



AGRA/Rockefeller Foundation Waste & Spoilage Learning Initiative Project

Final Report of AGRA's In-house Stock of Knowledge on Reducing Food Waste & Spoilage (W&S) in Africa

David Nyameino – Project Coordinator

31/05/2014

Table of Contents

INVESTIGATION OF AGRA'S IN-HOUSE STOCK OF KNOWLEDGE ON REDUCING FOOD WASTE & SPOILAGE (W&S) IN AFRICA	I
EXECUTIVE SUMMARY	I
1.0 Introduction.....	1
1.1 AGRA's Mission.....	1
1.2 The Background	1
1.3 Objective of the W&S In-house Stock Knowledge review.....	2
1.4 Methodology.....	2
2.0 Key bottlenecks driving post-harvest losses in the value chain.....	3
2.1 Key Challenges	3
2.2 AGRA's Institutional approach to Postharvest Loss challenge	4
2.3 W&S Approach at AGRA.....	5
2.4 Main Actors in the value Chain.....	5
3.0 AGRA's W&S Intervention Geography &Crop Value Chains.....	6
3.1 Factors influencing the Country and crop of Intervention	6
3.2 Western Africa Geography	6
3.3 Eastern Africa Geography.....	6
3.4 Southern Africa Geography	7
4.0 W&S Implementation Models.....	8
4.1 The Farmer Group Aggregation Model (FGAM)	8
4.2 AGRO-Dealer Model	9
4.3 The Warehouse Receipt System (WRS) Model	10
4.4 Commercial Village Model	10
4.5 Aggregator Model	11
4.6 Policy Design and Implementation.....	11
5.0 Emerging Lessons	12
5.1 Identifying the W&S problem	12
5.2 Building capacity of disjointed farmers.....	12
5.3 Enhancing Post-harvest management skills & creating awareness of PHH technologies available	14
5.4 Storage technology & equipment.....	15
5.5 Access to greater markets	18
5.6 Cross Cutting Issues.....	20
5.7 Opportunities	22
6.0 Learning Questions	23
6.1 Disjointed farmers.....	23
6.2 Awareness of W&S technologies	23
6.3 Access & affordability of technologies	23
6.4 Technology adoption	24
6.5 Learning Questions	24
7.0 Recommendations & Conclusion	27

Investigation of AGRA's In-house Stock of Knowledge on Reducing Food Waste & Spoilage (W&S) in Africa

Executive Summary

AGRA has identified six broad influencers of Waste and Spoilage in Africa that include; disjointed smallholder farmers (SHF), limited knowledge of these farmers on post-harvest management and technology use, lack of proper storage technologies and equipment, lack of structured markets, limited access to affordable finance and unfavorable policies. These broad challenges are responsible in one way or the other to; delayed or immature crop harvest, poor methods of harvesting, use of inappropriate on-farm storage structures and drying systems which exposes the produce to more pests and vermin.

In the past 5 years, AGRA has been intervening to meet these challenges through a value chain approach. The disjointed farmers have been organized into groups and over 750,000 SHFs trained on post-harvest management skills. Waste and Spoilage training manuals and pictorial aid training materials have been developed. For sustainability purposes special trainings have been conducted for the village stores management teams and Trainers of Trainers courses conducted. It has been a learning experience from this particular intervention that capacity building is an essential catalyst in solving the challenges of post-harvest losses. Through training SHFs have managed to maintained high quality standards and have been able to market their products to higher ends including the World Food Program - Purchas for Progress.

As a result of insufficient and in-appropriate storage facilities at the grass-root levels, SHFs are not able to aggregate and maintain quality of the produce in order to attract competitive higher-end value chain buyers for better prices. With AGRA's intervention in its program countries, SHFs in the project areas have now been enabled to jointly establish improved village stores, hence reducing post-harvest losses as opposed to the use of their rudimental storage facilities. The intervention has also witnessed the introduction of new storage innovations such as hermetic bags, cocoons, small metal silos, Purdue improved cowpea storage bags, heavy mold plastic containers and mobile dryers/sola drying.

Resulting from poor quality, low volumes, poor storage facilities, unaffordable finance and lack of market information and marketing negotiation skills SHFs have lacked access to large and competitive markets. Due to AGRA's intervention in training linkage to finance and markets over 615,000 MT of produce has been linked to higher end markets such as those of large processors and World Food Program. These farmers have experienced a price gain of between 11% & 20%. Farmer group aggregation, Warehouse Receipt Services and aggregator models have significantly contributed towards SHF's access to greater market opportunities.

Learning from AGRA's experience, lack of financial literacy, inaccessible and high cost of money in Sub-Saharan Africa is a major contributor to non-performing markets and high post-harvest losses. In this front, AGRA has intervened in supporting SHFs and Small & Medium Enterprises (SME's) through training and linkage to financial service providers. As a result a total of 293,419 SHFs and 2,529 agro-dealers have managed to access credit amounting to US\$ 122.2 million and US\$36.5 million provided under bank guarantee schemes in the past 5 years.

Most governments in Sub-Saharan Africa have policies that restrict market access to post-harvest loss reducing technologies through import duties and taxes (**e.g. Kenya imposes 16% VAT while Tanzania imposes 16% VAT and 55% excise duty on hermetic bag technology**) promoted by Grain Pro. This current system often benefits importers who are mainly politicians or their associates. In expanding African markets and making them more efficient, AGRA is working with governments to develop policies that promote this. AGRA has already initiated the development of legislation for warehouse receipt system for Mozambique and Mali, the enactment of legal metrology legislation in Tanzania and review of Agri-business and contract laws in Ghana. SHF farmer groups are also empowered through AGRA programs to proactively engage their governments to institute policies that promote their farming businesses.

1.0 Introduction

1.1 AGRA's Mission

The mission and mandate of The Alliance for Green Revolution in Africa (AGRA) is to catalyze a green revolution in Africa that will ensure food security for the continent's people and increased incomes for its farmers. This is achieved through focusing on smallholder farmers particularly women who form the vast majority of food producers while targeting Africa's major staple foods and vegetables for good nutrition. To achieve this, AGRA employs a comprehensive approach (value chain) and has so far invested over US\$315 million in 17 countries to increase farm productivity and market access of major staple foods, strengthen grassroots Institutions that can enable transformation, and create an enabling environment.

1.2 The Background

As a not-for-profit organization, AGRA works with African governments, other development partners, NGOs, the farmers and the private sector to improve and sustain the productivity and incomes of the resource poor smallholder farmers in Africa. To ensure success to the farmer, AGRA intervenes in the entire farming value chain in providing the necessary support more especially in: good seeds and healthy soils; access to markets, linkage to finance, knowledge transfer (training), information, storage and advocates for favorable policies.

Numerous challenges faced by the African farmer to produce enough to feed herself and generate a marketable surplus, however in the recent times it has become apparent that Africa's farmers are losing significant quantities & quality of food through poor harvesting and post-harvest management and storage facilities. It is estimated that for cereals alone the continent losses about US\$ 4.0 billion annually. Quantity losses affect both household food security and the size of the farm surplus available for sale which therefore, is a direct income loss to the farmer. Further, deterioration in food quality reduces not only family nutrition but also the kind of price premium that the farmer may obtain on the market.

Various studies have estimated postharvest losses in sub-Saharan Africa to be over 20% in most staple food crops. For instance the national average postharvest loss for grains in Kenya and Ghana is estimated to be 30%. The losses for roots & tubers in Africa are estimated to be over 40% while those of fruits are between 30-50%. This is a phenomenon that can mostly be attributed to insufficient, inappropriate and unaffordable storage solutions coupled with lack of postharvest handling

Poor storage facilities including substandard storage practices and pesticides have aggravated the post-harvest losses and aflatoxin contamination (Farm Africa: MATF project)

knowledge to the majority of smallholder farmers who engage in farming business. The W&S is therefore significantly responsible for the food insecurity and low incomes of the smallholder farmer. It also acts as a barrier to competitive structured markets for many small and poor farmers.

1.3 Objective of the W&S In-house Stock Knowledge review

In keeping up with its mission of ensuring food security and increased income to smallholder farmers, AGRA recognizes the threat posed by the post-harvest losses thus contributing a significant drain on food production and security in Africa and seeks to engage with other interested partners to find more effective solutions to the problem so that the produced food is conserved.

