immediately.

TESTIMONIALS ON THE BENEFITS OF CONSERVATION FARMING

Joyce Njeri, Majani Farmers Cooperative, Laikipia Kenya

The Majani farmers cooperative benefitted from the training on Climate Information interpretation and application in July 2020. Joyce Njeri is one of the leaders of the Majani Cooperative group and has adopted conservation Agriculture practices including water holding trenches, water pans, small scale irrigation, zero-tillage and terracing among others. Joyce narrated how she has successfully adopted conservation farming and the benefits realizes from the practices. The main technologies adopted in her farm are:

(i) Trenches

The water trenches are small one metre wide by 30 centimetre long troughs prepared across the entire crop field for the purpose of water harvesting and as a fertility trench. Joyce explained that she applies manure and fills the troughs with water and plant the crop on the lower side of the trough since the field has a small elevation. The troughs are beneficial as they eliminate run-off during the rains and retains water for a longer time. It is also possible to apply mulch on the trough to reduce water loss through evaporation.

(ii) Small scale irrigation

Joyce has a waterpan in her farm dug by herself and her Sons. This is what she told EAGC team "One day I was walking on my farm and found a section where water was oozing from the ground. I took a hoe and dug a small hole and the water filled the hole quickly and I decided to dig a water pan there. The next day I told my sons that I could give them some work to dig the waterpan and pay for their labor and they agreed so they dug the pan. The pan has good amount of water and I use a diesel driven pump to lift the water into a tank placed at the crop fields which is used to water seedling nursery bends and also the water is pumped directly and used to irrigate the field crop by filling the already prepared water holding trenches.

Joyce heavy yielding squash (Courgettes) crop in the Conservation Agriculture field

Peris Wairima, Kangumo Youth G-hub, Muhotete, Laikipia County, Kenya

"I started using conservation agriculture in my farm in the last 3 years and I have witnessed a lot of change. Previously, when I used to use conventional farming methods i would plough my field in preparation for planting. When it rained all the topsoil would be swept away resulting in poor crop performance and low yields. Upon changing to Conservation Agriculture, I no longer plough the land. During the land preparation, I slash the weeds and use a hire chisel to cut furrows in the field where I drop fertilizer and seeds. During the crop growing stages, I use herbicides to kill the weeds. This practice has been beneficial as it prevents soil erosion and retains the soil nutrients and water resulting in a better crop and increased yields. Since I adopted Conservation Agriculture my maize yields increased from 15 bags (90 kgs bag) to 25 bags.

Beth Wairima, member Kangumo Youth Farmers, Muhotetu, Laikipia County, Kenya

"My name is Beth Wairima from Kangumo Youth Farmers and I would like to explain the benefits I have realized from applying Conservation Agriculture practices. I started using conservation agriculture in my farm in the last three years, and I have witnessed a lot of change. Previously, when I used conventional farming methods, I would plough my field in preparation for planting. Then when it would rain all the topsoil would be carried away, and the crop would perform poorly and produce low yields. Upon changing to Conservation Agriculture, I no longer plough the land. During the land preparation, I slash the weeds and use a chisel to cut furrows in the field, where I drop fertilizer and seeds. During the crop growing stages, I use herbicides to kill the weeds. This practice has been beneficial as it prevents soil erosion and retains the soil nutrients and water resulting in better crop performance and increased yields. Since I adopted Conservation Agriculture, my maize yields increased from 15 bags (90 kgs bag) to 25, 90kgs bags. Due to the success I have achieved with the zero -tillage methods, neighbouring farmers have been visiting my farms to learn. One of my neighbours who has been using conventional methods of ploughing learnt from our farm last year and applied zero tillage this year and has a good maize crop in their field this season."

CHAPTER TWO

Increasing Grain Productivity

Climate Resilient Seeds

In the midst of rising drought impacts in the Eastern Africa region and with farmers eager to plant their seed for the next cropping season, it is recommended that farmers shift to planting stress-resilient varieties, like early maturing varieties that need 90 to 95 days to mature, instead of over four months for late-maturing varieties especially for maize. Seeds of such early maturing varieties are available from seed companies and agro-dealers operating in grain-growing areas.

Estimates suggest that 60%-80% of the seeds on which smallholder farmers in developing countries depend is saved on farm or obtained through informal distribution channels, such as exchanges between farmers, community sharing systems, and local markets. According to Biodiversity international, women, farmers play key roles in farmer seed systems, although they are often overlooked by researchers and development personnel, policies, and programs. This high level of seed autonomy among farmers masks the fact that, almost everywhere, local seed systems are under stress. Agricultural intensification and commoditization, privatization of natural resources, and the strong concentration and expansion of corporate power in the life science industries (including the seed industry) contribute to a decline in the collective local management of plant genetic resources for both conservation and sustainable use.

Many farming households have become more individualized in terms of decision-making and deployment of knowledge, labour, capital and seeds. Traditional seed exchange relationships have become weaker in many areas. Farming practices are becoming more market-oriented, and this increased involvement in markets has both benefits and costs depending on the local context. Large-scale rural-to-urban migration contributes to a decline in farming in many countries or transforming small-scale family farming into contract farming. It is also leading to the feminization of agriculture, increasing the workload and responsibilities of women in many regions. These trends affect local seed production, selection, storage, distribution, and exchange practices, for example, through substitution of local varieties with hybrids that can be easily purchased at local markets. Climate change has begun to put additional pressure on farmers' seed and food production systems and on the multiple functions that they fulfil. Although in many areas, farmers continue to maintain crop diversity, a significant reduction in the number of crops and area planted is occurring. Findings from the field point to a decline in the diversity of local varieties in many countries.

Future impacts of climate change are expected to become more pronounced in many parts of the world, forcing farmers to change their practices and causing them to search for information about crops and varieties better adapted to new weather dynamics.

EAGC, through the Grain Trade Business Hubs, collaborates with agricultural input suppliers, among them seed companies and active breeders. Farmers can access certified climate-resilient seed varieties through the facilitation provided by EAGC.

