REPUBLIC OF KENYA

Food and Agriculture Organization of the United Nations

KENYA POSTHARVEST MANAGEMENT STRATEGY

For

Food Loss and Waste Reduction

2024–2028

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

FOREWORD

The realization of food and nutrition security in sustainable food systems is central to realizing Kenya's long-term aspiration of lifting the average living standard of its citizens and achieving a middle-income status for the country by 2030. It is also important for meeting our commitment to achieving the SDG 1 and 2 goals on poverty and zero hunger by 2030.

With Kenya's population of approximately 55 million, projected to reach 85 million by 2050, innovative approaches are needed to achieve food security in its four dimensions of availability, access, utilization, and stability.

Food and nutrition security in sustainable food systems will require prudent and judicious use of production resources – land, water, energy, labour and production inputs. There is no doubt that with the right production inputs, favourable weather and technical support, Kenya's farmers, a majority of whom are smallholders, can produce sufficient food to satisfy domestic demand and surplus for the export market. Indeed, concerted efforts have been made to increase production through better and improved crop varieties and animal breeds; better crop and animal husbandry practices; and climate-smart production technologies. These production-inclined interventions have been supported further through government subsidies on inputs, and risk mitigation measures such as crop and livestock insurance. Despite the commendable efforts to increase production through these upstream interventions, there have been less work towards preserving the resultant harvest, through proper postharvest management. As result, an estimated 30 percent of the food produced is lost or wasted along the food supply chain. The upstream food losses (from production to retail) are attributed to technological, infrastructural and capacity limitations, some of which are unavoidable or beyond the control of the value chain actors. On the other hand, the food wasted downstream (from retail to consumption) can be curbed because it results from deliberate and avoidable actions by the actors.

Continued efforts to increase production without preserving the harvest by addressing the causes and drivers of postharvest food loss and waste (PHFLW) can be equated to adding water to a leaking bucket and expecting to fill it up. Unless the leaks in the bucket are fixed, it will never fill up! Similarly, unless we address the causes of the leaks in the food supply chain, increasing production alone will not bring about food and nutrition security. There is therefore need for a major shift in focus from just increasing production to downstream activities that are geared towards securing the harvest through proper postharvest management and development of value-added products and services. These downstream activities are expected to reduce PHFLW by ensuring that the food produced reaches the end user in the quality and quantity required. In addition, proper postharvest management is

key for market access for farmers, as well as for creating employment opportunities as outlined in the Kenya Government's Bottom-up Economic Transformation Agenda (BETA) under the Food Security pillar.

Proper postharvest management and food loss and waste reduction requires concerted strategies and actions by all stakeholders in the agrifood sector. The Government of Kenya has therefore developed the National Postharvest Management Strategy for Food Loss and Waste Reduction 2024-2028, to guide the efforts by various stakeholders.

I am glad to share with you this five-year Strategy, which outlines the measures Government at the two levels, in collaboration and partnership with non-State actors, will undertake in postharvest management and food loss and waste reduction. This will be achieved through a multi-sectoral food systems approach involving collective action by all stakeholders at national and county levels. The Strategy also outlines the mechanism for monitoring and evaluation to measure progress towards set targets for postharvest food loss and waste reduction at the global level (SDG 12.3), and also at continental level under the 2014 Malabo Declaration.

For this Strategy to achieve the intended goal of contributing to improved food and nutrition security and livelihoods for Kenyans, I call on all the stakeholders in the agrifood systems and from other relevant sectors to jointly support its implementation.

Hon. Franklin Mithika Linturi
Cabinet Secretary,
Ministry of Agriculture and Livestock Development

PREFACE

Kenya's agricultural landscape is predominantly smallholder-based, and relies heavily on rain-fed production. Under these circumstances, food and nutrition security, amidst a growing population, coupled with climate change, has been a difficult target to meet.

In the Agricultural Sector Transformation and Growth Strategy (ASTGS), the Ministry of Agriculture and Livestock Development (MoA&LD) has prioritized three anchors and three enablers to increase agricultural productivity, agro-processing, value addition, food and nutrition security, and farmer incomes.

The Government, through the agriculture sector line ministries, departments, and agencies, and in partnership with the private sector and development partners, has continued to invest heavily on production, but with limited measures for improving postharvest management. This has led to a situation where huge amounts of what is produced are lost or wasted along the food supply chain. The drivers and causal factors that contribute to the losses and waste are diverse and fall within the mandates of several sectors. There is therefore a need for a well-coordinated, multi-sectoral, multi-stakeholder systems approach to developing effective postharvest management programmes that also provide for efficient food loss and waste reduction interventions.