It is with this background that AGRA is collaborating with the Rockefeller Foundation to undertake a year-long in-depth learning initiative to address a number of research questions related to policy and regulatory requirements and interventions for reducing W&S to inform strategy development and potential additional investment towards reducing W&S in Africa's food systems.

Given that in the past five years AGRA has been implementing projects that address post-harvest issues, ***the prime objective of this in-house stock knowledge is therefore to bring out the models and technologies that work and the lessons learnt from applying these models and innovations.***

1.4 Methodology

Reviewing of AGRA In-house documents of completed and on-going projects with components of post-harvest handling and other related documents in order to address the stated objective. A total of 36 projects were reviewed. Other documents reviewed include among others W&S Development Initiative Strategy Template by Rockefeller Foundation, AGRA's Proposal on W&S, Status of Post-harvest Losses for major staple crops in 11 African countries (Study by AGRA with support from Bill & Melinda Gates Foundation) the Agricultural Pull Mechanism Initiative (World Bank sponsored On-farm Storage Project) and the Global Food Losses & Food Waste (an FAO commissioned study - 2011)

Besides reviewing internal documents, consultations were also made with a few grantees that include; Farm Concern International, Rural Development Initiative, mFarms and the Cereal Growers Association of Kenya. A selected number of project beneficiaries in Kenya (Romosha Farmers Association & Kathome Umbrella Marketing Association) and Amsig Resources a beneficiary of mFarms ICT platform in Ghana were also interviewed. Other beneficiaries were also consulted through telephone to confirm outcomes that were contained in the reports. The investigation also consulted AGRA staff members especially those from the policy and market departments.

2.0 Key bottlenecks driving post-harvest losses in the value chain

2.1 Key Challenges

All projects supported by AGRA are generated by grantees (with support of the program officer) that are comprised of farmer organizations, local and International NGO's, Agro-dealers, Small and Medium Enterprises (SMEs) and other private sector actors located closer to the smallholder farmers. AGRA plays an oversight role to ensure that the objectives initiated are met for the benefits of the farmer. The grantees identify the problem and recommend solutions through submitted project proposals. AGRA evaluates the proposals and awards contracts based on their justification and sustainability.

Due to the geographical diversity, social, cultural practices and range of crops, grantees propose the use of different models and technologies that are deemed appropriate to deliver results within the specified project period.

In all projects proposed to AGRA, problem statements are well articulated to bring out the challenges facing the smallholder farmers in those particular project areas and how they should be addressed to achieve the best outcome. The review of project documents brings out the following key influencers of W&S in the value chains:-

- Disjointed farmers - limiting economies of scale
- Limited knowledge on Post-harvest Management & Technology
- Lack of proper storage facilities, technologies and equipment
- Lack of competitive markets - Information
- Limited access to affordable finance
- Unfavorable policies

The above broad W&S influencers are responsible in one way or the other to; delayed or immature crop harvests, poor harvesting methods and transportation that cause breakage and or spillage, use of inappropriate on-farm storage structures and drying systems which do not reduce moisture adequately, rodents and weevil infestation by especially the larger grain borer. Due to the foregoing factors, aflatoxin contamination has become a major factor in postharvest management and a serious challenge not only on food security and income but of more concern to human health. In the recent past aflatoxin contaminated grains in Kenya have resulted in loss of human lives.

The losses are acute during the harvesting/threshing and storage because of the poor methods used. In threshing most farmers use sticks to beat grain and pulses. This causes breakage and spillage and lowers produce quality. Poor storage is a major cause of spoilage (molds & fungi) as well as high moisture content of produce and leaking roofs

2.2 AGRA's Institutional approach to Postharvest Loss challenge

In keeping-up with its vision of a food secure and prosperous Africa achieved through rapid, sustainable agricultural growth based on smallholder farmers, AGRA instituted deliberate measures to create a department to deal with not only the market but also the W&S challenges that result to depriving Africa the food resource that is most required. Within AGRA this mandate is vested in the Market Access program established in 2008 with core objectives of improving the market opportunities for smallholder farmers.

To achieve the above stated specific objectives the projects reviewed were found to have gone an extra mile to strengthen governance of Farmer Organizations (FOs) to become agribusiness hubs (aggregation for economies of scale geared towards reducing the farmer transaction costs) and to act as platforms to address desired agribusiness policy issues that will streamline their farming business. This challenge is tackled through the Farmer Organization Support Center (FOSCA) which was set up by AGRA in 2011.

Specifically; the Market Access Program has invested in:-

- *The reduction of smallholder farmer's (SHFs) transaction costs by supporting the improvement of farm storage technologies, development of structured markets (Warehouse Receipt Systems, Commodity Exchanges & Market Information Systems)*
- *Training SHFs on post-harvest handling, proper storage, and marketing*
- *Supporting the efforts of instituting grades and standards of the staple crops and in developing affordable and appropriate facilities for postharvest handling (drying sorting , storage and packaging)*
- *Stimulating the demand for commodities by developing markets for alternative uses*

FOSCA's approach to strengthening the capacity of FOs is based on 3 key programming pillars: scoping, strengthening the organizational capacities of farmer organizations, and facilitating their linkages with other value chain operators; and learning. FOSCA identifies the FOs and assesses their organizational/institutional capacities for improving access to services by SHFs. It then undertakes programmatic interventions in partnership with SPs to positively transform and develop the FOs by improving their managerial performance, financial autonomy, inclusivity and positioning them as farm services delivery platforms. FOSCA also improves the enabling environment for FOs to thrive and grow by improving the quality and quantity of service provision to FOs, strengthens the FOs vertical and horizontal networks with stakeholders especially other FOs, improves policy and regulation affecting FOs and also improves value chain governance. FOSCA also provides knowledge sharing and learning platforms where FOs meet to share their innovations, successes, lessons and best practices. By facilitating setting service delivery standards for FOs, FOSCA also enables the recognition, celebration and rewarding of FOs offering better services to SHFs. Improving access to credit and promoting conducive agricultural policies.

2.3 W&S Approach at AGRA

Owing to the magnitude of the W&S problem in Africa, AGRA has placed a lot of emphasis on this issue and has continued to look for solutions and the associated finances that will help fix/reduce the problem. **AGRA applies the value chain approach** towards meeting this challenge.

Knowledge available from both AGRA and Rockefeller Foundation demonstrate that availability and affordability of promising post-harvest solutions coupled with market access is necessary but not sufficient for the desired outcomes. The application of the value chain approach will ensure the adoption and proper use of the appropriate technologies. The approach will also assist in building wider stakeholders awareness for a greater impact and investment.

2.4 Main Actors in the value Chain

All projects implemented by AGRA have an element of Waste and Spoilage. The projects identify key actors in the value chain and seek to enhance their capacity. AGRA also recognizes that financing and policy are very essential in answering the questions of postharvest losses. Limited affordable credit and bad policies will accelerate postharvest losses due to low investments to address the problem. This is why AGRA is dealing with this challenge on a holistic manner.

Major Actors in Post-Harvest Handling (PHH)



AGRA's value chain approach stems from the understanding that no one stakeholder can fix the challenges of waste & spoilage and that there will be no single solution for these challenges. Therefore investing in the understanding of the value chain systems and allowing the stakeholders to interact so that they can provide wholesome solutions to the agribusiness industry is considered to be of necessity. The stakeholder inclusiveness is a principle adopted by AGRA so that its overall goal of improving food security, increasing productivity and incomes to millions of smallholder farmers in Africa is achieved.

3.0 AGRA's W&S Intervention Geography & Crop Value Chains

3.1 Factors influencing the Country and crop of Intervention

Generally, AGRA's W&S projects have covered most countries in its three geographical regions of coverage i.e. Western, Eastern and Southern Africa. With the projects reviewed, the crop intervention areas were found to cover all the cereals, legumes, roots and tubers. Specifically, this included; maize, rice, sorghum, millet, cowpeas, pigeon peas, green grams, cassava, groundnuts and sweet potato value chains.

The factors considered in the choice of the country and crop of intervention included among others the political stability of the country, the population, the weather, the level of constraint, the social and economic importance of the crop value chain, and the likely multiplier effect upon intervention. Alternative use of some crops such as cassava and sorghum was considered in order to reduce loss and reduce price pressure on other staple crops such as maize and wheat.