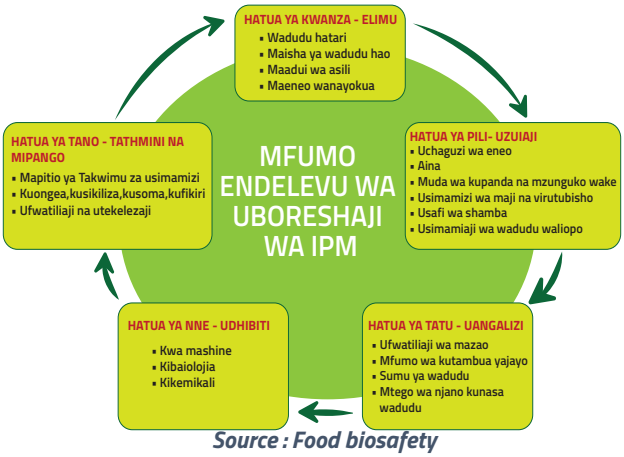
Jane Njoki's testimonial of the drought tolerant maize variety

In the MAM season 2020, Jane Njoki reported to the EAGC team that she adopted a new early maturing maize variety which she planted in one acre of land. This is her story as recorded by Penina Gichuru M&E Manager on 24th November 2020.

"This season, I planted a new variety of maize DC 890 which is early maturing. I planted one acre of the variety while in the other two parcels of land, I planted the conventional varieties I have grown before: HB624, HB628 and HB6213. This new variety grows fast and matures within a short period and, therefore, can yield some produce during periods of low rainfall, hence "Ni ya kuokoa mji" meaning "it is for saving communities". The maize planted in April matured two months earlier than the other two varieties. It was harvested in September to early October, while the other varieties were harvested in November and December. The crop performed well, and though I have not threshed the maize, I estimate I will get 15 bags from that acre. This is a good yield considering that the field has heavy cotton soils not known to support good crop yields. During the crop growing period, my neighbours were amazed at how fast the crop grew and came to inquire about the variety- which variety and source of seed. I shared the information since I had preserved the seed package and expect more farmers to grow the seed in the coming season".

Integrated Pest Management Practices (IPM)

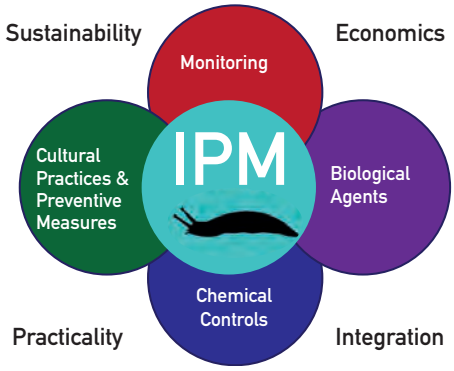
Integrated pest management (IPM) combines the use of biological, cultural and chemical practices to control insect pests in agricultural production.It seeks to use natural predators or parasites to control pests, using selective pesticides for Backup only when pests are unable to be controlled by natural means.



Source : Food biosafety

a. **Cultural control** is the non-chemical management of pests using manual or mechanical means to change the soil and crop environment to discourage pest establishment.
b. **Biological control** is where predatory or parasitic insects and mites known as 'beneficials' or 'good bugs' help to control chewing and sucking insects that affect the quality and productivity of crops by killing them or disrupting their breeding cycle.
c. **Chemical control** involves the use of pesticides in the management of pests.

NOTE: It is used in IPM when biological and cultural control has not been enough to protect the productivity of the crop. Where chemical control is required, farmers are advised to use selective insecticides which target the pest, leaving the beneficial population unharmed.



Source: Oregon State University

Efficient Water Use

Water Saving Technologies

Water is the most important factor for proper and healthy production of crops. Plants require huge quantities of water continuously during their life. It deeply impacts photosynthesis, respiration, absorption, translocation and utilization of mineral nutrients, cell division and many other vital processes.

- Water use efficiency is the ratio of the water used effectively to irrigate the crops (water used by the crops) and the water entering the irrigation scheme.Not all water withdrawn reaches the root zones of the plants, since part of it is lost during conveyance and in the fields. The reasons of this water loss through conveyance are numerous; it can be evapotranspiration, deep percolation to deeper soil layers, seepages, overtopping, bushes and weeds, runoffs, leakages and cracks, deteriorated hydraulic structures, etc.
- Some of the reasons can be effectively addressed by water use efficiency measures such as the maintenance of hydraulic structures, the lining and profiling of canals or the control of water supply.
- In addition, significant water losses can occur in the field if farmers do not take preventive actions. Surface runoff and deep percolation to soil layers below the root zone are the most common form of on-farm water losses.
- Water saving fertilizer is recommended for farmers as a best practice in efficient water management.

CHAPTER THREE

Pre and Post Harvest Aflatoxin Management Practices

Pre-Harvest Aflatoxin Management Practices

Aflatoxins are poisonous substances produced by certain kinds of fungi (moulds such as Aspergillus flavus fungus) found naturally all over the world. They can contaminate food crops and pose a severe health threat to humans and livestock. Aflatoxins also pose a significant economic burden, causing an estimated 25% or more of the world's food crops to be destroyed annually.

The fungus can be recognized by a grey-green or yellow-green mould growing on maize kernels in the field or in storage. Plant stress due to drought, heat or insect damage during fungus growth usually increases aflatoxin levels.

Climate Smart Practices in Aflatoxin Management and Control

Use of Aflasafe

Aflasafe is a natural biocontrol product that farmers use to control aflatoxin contamination in crops such as maize and groundnuts. It is an environmentally friendly granular formulation of native atoxigenic strains of Aspergillus flavus coated on sterile sorghum grains.

Aflasafe application: It is recommended that Aflasafe should be applied before crop flowering in the field to displace toxin-producing Aspergillus strains, thereby reducing aflatoxins.

Benefits of Aflasafe: The product has already achieved a reduction of 80-99% in aflatoxin contamination in countries like Nigeria, Kenya and Senegal.

Post-Harvest Management Practices

Structured trade[1] depends on having good-quality grain that conforms to certain minimum standards and therefore good postharvest management[2] is vital.

Shelling and Threshing

Threshing or shelling consists of separating the grains, or the shells in the case of groundnuts, from the portion of the plant that holds them.This separation, done by hand or machine, is obtained by threshing, by friction or by shaking the products; the difficulty of the process depends on the varieties grown, and on the moisture content and the degree of maturity of the grain.

Threshing or shelling operations

Threshing or shelling operations follow the harvest and whatever pre-drying of the crop is undertaken. These operations may be carried out in the field or on the farm, by hand or with the help of animals or machines. Depending on the influence of agronomic, economic and social factors, threshing or shelling is done in different ways:

1. Structured trading is an orderly, organized, trading process where all the players understand the rules and stick to them. It provides transparency, improves efficiency, and reduces transaction costs for all actors in the chain.
2. Post-harvest management is a system of handling, storing, and transporting agricultural commodities after harvest. This means having to ensure that moisture, contaminants, and insects will not affect the quality of the commodities.