The Ministry of Agriculture and Livestock Development, through the Plant Protection and Food Safety Directorate (PP&FSD), with support from the Food and Agriculture Organization of the United Nations (FAO Kenya), spearheaded the development of this Postharvest Management Strategy for Food Loss and Waste Reduction 2024-2028. The Strategy development process was consultative, involving key stakeholders across the entire country, working closely with the counties and various sectors. We are confident that the Strategy will serve as a foundation and guiding framework for more effective and long-term postharvest management services and interventions in Kenya. The Strategy is a first of its kind in providing a holistic approach to PHM-FLWR. It shall be periodically updated to accommodate emerging technologies and developments in this area. We are grateful and thank all stakeholders and partners, especially FAO Kenya, that made this Strategy a reality.

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ACKNOWLEDGEMENTS

I acknowledge the tremendous efforts of technical experts from the public and private sectors, non-governmental organizations, and research institutes, who actively participated in and contributed to the development of this Strategy.

I appreciate the facilitating role played by the Ministry of Agriculture and Livestock Development (MoALD), under the leadership of Dr Paul Kipronoh Ronoh, Principal Secretary, State Department for Agriculture; and Hon Jonathan M. Mueke, Principal Secretary, State Department for Livestock Development. I recognize too, the support of

Ms Mary M. Muriuki, Principal Secretary, State Department for Public Health and Standards; and Eng Festus K. Ng'eno, Principal Secretary, State Department for Environment and Climate Change.

I also thank Mr Mganda Ishmael, the National Focal Person for Postharvest Management on Food Loss and Waste Strategy Development, for coordinating the process, as well as the team of experts led by Winnie Yegon (FAO).

The national team was represented by Philip Kandie, NCPB; Elizabeth Kamau, FAO; Prof Catherine Kunyanga, University of Nairobi; Dr Francis Wayua, KALRO; Dr Jacqueline Oseko AFA; Protus Khisa, JAS-IGS; Michael Kipyego, Paul Obusuru, and David Ombalo, all from the MoALD; Wambui Mbarire, RETRACK; Gerald Masila, EAGC; Alvin Opicho, FPC; and Geoffrey Misati, Ministry of Health. Special appreciation goes to Professor Jane Ambuko for her technical knowledge and insights that went into shaping this document.

The Ministry of Agriculture and Livestock Development expresses immense gratitude to our development partner, FAO, for the timely financial and technical support extended to this process.

As it is not possible to mention everyone and every institution individually, kindly take this acknowledgement as an expression of our sincere gratitude.

Collins Marangu
Director,
Plant Protection and Food Safety Directorate,
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EXECUTIVE SUMMARY

Agriculture, the mainstay of Kenya's economy, plays a critical role in ensuring food and nutrition security for the Kenyan population. According to the 2022 Economic Survey, the sector contributed approximately 22.4 percent of total Gross Domestic Product (GDP) and an additional 17.1 percent to GDP through linkages to other sectors, such as manufacturing, distribution and services, in the year 2020. Agriculture contributes approximately 75 percent of industrial raw materials, 65 percent of export earnings and 60 percent of the total employment. The sector employs more than 40 percent of the total population and approximately 70 percent of the rural population, and is the principal source of rural incomes and livelihoods.

To address food and nutrition security, Kenya has invested mostly in production. There has, however, been limited focus in minimizing postharvest food loss and waste (PHFLW). PHFLW has a negative implication on the returns on investment in the sector as well as the livelihoods that depend on it. PHFLW against high levels of food and nutrition insecurity requires a reconsideration of strategic pathways that not only focus on production and productivity, but also include holistic approaches that ensure the entire food system works. Addressing it could potentially translate to increased availability of food and incomes without increasing production from an already strained food system.

Postharvest losses and food waste have negative implications on the economy, environment, and social fabric of the society. Food lost in quantitative terms leads to a reduction of available edibles for consumption, worsening the food insecurity situation. It also results in loss of money as well as natural and time resources. Economically, postharvest losses translate to wasted investment in production, in addition to loss of potential incomes. Environmentally, food production contributes to greenhouse gas emission, which worsens when food waste decomposes and releases methane. This is a double tragedy, as food production and subsequent value chain activities also contribute to greenhouse gas emissions. Apart from the greenhouse gases, urban waste is mainly composed of organic substances at rates of between 60-80 percent, further degrading the environment and leading to methane emissions.

This Postharvest Management Strategy (PHMS) has identified six key constraints that impede efficient and effective postharvest management in the agrifood systems, which, if addressed, can contribute to improved food and nutrition security and livelihood development. The constraints are:

1) Limited capacities for primary handling of food;
2) Limited efficiency of value chain development services to address food loss and waste;

3) Limited food waste management initiatives;
4) Weak coordination of policies, legal and legislative frameworks that influence PHFLWM;
5) Limited/inadequate institutional capacity and collaboration on PHFLWM; and
6) Weak linkages between research, development, and knowledge management on PHFLWM.

The Postharvest Management Strategy aims at improving the agrifood systems sector to enhance its contribution to agriculture and economic transformation. To address the identified constraints, the Strategy focuses on three strategic pillars and three strategic enablers that will guide interventions towards better postharvest management and ultimately contribute to food loss and waste reduction. The three strategic pillars are:

1) Knowledge, skills, and tools for primary food management;
2) Value chain development services; and
3) Food waste management initiatives.