3.2 Western Africa Geography

In West Africa, projects have been implemented in 3 countries (Ghana, Burkina Faso and Mali¹). Although this particular geography is faced with all the challenges listed in 3.0 above, most notable challenge in the area that the projects sought to address has been **the lack of storage facilities and knowledge on PHH across the value chains identified.** In attempting to address these challenges AGRA through its projects has trained over 60,000 SHFs on PHH and several warehouses have been built or rehabilitated especially in Ghana and Mali. In Burkina Faso the emphasis was to develop the necessary post-harvest management skills of smallholder farmers to supply to the World Food Program – Purchase for Progress (P4P).

In order to address the issue of market, the projects in Ghana have been working with the Ghana Grains Council (GGC) in establishing the village warehouses and linking them to the council's major structured warehouses that operate the Warehouse Receipt System (WRS). In Mali a model of Post-harvest and Trading Centers (PTCs) was developed with a number of PTCs built and equipped to address the issues of postharvest losses. For sustainability this approach targets the agro-dealers and farmer groups to provide the PTC services (threshing, winnowing, drying and storage).

In Burkina Faso, the Purdue PICS triple bag technology has been introduced to cowpeas SHFs and over 4,000 farmers have been trained on its use. Though the technology is found to be effective, it is relatively expensive and therefore not affordable to many SHFs. However, farmers who store their cowpeas in PIC bags can access top markets that pay a premium (>50%). Access to finance to invest in the technology (PIC bags) is a major constraint.

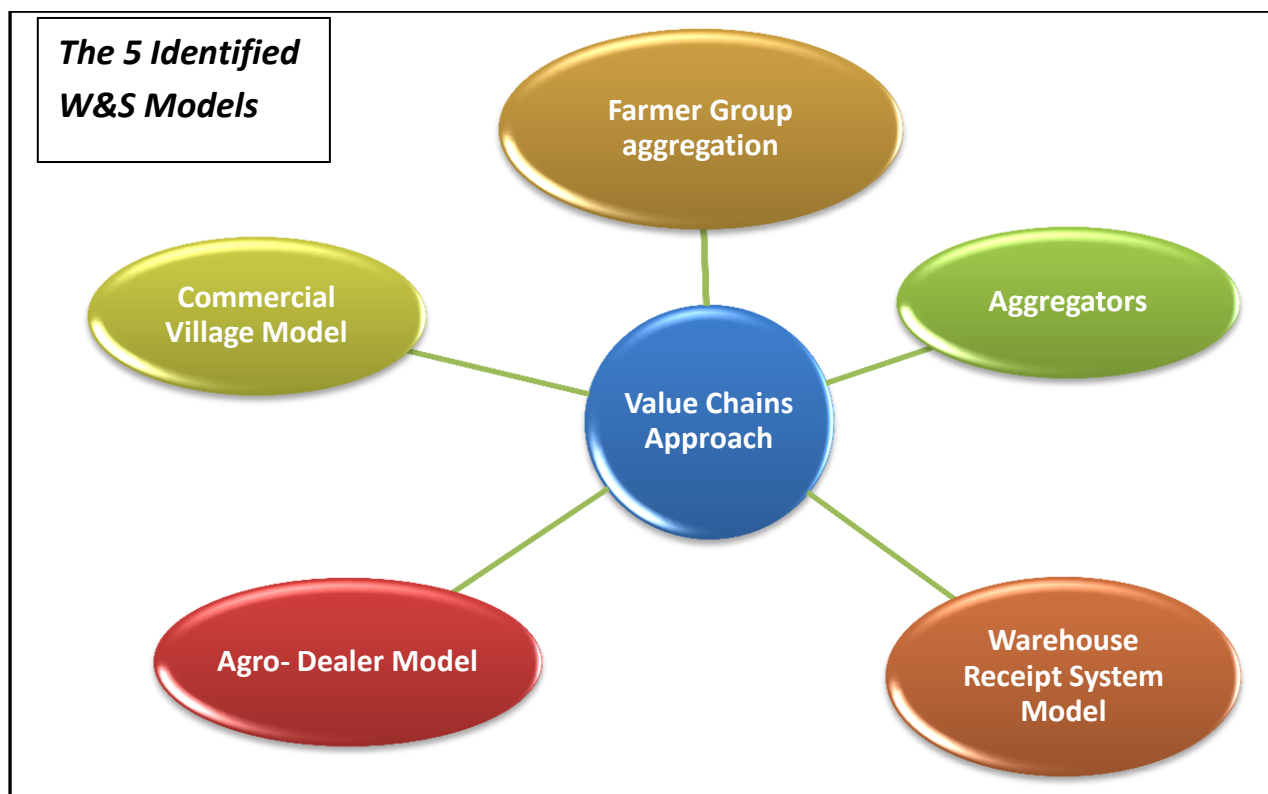
3.3 Eastern Africa Geography

In the Eastern Africa region the W&S projects have mainly been implemented in Tanzania Kenya, Uganda and Rwanda. Similar challenges of disjointed farmers, limited knowledge on W&S management and technology, limited storage facilities/PHH equipment, limited competitive markets, limited access to affordable finance and unfavorable policies have been exhibited. However, in this

¹ AGRA is also involved in Yam Improvement Program for Income and food security (YIIFSWA) in Ghana and Nigeria, a multi-country focused project managed by IITA and funded by BMGF. The Program has a significant component focused on the management of post-harvest losses in the context of an integrated and value chain based development strategy.

4.0 W&S Implementation Models

In addressing the identified W&S challenges while following the value chain approach, different projects have employed different models to achieve the expected results. The projects reviewed bring out five key models which include the Farmer Group Aggregation Model, Commercial Village model, the Agro-dealer model, the Warehouse Receipt Systems model and the Aggregators Model². The use of these different models depends purely on the grantees knowledge to apply it as a means of resolving the W&S challenges.



4.1 The Farmer Group Aggregation Model (FGAM)

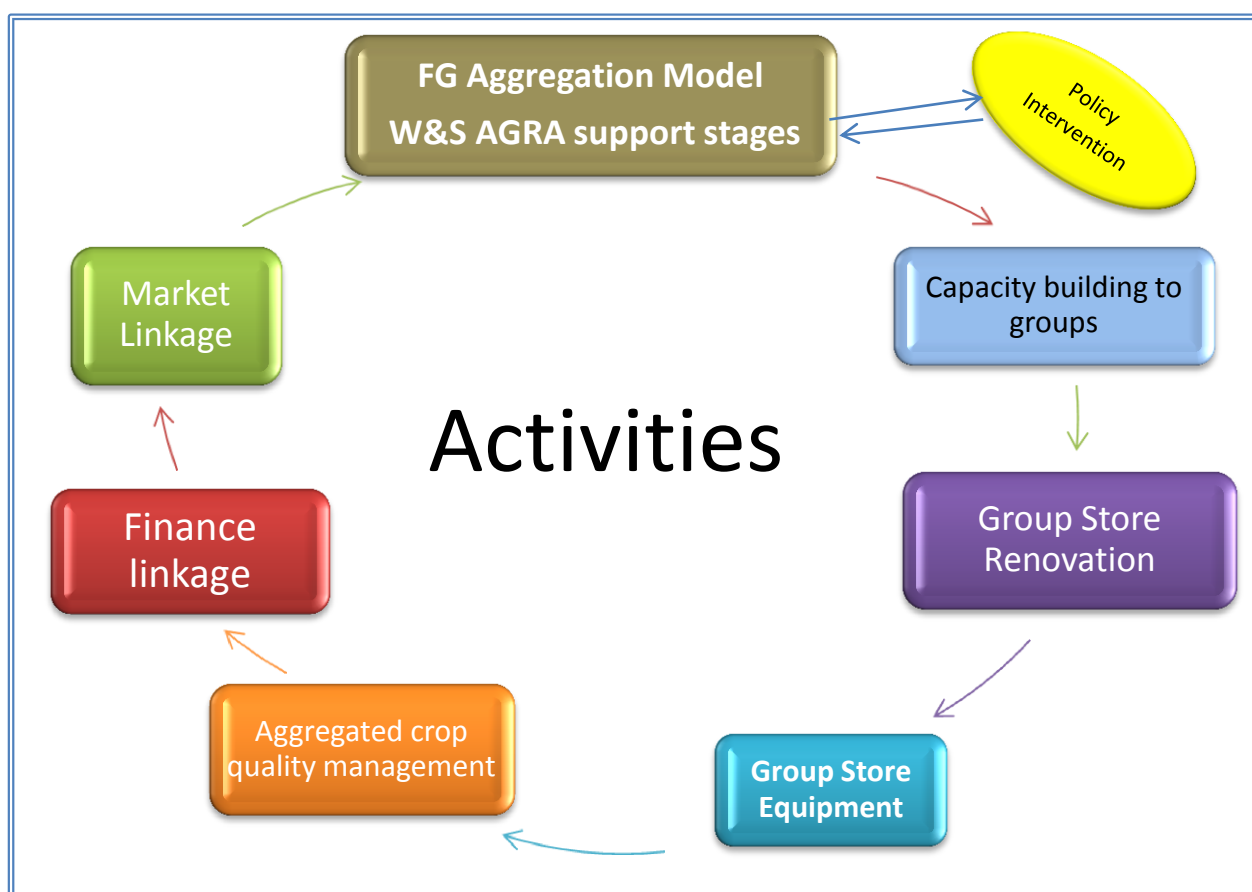
Most projects reviewed were found to be applying this type of Model. The basic principle of this Model is that services are provided to its members through the group leadership. FGM is a lower version of a co-operative society. It is comprised of smallholder farmers with the same interest in a particular locality who join together for purposes of economies of scale. The group members have common goals to achieve in agreed particular crop value chains. AGRA takes the FGM as village business hubs and intervenes to improve their capacity in the entire value chain to allow members make informed business choices and take control of their business destiny. It is hoped that the farmer groups will graduate to co-operatives or farming companies.