- threshing or shelling by hand, with simple tools;
- threshing with the help of animals or vehicles;
- mechanical threshing or shelling, with simple machines operated manually;
- mechanical threshing or shelling, with motorized equipment.

The operations of harvesting and threshing or shelling can be carried out simultaneously, by combine-harvesters or picker-shellers.Whatever the system used, it is very important that threshing or shelling be done with care. Otherwise, these operations can cause breakage of the grains or protective husks thus reducing the product's quality and fostering subsequent losses from the action of insects and moulds.

Transport of the product from the field to the threshing or shelling place must also be handled with special care, since it can bring about severe losses.

Hand threshing

One of the simplest systems for threshing rice is to pick up the sheaf of rice and strike the panicles against a hard surface.Another frequently-used method of threshing rice is to trample it underfoot. Threshing of rice, as well as of sorghum, beans and groundnuts, can be done by striking sheaves spread out on a threshing-floor with a flail or a stick.

The threshing-floors on which the sheaves are spread must have a hard, clean surface.By using one of these methods of hand-threshing, a worker can obtain 15 to 40 kg of product per hour.

Hand shelling

The easiest traditional system for shelling maize is to press the thumbs on the grains in order to detach them from the ears. Another simple and common shelling method is to rub two ears of maize against each other.These methods require a lot of labour, however. It is calculated that a worker can hand-shell only a few kilograms an hour.

Shelling of maize, as well as of sunflowers, can be more efficiently accomplished by striking a bag full of ears or heads with a stick.Maize and sunflowers can also be shelled by rubbing the ears or heads on a rough surface.Small tools, often made by local artisans, are sometimes used to hand-shell maize.With these tools, a worker can shell 8 to 15 kg of maize an hour.

Threshing with animals or vehicles

If draught animals are available and there are large quantities of rice, threshing can be done by driving the animals (harnessed, in that case, to threshing devices) over a layer of sheaves about 30 cm thick.

This operation, which is also called "treading out", can equally well be accomplished with vehicles.This method of threshing rice is adopted in some Asian countries, using a tractor for power instead of draught animals.Paddy is obtained by running the tractor twice over sheaves of rice that are spread in layers on a circular threshing-floor 15-18 m in diameter. The sheaves must be turned over between the two passages of the tractor.If operations are alternated between two contiguous threshing-floors, yields of about 640 kg/in can be obtained.

Threshing with hand-driven machines

Machines driven by a manual device or a pedal are often used to improve yields and working conditions during threshing. By means of the handle or pedal, a big drum fitted with metal rings or teeth is made to rotate. The rice Is threshed by hand-holding the sheaves and pressing the panicles against the rotating drum. The speed of the threshing-drum must be kept at about 300 revolutions per minute (rpm).

The hand-held sheaves must all be of the same length with the panicles all laid in the same direction, and the grains must be very ripe and dry. The machine must be continuously and regularly fed, but without introducing excessive quantities of product.

If the paddy obtained contains too many unthreshed panicles and plant residues, a second threshing must be followed by an effective cleaning of the product. Use of these threshing machines may require two or three workers. Depending on the type of machine, the skill of the workers and organization of the work, yields can be estimated at a maximum of 100 kg/in

A shelling machine suitable for threshing rice, wheat and beans

Demonstration of utilization of machine shellers by EAGC field agents at the Luyekhe farmers Village Aggregation Cnetre in Kakamega County

Maize-shelling with hand-operated machines

Manual shellers, which are relatively common and sometimes made by local artisans, permit easier and faster shelling of ears of maize. These come in several models, some of them equipped to take a motor; they are generally driven by a handle or a pedal.

Use of manual shellers generally requires only one worker. With yields of from 14 to 100 kg/in, they are well-adapted to the needs of small-scale production.

Threshing or shelling with motorized equipment

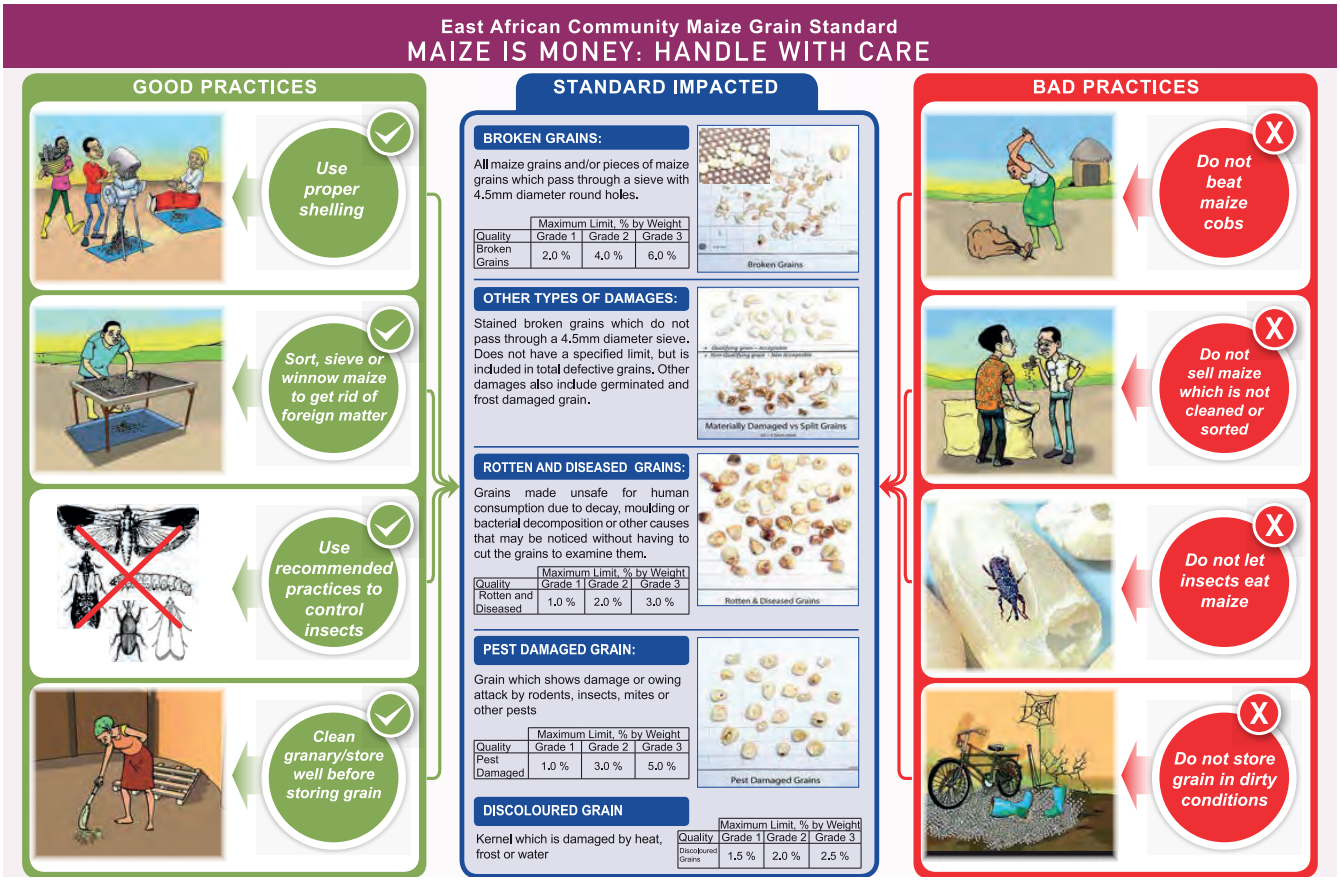
In describing operations of threshing or shelling with motorized equipment, the principal reference will be to motorized threshing-machines.Although they are gradually being replaced by combine-harvesters, these machines still have an important place in the post-harvest production process, especially for their convertibility.