Farmer Group Model- Members' aggregate produce in group store, manage and sell high end markets.

² Other models being explored include the Yam development forum (YDF) in the context of YIIFSWA and the Banana Conference, supported by AGRA through KENFAP and the Banana Growers' Association of Kenya (BGAK). Both models are based on the principle of bringing together the key players in a particular value chain in order to identify shared concerns and identify corrected measures which could be taken together in order to improve the performance of the sector. This model also entails elaborating some rules and mechanisms for ensuring the governance of the value chain.

Under this model, AGRA intervention has mainly been towards supporting the farmer-groups to build or renovate group managed stores, assist in procuring basic store equipment (moisture meters, weighing scales, tarpaulins, bags etc.), build members capacity in the value chain that includes governance and postharvest management before linking them to structured markets and financial services. The group model is also used as a platform to advocate on policy issues affecting their business.

AGRA's support on FGAM Activities



Over 95% of the projects reviewed were found to have or are using the FGA Model. The model allows a direct interaction with the beneficiary who is the SHF. It gives a sense of belonging and allows freedom of business choice as to who to sell their produce to.

4.2 AGRO-Dealer Model

The model aims to strengthen the ability of the existing value chain service providers (Agro-Dealers) to deliver efficient, fair and trusted services that include farm-input supplies, extension services, product aggregation and product quality management to a large number of smallholder farmers. The Commercialization of Rice Project in Ghana and the Smallholder Market Access through Aggregation Project (SMATA) in Tanzania are examples where this has been applied.

In Africa, agro-dealers are widely spread and perform an important function of delivering essential farm inputs such as fertilizer and seed closer to the smallholder farmers. Being close to smallholder farmers, this model therefore identifies Agro-Dealers as potential vehicles through which value chain services that include management of crop quality and markets can be provided. The AGRA support in

this regard is therefore to improve and strengthen the capacities of the identified Agro-dealers to be able to serve farmers better in their day today service and to expand the menu of their services.

Though the Model is viewed as another avenue through which knowledge (farmer extension messages that include PHH will be channeled), **this model has however had less impact in output marketing since farmers perceive Agro-dealers as middlemen who are unfair in their trade practices. In Tanzania they are commonly referred to as “walanguzi” (unfair).** However, in Rwanda Agro-dealers are important in information dissemination to farmers

AGRO-Dealer Model:-
Is a model where Agro-business dealers are supported to become a viable “one stop shop” in the provision of all services to farmers including W&S and market outlets outlet.

4.3 The Warehouse Receipt System (WRS) Model

The model is one of the structured market options to smallholder farmers. WRS is a process where Commodity owners (farmers, traders, and processors) deposit their commodities in certified warehouses and are issued with a Warehouse Receipt as proof of ownership. The receipt can be offered for sale to buyers using a structured mechanism or used as collateral to banks for loans pending sale of the commodity at a later stage.

The option operates at a higher and specialized level in dealing with crop Waste and Spoilage, storage, marketing advisory and linkage to financial services. The WRS operators have certified storage facilities and are bound by agreed operating rules regarding the quality and trade commissions.

In promoting this model, AGRA is supporting the activities of the Eastern Africa Grain Council (EAGC), the Ghana Grain Council and the Tanzania Warehouse Licensing Board. The intervention has mainly been in the area of strengthening capacities of the actors in the value chain to be able to operationalize the model.

Though there has been an effort to train, identify and certify warehouses, there has been little success in farmers using this model in Eastern and Southern Africa region. This may be as a result of the government intervention in price setting and the reluctance by financial service providers to participate. However the model is performing fairly well Ghana through the Ghana Grain Council.

WRS Model:-

Is a structured marketing option where Waste & Spoilage Management, storage, marketing advisory and financing service is operated by certified warehouse operators only?

4.4 Commercial Village Model

This is a model through which typical social administrative villages are systematically graduated into commercialized competitive market-led trading blocs. The model comprises 200-250 households depending on land sizes, population density, regions and the commodities traded. This is divided further to Commercial Producer Group (CPG) that comprise of 20-30 households.

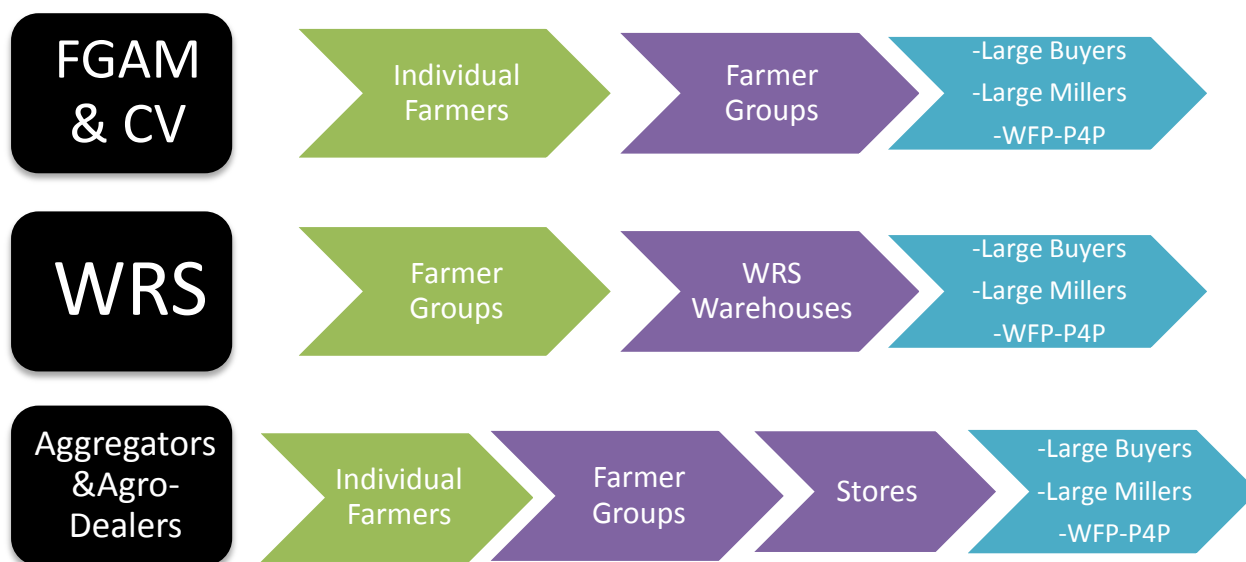
The model establishes subject-matter commercially oriented committees that are strengthened periodically to leadership in the value chain such committee include; production, markets and finance among others. This model has been formulated by Farm Concern International and is being applied successfully in implementing the cassava value chain project in East Africa titled “Cassava

Commercialization through Village Level Semi-processing for Industrial Use” The model is now being applied in 7 countries in Sub-Saharan Africa.

4.5 Aggregator Model

This is a private sector lead model of investors who provide services to SHFs by supplying inputs, extension and output market services. The services are provided on contractual basis. The aggregator model is mainly applied in Western Africa especially in Ghana.

Flow in the model Value Chains



4.6 Policy Design and Implementation

AGRA has launched “Policy Action Nodes” in four countries: Ghana, Mali, Mozambique and Tanzania. These are theme-based networks of policy stakeholders drawn together to influence policy design and implementation by creating new platforms for more effectively translating evidence into policy action. Participants in Nodes come from government ministries of agriculture and trade, local policy research institutions, private sector companies, farmer organizations, NGOs, and civil society organizations, with strong links to key government policy making platforms such as National Parliamentary Committees. Node members jointly identify major policy constraints affecting agri-food system performance, specific policy bottlenecks to be overcome and targeted investments in policy analysis, policy advocacy, policy design, and policy implementation to overcome the bottlenecks. AGRA provides financial support and technical and organizational backstopping to the Nodes and links them to external expertise, international best practice, development partner programs. Themes covered include seed policy, soil health policy, markets policy, land policy, and environment policy. Waste and spoilage issues enter the work of the Nodes through the markets policy action nodes. The Tanzania markets nodes have made most progress in influencing policy through support for development of a policy on grades and standards, and also on post-harvest management.

5.0 Emerging Lessons

5.1 Identifying the W&S problem

AGRA's intervention on issues and challenges facing the SHFs through the value chain approach is well-coordinated. All market access projects at AGRA are in essence addressing the questions of Waste and Spoilage related problems. The key issues that come out in this review is that the SHFs are disjointed and lack the essential skills and capabilities and other facilities required to not only reduce food waste but also access more rewarding markets.

The disunity of SHFs also contributes to unfavorable policies that affect their business. This is because without a united front by farmers there is no proper and coordinated advocacy that could check the government actions in relation to their farming business. The projects therefore follow the problem resolving approach including training of trainers (ToT) and the following are the key lessons learned.

5.2 Building capacity of disjointed farmers

Most SHFs are disjointed or have loose groups that are not formally registered and also faced with leadership problems that cause mistrust. To efficiently and economically address the challenges of W&S facing the SHFs, it is necessary to aggregate farmers for purposes of not only learning skills but also for sharing storage facilities and equipment that are used for managing post-harvest losses.

i. Learning from AGRA's Experience

The projects use consultants to conduct a needs assessment and identify areas of weakness in the entire value chain before deciding on the training/entry point. The projects deal with either the existing farmer groups or assist in developing new groups. In identifying or working with these groups AGRA encourages a gender balance and youth involvement not only in the group but also in the management.

After identification of the areas of training, consultants develop training manuals and training aid materials for the different modules which are used to effectively achieve the intended purpose. The common modules for training include:-

- Leadership and Organizational Development (governance)
- Post-harvest Handling
- Business planning/entrepreneurship

These trainings are segmented and targeted for different categories of people and conducted at different periods of time in order to achieve a specific objective and about 750,000 farmers have received at least one of the training modules. However, all farmers in a project undergo the basic PHH course as the basis for further training.

ii. Sustainability

AGRA promotes sustainability in its projects through the facilitation of win-win partnerships among the value chain actors; and employs measures to ensure there is gender balance in the participating team. In all projects Training of Trainers (ToT) is being applied as a measure of sustainability. For this course, trainees are selected using a set of criteria that considers a minimum level of academic qualification and the subject of interest given that there are different areas of training using modules. After the training, the candidates are tested and the top performers are identified as trainers. They are attached to the consultants to acquire experience and later become trainers at the village level. This creates an opportunity especially for the learned youth who are jobless.

iii. Innovative training

- The use of Cinema/Videos for training in the rural villages has become an innovative way of reaching many farmers with post-harvest skills and other extension messages in the value chain. Unlike formal training, this method gives an opportunity to view pictures of the actual action that remains fresh in the memory of farmers for long.
- This method does not discriminate attendees it allows children and the youth to learn since they also assist their parents on the farm. So the training impacts the entire community directly
- This innovation is also an effective tool in creating awareness of a new innovation that farmers should know about in the value chain just as adverts done on a television

The Cinema/video training method is being practiced in Tanzania by projects implemented by RUDI where by a van mounted with a projector and screen moves from within the remote villages and extension information on best practices is aired to the villagers as a movie. The use of a Tri-cycle is implemented in Ghana and works on the same principle but it was designed specifically to reach remote areas where vehicles cannot penetrate. The method reaches many people at a given time and is done in the evenings when most of the people have concluded their work.

iv. Policy Reform

AGRA's experience with policy reform in Africa suggests that key drivers of success include:

- The relevance and quality of the evidence and analysis brought to bear on given policy problems;
- The strength of the consultation platforms within which the evidence is examined, critiqued, adapted, and embraced; and
- The convening and coordination power of the 'owners' of the reform process

AGRA has developed formal and informal criteria for ensuring that these elements are in place in the regulatory reform plans drawn up in each participating country. Cutting across these three drivers is a need for opportunities for learning-by-doing. Policy reform is inherently nonlinear, subject to capture by special interests, and prone to both lengthy inertia and frenetic action. Most of this cannot be foreseen, but it must be prepared for through institutionalized mechanisms that capture events and translate them into learning examples. This is a key feature of AGRA's monitoring and evaluation system.

5.3 Enhancing Post-harvest management skills & creating awareness of PHH technologies available

The biggest challenge of the farmer in Sub-Saharan Africa is food Waste and Loss. Although the average loss is placed at 30% in some circumstances farmers experience 100% loss. For example in 2011 an AGRA project implemented by the Cereal Growers Association of Kenya built the capacity of three farmer groups in Eastern Kenya who managed to aggregate over 200MT of maize to be supplied under the WFP-P4P contract. Unfortunately due to the heavy rains experienced in the region during the harvest period the consignment was found to have high levels of aflatoxin and WFP rejected it. For health reasons the government banned the marketing of grain from that region resulting to a total loss to the farmers.

The above example raised a number of questions that include among others:-

Are farmers fully aware of the causes of post-harvest losses? What will they do within their means to control these losses? Are there causes that are beyond their means? What can be done to resolve it?

In addressing these questions AGRA has intervened and has so far trained over 750,000 farmers on post handling. In achieving this, the following measures were taken by the project implementers:-

- Formulation of simple but all inclusive W&S training manuals for the value chains in question for training purpose
- Design and development of pictorial aid materials (posters) on PHH (with cartoon illustrations) for training and public awareness
- Special training offered to Trainer of Trainers (ToTs) (for sustainability)
- Specific training given to the store management team.

All trainings are simplified to create awareness as to how they can identify the main causes of PHLs and how this can be avoided as shown in table 1 below.

Table1: Identification of PHLs

Causes of PHLs	How to identify the cause	Remedies
High Moisture	Rotten, diseased & discolored grains	Proper sun-drying & measure moisture
Spoilage	Molds & Fungi	Sorting & drying grain
Pilferage	Theft – keep monitoring the produce	Package the produce & place in a secure store
Pests & Vermin	Check for moths and rat/rodent droppings	Dusting, traps, cats etc
Spillage	drying grounds and the stores	Ensure using secure drying materials & clean level store
Broken/damaged	Observe the grain	Don't beat the produce during de-husking

It is identified that the largest amount of food losses occur at the early stages of the value chain, specifically during the harvesting, storage and transportation stages. This is basically due to the rudimentary system of harvesting and storage, poor rural road infrastructure and mode of transport.

i. Lessons Learned:-

- Training is the foundation and an essential catalyst in solving the challenges of food waste and spoilage. The AGRA supported smallholder project farmers trained in Kenya, Tanzania, Ghana, Malawi, Mali and Mozambique are able to meet the high quality standards set by the WFP-P4P & other large traders with whom they have been contracted and managed to supply thousands of tons of cereals and pulses.
- Farmers can learn skills from others. For example in Kenya when the first women group was contracted by WFP-P4P and managed to meet the quality standards and supplied the first consignment, the neighbouring groups came to learn and started to adopt the skills and requested to be considered for contracts.

ii. Capacity Building Impact

From the project documents reviewed, *training of SHFs can be identified as the most scaled intervention*. This measure was arrived at, by comparing the projected training targets in relation to the achievement. This measure relates to the completed projects only. The average achievement as shown by the table below is over 100%.