By the simple replacement of a few accessories and the appropriate changes in settings, these machines can treat different kinds of grain (e.g. rice, maize, sorghum, beans, sunflowers, wheat, soybeans, etc.). Equipped with a rotating threshing-drum (with beaters or teeth) and a stationary counter-thresher, these machines often have devices to shake out the straw and to clean and bag the grain.

Whether self-propelled or tractor-drawn, these threshers are often mounted on rubber tyred wheels for easy movement to the field. The use of motorized threshers may require two or three workers.

Compliance to standards and grades

Structured trading starts with good postharvest management. That means making sure that the grain is harvested properly, threshed (or dehusked and shelled), dried to the recommended moisture level, sorted and cleaned to remove all foreign matter and then stored properly in a good store. Structured trade depends on having good-quality grain that conforms to certain minimum standards. Good postharvest management is vital for this. The following best practices show how farmers and small-scale cooperatives can do to maintain grain quality for the case of maize.



Best Practices for Maintenance of Good Maize Quality

Producing good-quality grain brings many benefits:

- Farmers can sell their grain to different buyers and get a higher price for it.
- Traders, transporters, and others in the grain trade can handle more grain and sell it to new markets, such as regional and international buyers. This leads to better business for all.

- When people buy grain, they need to know exactly what is in the bag or silo. Is it high-quality grain, free of contaminants, and suitable to be ground into flour or meal for human consumption? If it is not suitable for human food, can it still be used as animal feed?

- Grain standards help buyers know such things. They specify the characteristics for the grain and set the requirements for three things: safety, quality, and sampling and test methods.

- Safety requirements cover things that may harm the consumer: the presence of aflatoxins and other poisonous substances, pesticide residues and physical materials (like stones or pieces of metal) that can get into the grain.

- Quality requirements cover other things that processors or consumers may be concerned with, such as moisture content, broken grains, diseased grains and foreign matter.

- Grain safety is not negotiable and should not be compromised. If the grain is not safe for human consumption it must not be traded unless it has been treated to eliminate the hazard. For example, stones can be removed mechanically; metal can be removed using magnets. If that is not possible, the grain will have to be disposed of in an appropriate way.

- Grain quality, on the other hand, depends on people's preferences. Many industrial processors require certain types of grain. A processor who mills flour, for example, needs

- good-quality grain with very low levels of impurities and contamination. He or she is prepared to pay a higher price for such grain.

Testimonial on benefits of adopting best practices in maize shelling

Iganga Adult Literacy Group , Eastern Uganda

Members of the Iganga Adult Literacy Group in Eastern Uganda used to shell their maize by beating the cobs with sticks. This was hard work and took a long time, so the group had to delay it while they planted the next crop. The sticks also broke plenty of kernels, which buyers did not like: they offered a low price for the group's output. Then the group had the opportunity to rent a motorized thresher. This assisted them to shell their maize much faster, resulted in fewer broken grains and made it possible for them to sort the grain. They moved the grain to a warehouse and got a receipt for it. The group presented this to the bank, which accepted it as collateral for a loan to buy the inputs they needed for the next season. At the warehouse, the manager found that the grain from the Iganga group was of excellent quality. He did not have to reject any. When the group came to sell, they were able to get a premium price.

CHAPTER FOUR

Post Harvest Storage Technologies and Innovations

Hermetic Storage Technologies

Hermetic Storage Technology (HST) is an innovation that relies on creating modified atmospheres around the produce via physical or biological means to retard the activity and survival of the insects and inhibit mould growth. It is gaining momentum in Sub-Saharan Africa (SSA) as an alternative to conventional storage systems, particularly in grain storage. It comes in the form of various devices that include bags and silos, and is gradually being adopted by small scale farmers.

A report by the World Bank in 2011 revealed that each year, significant volumes of food are lost after harvest in Sub-Saharan Africa (SSA) with a value estimated at USD 4 billion for grains alone. Reducing food losses offers an essential pathway to food security. Despite the action taken by world bodies, such as the World Bank and FAO, to minimise these losses, Post-Harvest Losses (PHL) remains a constant problem in SSA, presenting an enormous threat to food security. PHL reduction is also in agricultural and food security strategic plans of national governments that are encouraging the development of various approaches and technologies to be applied and promoted to counter PHL.

Farmers continue to store grains in normal polypropylene woven bags seldom unprotected, leading to high quantities of food loss. They sometimes use pesticides, which can be ineffective or cause negative health effects if not used according to recommended doses. Therefore, the use of innovative storage technologies such as Hermetic Storage Technologies is required to minimise PHL losses to boost food security.

i. Hermetic Bags Technology

Hermetic bags are among insect pest management options for small-scale farmers promoted in Africa because they are cheaper than metal silos and safer but relatively expensive to ordinary propylene bags with chemical protectants.

The hermetic bags have either a one or two-layers envelope made of high-density polyethylene (HDPE) liners, enclosed outside by a bag made of woven polypropylene. The polyethylene inner liner(s) have finite oxygen permeability which is sufficiently low that it greatly hinders oxygen leakage into the bag from surrounding air.