Table2: Training Targets & Achievements of Completed Projects

	Country/ Region	Grantee	Project Title	Target	Achieved	%
1	Ghana	ASI	Arzakinmu Program. Multi-faceted to reduce postharvest losses by improving storage & markets.	15,000	12,327	82
2	East Africa (Ke,TZ &UG)	FCI	Semi-Processing of cassava chips for animal feed processors in East Africa	30,000	54,000	180
3	Kenya	CGA	Strengthening the governance of SHFs to Access Markets	30,000	17,716	59
4	Tanzania	RUDI	Enhancing SHF's market competitiveness (Rice)	10,000	10,567	105
5	Mozambique	KIXIQUILA	Building capacity of SHFs to supply to WFP	8,000	13,810	173

The targets were surpassed in most cases there was an effective awareness created about the projects and the methods used for training were also effective. All farmers that showed interested were offered at least a basic training.

5.4 Storage technology & equipment

Most of the smallholder farmers still use rudimental storage technologies such as cribs made of wood with grass-thatched roofs or small conventional stores made of timber with grass-thatched roofs or iron sheets. These stores are often faced with challenges that include leaking-roofs, rodents, birds and pests that not only increase losses but affect quality of the produce.

As a result of insufficient and in-appropriate storage facilities at the village level, SHFs are not able to aggregate and maintain quality of their produce in order to attract competitive higher-end value chain buyers for better prices.

AGRA's Intervention

In mitigating for this challenge, AGRA working with other partners, has promoted and supported a number of storage technologies for smallholder farmers throughout its project areas. These innovations include:-

- Construction/renovation of village warehouses
- Hermetic Bags
- Cocoons
- Promotion of small Metal Silos
- Purdue Improved Cowpea Storage Bags
- Mobile dryers/solar drying

i. Village aggregation warehouses

AGRA has provided significant support in renovating and constructing new village warehouses/stores and assisting in the procurement of the basic post-harvest equipment for these stores in almost all of the reviewed projects. This is meant to stimulate aggregation, maintain quality and prolong storage of the produce in order to stabilize prices.

The aggregation models (Farmer Group, Agro-dealers, Aggregator and the Warehouse Receipt Systems identified in chapter five above) have been supported by AGRA's projects to improve storage facilities and services in order to reduce postharvest losses. AGRA's



Support on the construction of these warehouses was however done on a cost-sharing basis. The beneficiaries often provided land and raw materials. The Arzakinmu Program in Ghana is a typical example where 18 new warehouses were constructed.

ii. Equipment

AGRA's intervention also extended to the procurement of quality management and the value addition equipment such as grain moisture meters, weighing scales, pallets, tarpulins, aflatoxin kits, rice threshers, mobile maize shellers, chippers etc.

The adoption of the village aggregation model is faster and more sustainable as member farmers have shares of ownership by partially contributing to the warehouse establishment. The farmer leaders were trained on storage management and have established committees to manage them. With successful management systems at the group level, this model will continue to sustain postharvest loss management beyond the project period. Two groups were visited and interviewed on sustainability and the following was recorded.

a). **Romoshia Farmers Association** based in the South Rift region of Kenya was a project supported by AGRA's grant and implemented by the Cereal Growers Association (CGA). The major objective of the project that ended in 2012 was to establish group aggregation, postharvest management & joint marketing. The field visit and interview of the committee leaders of the project that was completed two years ago found the group to be active in joint bulking and marketing their aggregated produce to large buyers. As a matter of fact, on the day the group was visited, WFP-P4P was uplifting the consignment of maize they had contracted the group to supply. The group was also expecting to supply beans and maize to 13 schools within the county that they had been contracted. Various committees of the group were operational and strong and the main management committee had a business plan focusing to establish a milling facility within their newly build store for value addition. The store was also being utilized by third party members such as traders as a storage facility on a lease basis at a fee. The group has clearly overcome the postharvest handling challenge and is extending storage service to the committee. The group's membership had increased from 22 to 44.

b). **Kathome Farmers Marketing Umbrella Association** is located in Kitui County (Eastern Kenya). The AGRA supported project through its sub grantee CGA has an objective of commercializing traditional staple crops (sorghum, pigeon peas, green grams & cowpeas). The intervention to the group is through provision of a sorghum thresher and training. The discussion with the management of the group revealed that although the project has less than one year before its completion the group seemed not to be cohesive and did not have a business plan as to how the thresher will be used to benefit its members and the community at large. The equipment was hosted at the chairman's homestead. They indicated it required a tractor to move it from one homestead to another to thresh their grains but they had no clear plan and resource to accomplish this. The group may have required smaller threshers that could be pulled by oxen or donkeys.

iii. Hermetic bags & Cocoon technology

Through AGRA projects hermetic bag and cocoon technology marketed by Grain Pro has been promoted especially in the Eastern and Southern Africa. In Rwanda cocoons have been used for storage, however, the demand for this technology is either from the government or from sponsored projects. An AGRA project in Mozambique (Ikuru) also supported the procurement of a 20 MT cocoon in order to store organic peanut while waiting for export. **The adoption of this technology is slow due to inaccessibility and unaffordability of the technology.**

iv. Metal Silo & Technology

This technology is more prominent in Southern Africa especially in Mozambique and Malawi being promoted by CLUSA an international NGO. In Kenya, CIMMYT has been promoting the technology, but the adoption has been slow.

v. Purdue Improved Cowpea Storage Bags

In Burkina Faso, the Purdue PICS triple bag technology has been introduced to cowpeas SHFs and over 4,000 farmers have been trained on its use. Though the technology is found to be effective, **the adoption is slow because it is relatively expensive** and therefore unaffordable by SHF. However, some traders who intend to store for long demand cowpeas in PIC bags and are willing to pay for it.



Mobile Dryers

This technology is available and is being implemented mainly by the private sector such as companies in Ghana and in Kenya (Lesiolo Grain Handlers). The adoption of the technology is however low. Like other technologies demand for his particular service may be low thus not attracting more investments. In fact the Kenyan case is an investment supported through a USAID Market Linkage Initiative project that required matching funds. Solar mobile innovation is being practiced in Uganda but equally expensive to upscale.

5.5 Access to greater markets

a. Marketing Skills & Information

Poor quality, low volumes, poor storage facilities, lack of finance and lack of market information and marketing negotiation skills are some of the reasons why SHFs lack access to large and competitive buyers. This forces the SHFs to sell their produce at the lowest end of the marketing chain and hence receiving low returns for their produce.

To address this challenge, AGRA has between 2009 & 2013 trained 731,971 farmers on postharvest handling, quality management and market linkage (marketing kills). Promotion of innovative market information systems such as those of MFarms developed by Imagead in Ghana, RATIN through Eastern Africa Grain Council, SMS through projects such as that of the Kenya Agricultural Commodity Exchange has also enhanced the market linkage process.

mFarms ICT platform developed by Imagead Ltd in Ghana is among those supported by AGRA that is experiencing a faster growth. It has been introduced in 17 countries in the continent of Africa that include Ghana, Burkina Faso, Rwanda & Kenya. The platform allows actors in the agricultural value chain to network and exchange actionable production, logistics, market and other business and technical information via mobile or the web. It brings together profiled and geo-referenced data on value chain actors and services: - Who are they? What do they do? What are their needs? Where are warehouses, haulage companies etc. located?

During the review, one of the mFarm's beneficiary called Amsig Resources an aggregator operating in Northern Ghana was interviewed. The aggregator indicated that mFarms ICT system is beneficial to their business because it reduces the company's transaction costs by allowing profiled farmers to be reached via SMS and or voice messages left on their mobile phones. The aggregator uses the system to gather information from farmers regarding the acreage cultivated and reminds them on critical extension messages of production such as weeding in time. The aggregator also serves as a distributor of the government subsidy fertilizer, the system allows for the input information transmission to farmers as to what particular date to pick their fertilizers.

In these transactions, the aggregator works with the profiled farmers on the understanding that they will supply their outputs to their company. With this in mind the aggregator also supplies some inputs to these farmers and such transactions are conducted through the mFarm platform.

b. The higher end Market outlets

Through AGRA's intervention, SHFs have been enabled to access greater markets and have so far jointly marketed produce of over 615,000 MT between 2009 & 2013. **These higher end market outlets include WFP-P4P, millers, big traders, processors, government marketing boards, schools, animal feed companies, exporters (e.g. peanut exports – Mozambique)**

The main reasons for these large buyers committing to procure from SHFs is because they are able to aggregate a critical commercial volume of high quality produce in their group stores or larger warehouses and that these SHFs are able to negotiate and enter into supply contracts and meet contractual obligations that include specified time of delivery and type of packaging required by the buyer. This is demonstrated by sales made to WFP-P4P and exports.

Farmer aggregation, WRS and aggregator are some of the models that have significantly contributed towards SHF's accessing greater market opportunities. But for this to happen, intervention had to be done through AGRA in terms of offering training services especially in PHH and in marketing skills, partial support in building warehouses and equipping them. The assured market at competitive prices especially from the WFP, financing through WRS and supply of inputs in the case of aggregators are some of the incentives that contributed to the success.

c. Market Prices

The reviewed projects indicate that the price gain for the improved quality produce ranges between 11% and 20%. This is an indication that Waste and Spoilage Intervention is likely to stabilize crop prices throughout the food value chain. In cases where prices may decline due to increased volumes resulting from improved quality or any other unintended consequences, it is hoped that this risk may be managed through effective structured markets (contracts, WRS Commodity exchanges). Crop alternative uses and value addition may also be other options that can increase demand hence mitigating the risk of declining prices. For example processing cassava for animal feed and into more food products such as bread will increase demand.

This may be an area for investigation to identify the actual gains arising from improving quality.

5.6 Cross Cutting Issues

a. Linking SHFs to Financial Services

Learning from AGRA's experience, lack of financial literacy and high cost of money in Sub-Saharan Africa is another contributor to non-performing markets and high post-harvest losses. AGRA has intervened by supporting SHFs and SME's through training on Financial Literacy and linking them to financial service providers. Through this assistance 293,419 SHAs and 2,529 agro-dealers managed to access credit amounting to US\$ 122.2 million (2009-2013) and about US\$ 36.5 million provided under guarantee schemes in the same period.

Though financial services linkage is in-built in all projects, greater success has been experienced in Rwanda through Rwanda Development Organization, Uganda through Uganda Development Trust, Tanzania and Kenya where SHFs have been assisted in opening bank accounts and payment for their produce is being made directly to their bank accounts. This process enables SHFs to supply to greater market outlets such as WFP-P4P that requires bank accounts for ease transfer of money.

However, the credit that has been disbursed so far is considerably low compared to the number of farmers reached through AGRA projects. This suggests that the existing financing systems are not attractive to SHFs. The disjointed farmers and traders, unstructured markets and lack of collateral are responsible for the high cost of lending due to the perceived risk. There is therefore need for innovative finance that will:-

- Inject accessible & affordable finance to SHFs and PHL technology innovators
- Accessibility and affordability of finance will enhance demand for post-harvest loss reducing technologies. The demand will create initiatives to SME's to replicate the technologies hence making them affordable and creating jobs at the village levels.

An interesting example associated with the AGRA investment in Rwanda related to the leveraging of commercial loans for SHFs through their FO in the context of an AGRA integrated investment. This case is illustrated below.

Strengthening farmer groups is making a difference



**Coamanya Cooperative
Nyanza province, Rwanda**

Before:

The FO was

- Small
- No services
- Unable to tap ready opportunities

AGRA's integrated project provided support to:

- Strengthen FOs
- Learn good farming practices & access inputs
- Learn post-harvest handling & aggregation
- Rehabilitate & equip a store
- Link to markets



After:

The FO is now

- Larger
- Achieving higher crop yields
- Obtaining credit from banks to buy farm inputs
- Aggregating produce & selling at higher prices
- Adding value




b. Policy & Advocacy

Policy and Institutional environment is a crucial factor that influences how farmers access market and preserve quality. This factor is being considered in AGRA's intervention projects. Some of the grantees such as CGA of Kenya play a major role in engaging the government on policies that affect its members. They are recognized and consulted by the government before a major policy decision is made that may affect the cereal farming business. For example in 2012 CGA mobilized other farmer organizations and engaged the government to drop the proposal of imposing Value added tax on grains. The Eastern Africa Grain Council has also engaged the Kenyan government to have a policy on WRS. A draft policy has now been developed and submitted to the government for consideration.

Ad hoc Government policy pronouncements affect the businesses of smallholder farmers and often contribute to high food losses. For example in 2012 the Tanzanian Government banned maize exports to Kenya without putting measures of procuring the same maize at export parity prices. This increased W&S and therefore loss of incomes to both traders and farmers. These kind of un-predictable policies discourage private sector investment and enhance post-harvest losses.

Most governments in Sub-Saharan Africa have policies that restrict market excess to post-harvest loss reducing technologies through import duties and taxes (**example Kenya imposes 16% VAT while Tanzania imposes 16% VAT and 55% excise duty on hermetic bag technology**) promoted by Grain Pro. This current system often benefits importers who are mainly politicians or their associates.

In expanding African markets and making them more efficient, AGRA provides grants to policy nodes in various countries who commission studies that generate evidence based research. The research is summarized to policy briefs which are used for discussion with key policy decision makers. AGRA has already initiated the development of warehouse receipt system legislation for Mozambique and Mali, the enactment of legal metrology legislation in Tanzania and review of Agri-business and contract laws in Ghana.

In order to address this policy gaps, stakeholders in the value chain need to proactively work with policy research institutions to seek for research evidence studies that they will use in advocacy to convince governments to set up the right policies that will promote reduction of food loss.

c. Gender Perspective

All projects implemented by AGRA include the gender perspective. Through awareness and trainings gender issues are prioritized and therefore women and youth are included in group leadership. In the completed projects the 48% of the farmers reached were women.

5.7 Opportunities

Sub-Saharan Africa is witnessing a fast increasing population and facing the highest food insecurity. The region therefore has unsatisfied domestic demand, import substitution and export potential within and internationally. Africa's food loss is bigger compared to the food waste, so reducing food losses is essential in fighting food insecurity. Learning from AGRA's intervention, we need to focus at the value chain rather than at the consumer levels in order to achieve maximum impact.

Opportunities for all actors in the value chain to invest in interventions that reduce PHLs among smallholder farmers exist but on varying degrees based on crop characteristics and country. However, for these opportunities to be tapped African governments should prioritize on key policy and regulatory instruments that will promote investments targeted on food loss (especially focusing on technology affordability and access barriers)



6.0 Learning Questions

Learning from AGRA's experience, it can be concluded that there is willingness from farmers and other actors in the value chain to learn and adopt Waste & Spoilage reducing techniques and technologies. However, there are a number of limitations that need to be addressed in order to facilitate scalability.

6.1 Disjointed farmers

- SHFs need to be consolidated into cohesive economic business units (groups) for economies of scale and advocacy purposes
- Role of government, development partners such as RF and AGRA is essential in promoting farmer group platforms

6.2 Awareness of W&S technologies

- There is limited awareness by SHFs of W&S reducing techniques and technologies/food safety due to weak government extension services
- Engage elaborate innovative campaigns and trainings (through media, cinema/video radio, mobile phone technologies etc.)
- Given the limitations by the governments RF and AGRA are in a good position to use the evidence coming from the learning studies and experience to influence other development partners' support for elaborate awareness campaigns.
- To encourage both public and private sector action and investment, national governments and regional bodies should provide assurance (political will) at highest level possible. Develop investment incentive packages and promote them to attract private sector participation

6.3 Access & affordability of technologies

- SHF's use of storage equipment techniques/technologies is low not because of lack of demand but due to access and cost barriers
- Access to processing equipment such as cassava chippers is also limited and costly. SHFs are willing to pay for processing if the equipment was available in their villages
- The mobile cassava chippers under the FCI project in East Africa demonstrates that access to processing equipment will change the level of business, increase employment and improve lives
- **Action:** Governments should remove barriers of investment such as taxes, improve infrastructure (rural road network, electricity for processing) and target financial subsidies to local artisans that will fabricate the processing equipment