Among the commonly used hermetic storage bags are: Purdue Improved Crop Storage (PICS®), AgroZ, AgroZ Plus, Elite bag, SuperGrain bag IV-R, and others that include SuperGrain bag Farm, Mini GrainSafe, Kuraray and Zerofly.

The hermetic bags are resistant to the perforation by maize weevils but not by larger grain borer. Maize grain stored hermetically also has a much longer viable life, with lower weight losses (<1%) compared to grain stored under normal PP bags (41.2%) and jute bags (48.5%). On storage of beans and pigeon peas, weight losses in grains stored in PICS bags did not change, whereas losses in untreated and Actellic Super dust treated polypropylene bags ranged between 12.5-26.2% after 6 months of storage. Laboratory and semi-field trials conducted in Tanzania and Kenya showed that AgroZ Plus, an improvement of AgroZ bag and incorporated with a chemical within the inner layer, resists the LGB. This was proven by the bag having no perforations after 48 hours of laboratory exposure and 7 months grain storage compared to puncturing of both liners of PICS, SuperGrain bag and AgroZ bag.

Photos of Different Brands of Hermetic Bags

Compared to other HSTs, hermetic bags face the challenge of perforations from insects especially the Large Grain Borer. However, they are still effective in grain storage compared to ordinary PP bags. Hermetic bags are also prone to rodent attacks which make them no longer airtight, this challenge cuts across all bags with exemption of AgroZ Plus which have been found without perforation during efficacy evaluation. From field experience, farmers use pepper to repel the rodents.

The hermetic bags can also be easily perforated by sharp objects and can also burst during transportation. The twist and tie after every use also renders them time consuming and labour intensive. Moreover, the cost is relatively higher (US$ 2.5 for a 100 kg capacity), especially for small holder farmers, compared to ordinary PP bags.

Testimonial on the benefits of Hermetic Storage Technology

Mrs Jane Njoki Gititu is the Treasurer of the Laare- Kiriri-Bagaria Community Based Organization in Nakuru, Kenya

Mrs Jane Njoki Gititu is one of the officials, precisely the Treasurer of the Laare- Kiriri- Bagaria community based organization in Nakuru, county Kenya. The group receives support in from EAGC and has been trained on climate information interpretation and application. Jane narrated her story of success with two climate adaptation technologies adopted and applied in her farm. She narrated her story to Penina Gichuru M&E Manager, EAGC in Swahili one of the national languages in Kenya and the story is interpreted in English below:

"In 2019, I acquired 10 hermetic bags to store my maize for home consumption. I dried the maize to the recommended moisture content and weighed 90 kgs in each bag. I instructed my son to tie the bags as recommended ensuring that all air is removed before tying up the inner plastic bag. He then tied each layer as recommended and the bags were stack in the store.

My family has consumed that maize from November last year (2019) to date without a single trace of pest damage as used to be the case with ordinary bags. I sold some of the maize in May 2020 to meet the cost of weeding the current season crop and even at that time the grain had no pest damages. Recently, my neighours approached me to exchange for them their current season grain with my stored grain as it is believed the older grain produces better flour. Though I did not weigh the bags to check if there is weight loss I exchanged with them a bag for a bag. My neighbours have been so impressed to see how clean the grain is and have been asking how they can get the bags. I expect this will influence more people to purchase and utilize the hermetic bags going forward.

Milka Nyambura, member Kangumo Youth Group

"We really want to thank EAGC for supporting us to buy hermetic bags. previously we used to store our maize grain in the ordinally nylon bags and we had a lot of problems because even if you cleaned your grain well and stored in the bags, the maize would still be infested by weevils.

But, now the hermetic bag has helped us a lot. Maize stored in hermetic bag does not get infested by weevils and even if the maize had been infested before bagging, once you put in the hermetic bag the weevils die and your maize remains clean and can be stored for a long time. I personally did an experiment and put infested grain in the hermetic bag and when I checked after two days all the weevils were dead. Also, the hermetic bags are of a bigger size than the ordinary bags so one is able to put more grain in a single bag. When using hermetic bag all that one need to do is fill the bag with grain, remove air from the bag, then tie the inner plastic lining and tie the outer bags. This way, you can store your grain for one year without spoilage. This is unlike the ordinary bag which when you store the maize gets infested and has high breakages which reduce the marketable quality".

I would advise all the grain farmers to use the hermetic bag to store their grain to avoid spoilage and grain loss. As a group we have advocated for all members to use hermetic bags and each member's has about three or more hermetic bags. We have also been advocating to our neighbours who are non-members of the group. I wish to thank EAGC for exposing us to this technology and we remain open to receive and adopt any other technologies that are beneficial to our farming activities."

ii. Airtight Metal Silo Technology

This is a cylindrical structure constructed from a galvanized iron sheet (gauge No.26 or 0.5mm thickness) with a top-loading inlet and a lateral unloading spout at the bottom. Airtightness is ensured by tight seals and lighting a candle to deplete oxygen after filling it with grains. It was first promoted by the Swiss Agency for Development and Cooperation (SDC) in Honduras (1993) and Guatemala (1990) for the storage of maize and, to a lesser extent, beans. FAO also introduced metal silos in Africa, Asia and Latin America between 1997 and 2007.

On-station studies conducted in Kenya, Malawi and Zimbabwe show that hermetic metal silo effectively prevents the attack of maize grain when artificially infested with maize weevils and the larger grain borer. Metal silos have initial higher cost (US$ 200 for 1.8 tonne capacity) than for the commonly used polypropylene storage bags. This stifles the demand and widespread adoption by smallholder farmers. Therefore, supporting policies are required to facilitate increased access to credit, reduce the cost of metal sheet, and promote collective action for enhanced uptake of the technology at the smallholder and commercial scales.

Airtight metal silo: Source www.karlo.org

Solar Powered 6 Ton Kikapu metal silo manufactured by Braz Africa entreprises Ltd in partnerhsip with Kepler Weber

iii. Airtight Plastic Silo Technology

Hermetic plastic silo is a storage container (or tank) similar to locally produced water containers, constructed by industrial manufacturers from plastic polyvinyl chloride (PVC). It has a widened inlet to facilitate grain loading that provides effective insect pest and rodent protection. It has a larger capacity than hemertic bags and relatively cheaper compared to metal silo. Hermetic plastic silo technology has very little, if any, formal evaluation of its comparative effectiveness in protecting grain against insect pests and aflatoxin contamination.

Further, in most countries aggressive campaigns and promotion of the technology compared to the hermetic bags has yet occurred. In Tanzania, the plastic silos are used as storage devices but without promotional campaigns while in Kenya, Kentainer's plastic silo has only been tested for storage of maize by CIMMYT. It is only in Uganda that plastic silos have been reported to maintain weight losses of stored grain at ‹1%.

Air and water tight plastic grain silo manufactured by Kentainers with a capacity of 500 litres which is equivalent to a storage space of four 90kg bags of maize.

Unlike in metal silo where lit candle burns until all of the remaining oxygen is consumed, thus swiftly creating an uninhabitable environment for insects and pests, no de-oxygenation process is applied to the plastic silo.

iv. Airtight Cocoon Technology

These are airtight storage devices made of tough gas-proof plastic sheeting and are closed using a gas-tight zip. The cocoons come in 5-300 tonnes capacity sizes. The grain cocoons are manufactured by GrainPro Inc. and have been extensively tested in Asia and Africa with different commodities. It has the advantage of outdoor grain storage.

Laboratory determination of the respiration effect of fermented cocoa beans showed that the concentration of oxygen was depleted to ‹1% while that of carbon dioxide increased to 23% within six days; while in a field experiment, oxygen concentration decreased to 0.3% after 5.5 days with no live insects recorded in cocoa beans. The storage technology also eliminates double cooking time that is required after three months of conventional storage. Further, tea stored in cocoons was found to maintain essential constant moisture content as well as taste, color and texture for 4 months. In coffee, this storage technology has proved to preserve desirable aroma for duration of up to one year.

Cocoons also retain a higher germination rate (95-98%) compared to those stored in either cold room or in unprotected condition. In addition, they are very effective in controlling insects and other micro-organisms such as mold. However, the technology is yet to be tested in Kenya.

Indoor airtight grain storage cocoon manufactured by Grain Pro

Outdoor airtight grain storage cocoon by Grain Pro

The challenge of cocoon storage technology is that it demands huge space; material used is non-durable non-bio gradable; prone to major threats like theft, fire, termite and rodents attack; a lot of labor needed in loading and off-loading and difficulties in handling/management.

v. Silo Bags Technology

They are specialized plastic bags in a shape of a tube made of three-layer polyethylene membrane (a mixture of high density (HDPE) and low density polyethylene (LDPE) 235-250 µm-thickness). Silo bags have been tested for storing wheat, barley, corn, canola, soybean and many other crops in Argentina.

Dried grain (11.5% m.c) stored in bags for 5 months had no significant effect in protein value and germination rate but the germination capacity of wet wheat dropped from 94 to 51% after 45 days and was further reduced to 41% after 150 days.

Airtight Silo bags for grain storage: source www.silobags.com

Though effective storage technology, silo bags require specialized loading and unloading equipment which is a requirement for their use. They are also prone to the effects of the environment especially extreme weather and damage from rodents and insect pests.

Tarpaulins

Tarpaulins are large sheets of fabrics that can be reinforced with rope and eyelets for multipurpose uses and applications. They can be heavy duty or light weight fabrics. The following is a guide towards selecting the right type of tarpaulin

	Laminated PVC	Coated PVC	Dickson Coatings Laminated	Low & Bonar Laminated	Canvas CC3	Canvas CC4 (510gsm)	Wax coated polycotton ripstop	PE 200gsm	PE 300gsm	Agricultural shadenet	PU coated polyester ripstop
Cost	Low	Medium	Medium	Medium	Medium	High	Medium	Low	Low	Low	Medium
Lifespan	1-3 years	2-4 years	4-6 years	4-6 years	2-3 years	2-3 years	2-3 years	6 - 18 months	18 - 24 months	1 - 3 years	3-5 years
Availability	Usually In Stock	Usually In Stock	Seasonal	Usually In Stock	Usually In Stock	Usually In Stock	Limited	Usually In Stock	Limited	Usually In Stock	Usually In Stock
Sun protection	Good	Good	Excellent	Excellent	Good	Good	Good	Good	Good	Grade dependent	Excellent
Rain protection	Good	Good	Excellent	Excellent	Not Good	Not Good	Good	OK	OK	Grade dependent	Excellent
Maintenance	Frequent	Occasional	Occasional	Unlikely	Occasional	Occasional	Unlikely	Frequent	Frequent	Frequent	Unlikely
Aesthetic	OK	Good	Good	Good	Good	Good	Excellent	Poor	Poor	Depends on application	Excellent
Durability	Low	Medium	High	High	Medium	High	Medium	Low	Low	Medium	High
Repairability	Easy	Easy	Easy	Easy	Tricky	Tricky	Very Tricky	Easy	Easy	Tricky	Tricky
Weight	Light	Medium	Medium	Medium	Medium	Heavy	Medium	Light	Light	Light	Heavy
Thermal Properties	Poor	Poor	Good	Good	OK	OK	Poor	OK	OK	n/a	Good

GrainPro Collapsible Dryer Case.

Grain drying tarpaulin manufactured by AgroZ.

Climate Smart Post-Harvest Storage facilities

Use of Commercial Grain Handling, Storage and Warehousing Facilities

Commercial grain handling, storage and warehousing companies are businesses that offer their services to grain depositors (farmers, traders, co-operatives, non-governmental organizations, among others. who place their grain in the warehouse for a fee). These handling and warehousing companies aim to make a profit. They are answerable to the depositors for the grain left in their custody.

Warehouse operators do not own the grain that they store; they earn their money from the handling and warehousing fees they charge. This means, for example, that if they go bankrupt, the grain cannot be sold off to pay their debts. Commercial warehouses have to meet certain minimum standards. They need to have:

- Professional workers trained in grain handling and safety.
- Equipment for weighing, grain analysis and storage.
- Procedures to ensure that the grain is safely handled and stored.
- Security to ensure the safety of the grain, equipment, employees and the public.

Why use commercial storage services?

After harvest, farmers are faced with a choice: sell the grain immediately, or store it? If they store it, they have to decide whether to put it in their own or a cooperative store, or in commercial storage.

Testimonial from Lesiolo Grain Handlers Ltd on commercial grain storage

Lesiolo Grain Handlers Limited (LGHL) is a grain handling and storage firm in Kenya that handles maize, wheat, barley and sorghum. The company has its own storage facility with a capacity of 30,000 tonnes and has leased another 50,000-tonne facility from the National Cereals and Produce Board. LGHL intends to expand its capacity by 60,000 tonnes by constructing facilities in Nakuru and Kitale.