6.4 Technology adoption

- Assured markets (contracts) accelerate W&S reducing technology adoption
- Functional structured markets such as WRS and commodity exchanges will enhance adoption
- Governments implement regional phytosanitary standards to promote regional exports
- Increasing awareness and training, accessibility and improving affordability will be measures towards improving adoption of the W&S reducing technologies

6.5 Learning Questions

- a. The **core policy and regulatory requirements** for reducing post-harvest loss in the food value chain? What are successful models of proactive policy interventions to address post-harvest loss? Who benefits from the current system and who would stand to lose from changes (and therefore resist)?*
 - Establish/support extension, research and development institutions that deal with waste and spoilage (create curricula in colleges that train postharvest handling).
 - Fix the right policies that discourage high taxes, duties and fees imposed on waste and spoilage reducing technologies.
 - Discourage inconsistent trade practices such as price fixing and export bans that distort the market and thus discourage private sector involvement.
 - Governments to put in place the regulatory framework that would support and regulate structured market systems (warehouse receipt system) in order to stabilize markets and hence reduce food losses.
 - Set clear, simple and effective systems for food standardization, certification and inspection.
 - Reduce the role of National Food Reserve Agency (NFRA) e.g. National Cereals & Produce Board (NCPB) in Kenya to open buying/grain storage to private sector. Such agencies should be buyer of last resort to reduce market distortion and encourage private sector investments in storage and storage services

Proactive Policy Intervention

- Provision of infrastructure such as electricity
- Provision of PHL technology reducing investment grants
- Governments investing in storage and equipment where the private sector is not effective
- Promote public/private investment partnerships

Who benefits from the current situation?

- Without fair rules of trade a few large traders, exporters and importers often linked to powerful politicians take advantage of the situation. They are likely to resist some of these proposed policy changes. Middle men who profit by buying produce on the cheap from desperate farmers would also be another category of losers.

- b. *The risks and opportunities associated with greater engagement of wholesale and retail private sector investors in reducing post-harvest loss in the food supply chain?*

Opportunities

- Rain-fed agriculture practiced in Sub-Saharan Africa causes temporary over supply of commodities due to harvest seasonality trends. The private sector has the opportunity to invest in storage and other value addition processing facilities to service the demand throughout the year.
- The increasing population in the cities and towns of Africa is shaping the trend on how food should be packaged and distributed. The increased nutritional awareness also demands for the processing and packaging of traditional foods. All these present great opportunities for private sector investment.
- Greater engagement by the wholesale and retail private sector will require specific quality of food in specific packages. This will increase investment and employment in this area where sorting, packaging and specialized transportation would become necessary activities
- Increase opportunities for technology and financial services

Risks

- Unpredictable Government intervention activities including through imposition of taxes, duties, fees and cess
- Challenges of the legal and regulatory systems (e.g. export bans, corruption in certification and inspections)
- High and unstable interest rates by financial institutions
- Unpredictable weather conditions since most of sub Saharan Africa is mainly dependent on rain-fed agriculture
- Poor infrastructure (unreliable electricity supply, bad rural roads affect the timely supply and quality of food)
- Political instability which may interrupt farming and trade activities
- Power Dynamics: Level of trust between wholesale/supermarkets and SHFs supplying them (for vegetables and fruits e.g. dessert bananas, - any product that remains unsold in the supermarket is to the farmers account.
- Honoring supply contracts- if market prices fall, wholesale buyers renege on contracts, if the prices increase SHFs side sell. In the process postharvest losses are high

- c. *What role can innovative finance and innovations in technology play in the creating conditions of scale for post-harvest loss reducing technologies and initiatives?*

- Greater access to affordable finance will motivate farmers and traders to maintain the quality and preserve food for longer periods of time in order to stabilize prices. This has been demonstrated in AGRA's intervention countries like Ghana where the warehouse receipt system through the Ghana Grains
- Council has started to be effective.

- With increased access to affordable finance more investors will emerge to increase competition in post-harvest technology supply thus creating efficiency hence increasing demand for innovations
 - Increased demand for finance and technology will trigger value addition and product processing at the village level hence increasing employment to the rural population especially women
- d. *What and where are **the highest potential intervention stages** along the food supply chain in various countries for reducing post-harvest loss?*

In most countries the highest potential intervention stages include:-

- Creating postharvest loss awareness at village/household and smallholder trader levels
 - Building the capacity (training) of smallholder farmers at the group levels specifically on postharvest management, marketing skills and financial literacy. AGRA's intervention in strengthening the capacities of farmers has enabled them to improve the food quality and be able to sign contracts to market their food to high end buyers such as WFP-P4P, large millers and government marketing bodies.
 - Intervening in establishing village stores and provision of produce quality handling equipment is essential in reducing postharvest loss. By partially supporting the construction and or renovation of village stores, AGRA and its partners has motivated farmers to mobilize their own resources to establish village storage facilities that have enabled them to aggregate their produce to market to high end buyers (this has been more so in the Kenyan situation).
 - Support in availing the value addition processing equipment at the village level is necessary in reducing postharvest reduction. For example AGRA's intervention in supporting the procurement of cassava and sweet potatoes processors in Eastern Africa, for peanut in Mozambique, rice milling in Ghana & Mali and groundnut processors in Senegal and Mali has greatly assisted in reducing postharvest losses and improved prices of these products.
- e. *What **issues, challenges, skills, capabilities and technologies** do/should small holder farmers (SHFs), especially female SHFs, prioritize in order to reduce post-harvest loss, increase their incomes and off-farming livelihood options?*

The key priority issues that the smallholder farmer has to overcome includes:-

- Acquiring knowledge on postharvest handling, market trends and market negotiation skills coupled with knowledge to access and utilize credit to leverage their business.

Smallholder farmers face a number of challenges that include:-

- Lack of structured markets
- Seasonality of supply (rain-fed farming = marketing at the same period of time causing temporary over supply that reduces prices)
- Weather (rains during harvest periods that affect quality and increases food losses)
- Inadequate/inappropriate storage facilities
- Limited knowledge on postharvest management, marketing skills and financial literacy

- Inaccessibility/unaffordability of finance & innovative technologies
- The dis-economies of scale experienced by the smallholder farmer aggravate the challenges, pulling together into groups SHFs are able not only to get joint training, but also to aggregate produce into common storage facilities, maintain quality and attract competitive buyers of their produce. By aggregating together, the smallholder farmers will also be able to attract financing since they will be holding significant amount of produce in a common pool that could also act as collateral
- In order to reduce postharvest loss, smallholder farmers must have skills to know at what time they should harvest to avoid waste, which method they should use to harvest to avoid breakage, they should know how to identify the moisture levels of their produce, how to preserve their produce with chemicals and the type of storage technologies they should use for long term storage.
- Different technologies are available in different countries for different crops. From AGRA's intervention experience technologies available for cereals and pulses include, improved village warehouses and use of gunny bags, use of hermetic bags, cocoons, small metal silos and use of Purdue improved cowpea storage bags. For roots and tubers, simple value adding processors such as cassava chippers are essential.

7.0 Recommendations & Conclusion

A lot of knowledge on postharvest management has been generated at AGRA. However the knowledge still remains in unfiltered reports from various country projects. The information is still maintained by departments and is not well-utilized in their form.

There is therefore need for this knowledge to be distilled for dissemination to many users. To make this to happen, AGRA requires an in-house knowledge manager who will distil and document success stories and experiences in a more precise manner and in different formats (soft/hard) that will be disseminated through various communication channels.

To ensure success, enhance sustainability and up-scale success stories, the life of a project need to be (minimum of 3 years) to allow enough time for training and adoption. To ensure continuous mentoring of farmer groups, grantees need to be capacitated to provide back-stopping services beyond project period. Regular Monitoring and evaluation is essential in spearheading desired results.

In relation to policy, AGRA, Rockefeller and other stakeholders in the value chain should invest more in evidence-based research and use a single platform to engage governments to adopt proper policies that will enhance postharvest management.

Conclusion- In reducing W&S emerging lessons indicate that intervention in crops such as cassava that have potential for processing (value addition) different types of products for the market will create a larger impact to the economy and will increase both food security and income. The processing will create employment for women and youth and also attract SME's. AGRA's intervention in W&S is generally contributing to its overall goals of attaining food security, increasing productivity and increased incomes of smallholder farmers.