LGHL handles over 100,000 tonnes of grain a year. Its services include grain grading, weighing, cleaning, drying, seed-dressing, fumigation and storage. LGHL was the pilot certified-warehouse operator under the Eastern Africa Grain Council's warehouse receipting system, launched in 2008. Since then, over 3,000 tonnes of grain have been handled under this system. By storing their grain until the market price is high enough for sale, farmers have benefited from commodity financing and higher margins. LGHL intends to expand its services across East Africa.

Traders face a similar choice: they can immediately sell the grain they have bought, or keep it until they find a purchaser who is ready to pay the right price. Commercial storage services offer farmers and traders a number of advantages:

Lower costs. The farmer or trader does not have to invest in his or her own storage facilities and equipment, or in the staff to manage the grain.

Storage space. Farmers or traders often have little storage space, or it may be unsuitable for storing grain for long periods. They may have more grain than they can safely store themselves.

Grain-handling equipment. Individual farmers and traders cannot afford grain-handling equipment such as dryers, cleaners and fans. Commercial grain handlers have such facilities.

Convenience. When the farmer or trader deposits the grain in a commercial warehouse, the warehouse operator takes over responsibility for handling and storing it, in return for a fee. This leaves the depositor free to do other things.

Quality management and pest control. Grain storage is one of the major challenges farmers and traders must deal with. Some lack the skills and experience in managing grain on-farm or in cooperative stores, so their grain deteriorates quickly. They may not be allowed to use restricted pesticides (such as phosphine) for fumigation. Commercial grain handlers offer such services at an affordable fee.

Security. Individual farmers or cooperatives may be unable to protect the grain from thieves, leaky roofs or fire. They may find it difficult to get insurance for a crop in their own store. Commercial grain handlers are normally insured and are obliged to compensate depositors if the grain is stolen or spoiled. They must be insured if they are to issue warehouse receipts.

Professional services. Commercial grain handlers provide professional services so they can attract repeat customers, compete with other handlers, and avoid having to compensate depositors for spoilt grain.

Transfer of ownership. If the grain is in commercial storage, the grain depositor can sell it to a buyer without having to move it somewhere else. This reduces losses and costs due to bagging or re-bagging, spillage, theft, etc.

Linkage to markets and structured trade. Some commercial storage providers link farmers and traders to opportunities for structured trade and commodity financing, by issuing warehouse receipts and facilitating commodity financing. Some commercial warehouses also have a network with buyers and can link farmers to better markets (or actually arrange buyers) for the stored grain. Because commercial storage firms store grain from many producers, larger buyers can come there to purchase large quantities of grain. That saves such buyers money: they do not have to go around many places to buy small amounts at each location.

Grain Silos

A silo is a structure for storing bulk materials. Silos are used in agriculture to store grain or fermented feed known as silage. Silos are commonly used for bulk storage of grain, coal, cement, carbon black, woodchips, food products and sawdust.

Grain storage grain silos (also called grain storage bins) are one of the efficient and economical facilities to handle grains, which offer protection from outside insects and other effects as well as provide handling management conveniently. Three types of silos are in widespread use today: tower silos, bunker silos, and bag silos.

Warehouses

Warehouses are intended for the storage and physical protection of goods. In the context of grain storage, 'goods' primarily refers to bagged grain. It may also include materials and equipment required for the packaging and handling of bagged grain, and storage pest control; although, in an ideal situation, such items should be stored separately.

Below are the EAGC warehouse construction standards

Parameter	Required Standard
Walls	• Nature: solid with no cracks or dents • Material: concrete blocks and brick (with plaster on the inside & outside) • Waterproof: must be entirely waterproof
Internal supports	• Must have internal supports of either metal or concrete and in good condition
Floor	• Must be a continuous concrete surface (cemented & solid)
Roof	• Must be covered with corrugated galvanized steel in good condition, and with no rust • Must be waterproof
Doors	• Must be of solid material and lockable • Number of doors: one or two • Padlock points: the door should be securely sealed with at least two padlock points
Openings [ventilators]	• Ventilation should either be in form of windows or openings high up under the roof overhang • Ventilation areas must be reinforced with security grills and protected by wire mesh
Internal Surroundings	The warehouse shall be: • Free from live and dead insects that infest grain • In a clean condition and free of dust • Goods stored shall be in neat organized stacks • Pallets shall be clean and in good condition
External surroundings	• The warehouse shall have within its perimeter wall free space to allow access in and out. • Sheltered area to allow offloading and loading in all normal weather conditions • Perimeter wall: required in all stores; should be made of concrete, barbed wire or chain link • The access gate: must be able to accommodate transporter access, • Guard house: essential but not a must • External area shall be clean, without evidence of rodents, grain infesting insects, and tidy.
Drainage	• The warehouse must have good water drainage, kept clean at all times
Fire • Fire equipment	• Fire extinguisher is essential in case of emergencies

Power • Electrical Installation • External lighting • Back-up generator	• Electrical installation shall be in excellent condition and intact • Surrounding of the warehouse shall be well light including external gate • Back-up generator is essential but not a must
Weighing • Weighing scale • Digital scale	• Weighing equipment for bags must be present and shall have the appropriate inspections and licenses and shall have up to date records of calibrations.
Storage • Pallets • Bags • Moisture meter • Coffee mesh sieves • Tarpaulins • Stitching Machine • Sampling spears/spikes • Traps and baits	• Equipment to be in good working condition, serviced and calibrated where need be
Office and accessories • Office space • Telephone • Computer (Internet & Email access) • Guard personnel	• Office space, which can be part of the main store is essential for all; the office shall have in place working telephones, desks, chairs, shelves & other essentials • Internet and email access essential
Office & business records • Group records • Business License • Insurance • Stock tracking	• Up-to date membership record must be in place • Copies of License: all relevant license including single business permit must be in place • Insurance: Insurance cover for stocks and equipment is essential • Stocks follow up methods and tools: stack card backed up with records in the office must be in place.
Store Personnel • Operation & Admin staff • Guard personnel	• Personnel recruited into the store must have relevant qualifications and experience • Up to date records of whose staff recruitment must be available within the warehouse • Guard personnel must be present within the warehouse premise
Store/lab	• The warehouse should have adequate space for equipment
Hazardous signage	• Hazardous signage should be in place

The African Postharvest Losses Information System

APHLIS (www.aphlis.net) is a source of information on postharvest losses of cereal grains in Sub-Saharan Africa. It gives estimates of weight losses in tables and interactive maps, using information from a network of local experts from each country in eastern and southern Africa. It also offers tips on reducing postharvest losses. APHLIS also has a downloadable calculator that enables practitioners to make their own estimates of postharvest losses.

In order to adopt climate-smart agricultural practices, smallholder farmers need access to sufficient and adequate finance and skills to rightly use finance.

CHAPTER FIVE

Climate Smart Financial Products

Crop Insurance

Crop insurance is purchased by agricultural producers and sometimes subsidized by the government to protect against either the loss of their crops due to natural disasters, such as drought and floods, or the loss of revenue due to declines in the prices of agricultural commodities. The two general categories of crop insurance are known as crop-yield insurance and crop-revenue insurance.

Crop-Yield Insurance

Crop insurance is a type of protection policy that covers agricultural producers against unexpected loss of projected crop yields or profits from produce sales at market. Crop-yield insurance protects the expected revenue due to unexpected yields, which is the volume of a crop's harvest.

Crop-Revenue Insurance

Crop Revenue Coverage is a form of revenue insurance that protects a producer's revenue for an insurable crop whenever low prices, low yields, or a combination of both causes revenue to fall below a guaranteed level selected by the producer. Revenue Protection insurance guarantees a certain level of revenue rather than just production. It protects the producer from declines in both crop prices and yields.

Agricultural Loan Cover

Agricultural loans provide the capacity to purchase a new farm or expand current operations. Farm loans are available through traditional lenders as well as dedicated government agencies. Experience in farming and a good credit score as well as farm updated records is preferred to get approved for a farm loan.

Picture Based Crop Insurance

Another new, innovative way of delivering affordable, comprehensive, and easy-to-understand crop insurance is the Picture-Based Insurance which is currently being piloted in Kenya, India and Ethiopia, where the service focuses on analyzing how improved crop monitoring affects insurance markets and whether the technology has applications beyond insurance.

By relying on visible crop characteristics derived from farmers' smartphone pictures, the project aims to minimize the costs of loss verification and detect damage at the plot level, making crop insurance more attractive and accessible to small farmers. Importantly, such an instrument lends itself to natural synergies with agro-advisories, adoption of climate-smart practices, and other value-added services.

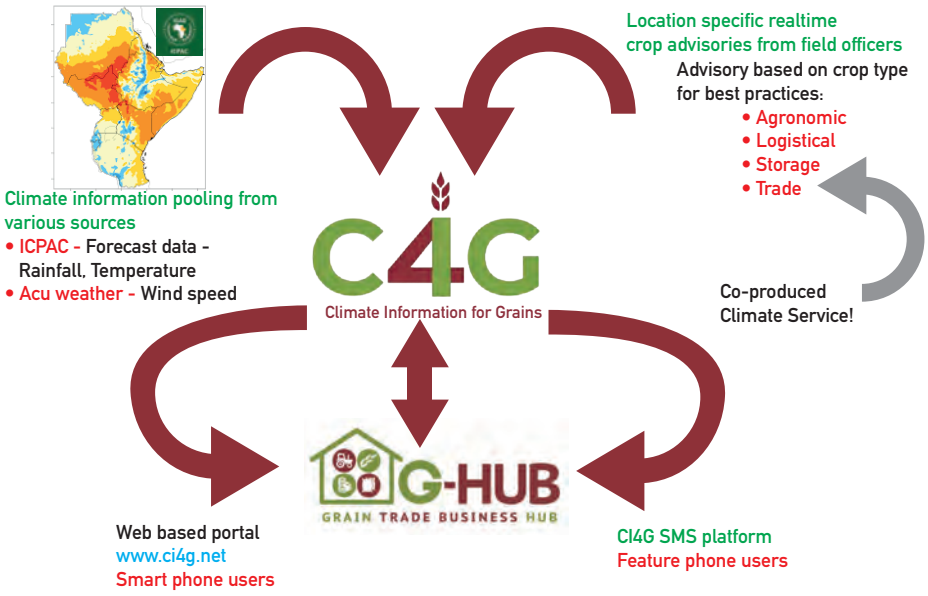
CHAPTER SIX

Climate and Weather Information Services

The CI4G Tool, an EAGC G-HUB Service

The CI4G tool is a service of the Eastern Africa Grain Council (EAGC) provided through its Grain Trade Business Hubs.It is a service for collating and disseminating Climate Information for Grains which provides area specific climate information as well as related crop advisories currently for maize, beans, sorghum, and green grams value chains.The tool was developed with support from the Climate & Development Knowledge Network (CDKN) aimed at disseminating climate information for grains to grain value chain actors to reduce post-harvest losses and increase grain production through the mitigation of climate change effects in Kenya and Uganda, in partnership with the IGAD Climate Prediction and Application Centre (ICPAC), Kenya National Disaster Management Authority (NDMA) and Uganda Ministry of Agriculture, Animal Industry and Fisheries (MAIFF).

Grain value chain stakeholders can utilize the CI4G information either via an SMS service or the web portal www.ci4g.net for real time climate information that includes precipitation, temperatures, and wind speed availed nearest to the value chain actors' locations.



Besides area-specific climate information, CI4G provides grain value chain stakeholders with crop advisories currently for maize, beans, sorghum, and green grams value chains, as one of the services in the EAGC Grain Trade Business Hubs (GHUBs).

The GHUBs are a one-stop centres owned and operated by smallholder farmer groups that facilitate their access to farm inputs such as seeds, fertilizer, mechanization, trainings and information for market and climate, and aggregating their produce and selling collectively through the EAGC's GSOKO grain trading system.

The CI4G tool has empowered grain value chain actors to take appropriate action using the crop advisories received through the EAGC CI4G platform such as when to prepare for planting or harvesting, drying etc and therefore helping them reduce transaction costs and post-harvest losses while at the same time creating market opportunities for their produce.

The Crop Monitor

This is an initiative by the IGAD Climate Prediction and Application Centre (ICPAC) for crop monitoring for Food Security in Eastern Africa region. EAGC as a partner to ICPAC contributes updates to the crop monitor particularly on the regional trade and markets updates which are drawn from the EAGC Regional Agricultural Trade and Intelligence Network (RATIN).

The publication provides grain value chain stakeholders with updates on weekly, monthly and seasonal forecasts as well as updates on climate monitoring and food security statements.

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