The three strategic enablers are:

1) Policy, regulations and legislation;
2) Institutional arrangement; and
3) Research and development, and knowledge management.

The Strategy is designed to promote partnerships and innovation, build skills, and improve linkages for better performance in the sector. This is through maximizing value of investment for sustainable and efficient postharvest management and food loss and waste reduction strategies. The Strategy will help to promote actions across the value chains for all actors, taking a systems approach along the core value chains. Additionally, it will build on the enabling pillars that look at creating a conducive environment for successful implementation of the actions around the Strategy pillars.

The PHMS also outlines the institutional framework required to deliver the Strategy objectives; key stakeholders and their roles in the Strategy implementation, and how they will be coordinated; risks that may affect the implementation of the Strategy and measures for their mitigation.

The Ministry of Agriculture and Livestock Development will spearhead the operationalization of this Strategy in collaboration with other line Ministries, county governments and other stakeholders in conformity with devolution and the Constitution of Kenya (2010). The process will adopt an agrifood systems approach.

The successful implementation of this Strategy will cost approximately Ksh 3.29 billion over a period of five years. The Strategy will be reviewed during or at the end of the implementation period.

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

Food and nutrition insecurity is a global challenge that is very pertinent to the social and economic well-being of any society. This is in line with the Sustainable Development Goal 2 that focuses on creating a world free of hunger by 2030. The goal of food and nutrition security is also amplified by the Constitution of Kenya 2010 under article 43 on Economic and Social Rights (1c): "**To be free from hunger, and to have adequate food of acceptable quality**."

However, despite the investment put in the agricultural sector, 26 percent of the Kenyan population was undernourished in 2020 (FAOSTAT 2023). The trends in food insecurity are on an increasing trajectory, from 2020 when 1.8 million people were counted as being food insecure, to 2.1 million in 2021 and 3.5 million in 2022. The food insecurity is primarily driven by a combination of shocks, including a fourth successive below average rainy season, which was poorly distributed in space and was short-lived (IPC, 2020). The current government allocation for agriculture transformation and inclusive growth is Ksh 49.9 billion for FY 2023/24. However, without a major shift, Kenya is unlikely to achieve a low hunger status as measured by the Global Hunger Index (GHI), by 2030.

Investment in the agriculture sector in an ideal situation should translate to food and nutrition security, where food is accessible, affordable, stable, and utilized. However, the question then emerges: "What happens to the food that is produced? This Strategy seeks to address this concern, focusing on postharvest activities that contribute to ensuring food produced is utilized for the intended purpose. This is through identifying the postharvest bottlenecks in the sector that contribute to food loss and waste, a direct set back to achieving zero hunger. Postharvest food loss and waste (PHFLW) exacerbates food insecurity, results in income loss, and has negative impacts on the environment through wasting land, water, farm inputs and energy used in producing food that is not consumed.

Historically, to address food and nutrition security, Kenya has invested mostly in production, with limited focus on minimizing food loss and waste. The paradox of food loss and waste against high levels of food and nutrition insecurity call for review and reconsiderations of strategic pathways to go beyond production and productivity, and include holistic approaches that ensure the entire food system works, such that investment in production and productivity result in increased food and nutrition security. Food loss and waste reduction could potentially translate to increased availability of food without increasing production.

Despite high levels of postharvest food loss and waste, estimated at 30 percent, Kenya has inadequate strategies and legislation that explicitly guide on PHFLW management. To address this gap, the government, through the Ministry of Agriculture and Livestock Development, and with funding from the Food and Agriculture Organization of the United Nations (FAO), has developed a Postharvest Management (PHM) Strategy to Reduce

Food Loss and Waste. The Strategy is anchored on continental, global, and national policies to ensure Kenya is on track in the efforts to address food loss and waste.

1.2 OVERVIEW OF THE PHM MANAGEMENT STRATEGY

This Strategy is benchmarked on the African Union (AU) Commission postharvest management Strategy of August 2018, in line with the 2014 Malabo declaration targeting to reduce PHLs by 50 percent by the year 2025, in AU Member States.

The Strategy is also aligned with the following national laws, policies, strategies, frameworks and guidelines: Constitution of Kenya; Vision 2030; Agriculture Policy 2021; Agricultural Sector Transformation and Growth Strategy (ASTGS 2019-2029); Food, Drugs and Chemical Substances Act (Cap 254); Crops Act, No. 16 of 2013; Agriculture and Food Authority Act, No. 13 of 2013; Meat Control Act (Cap 356); Fisheries Management and Development Act, No. 35 of 2016; Dairy Industry Act (Cap 336); Standards Act (Cap 496); and the Bottom-up Economic Transformation Agenda (BETA) 2022-2027, among others.

The focus areas for this Strategy are guided by the situation analysis in Chapter 2, where the extent, causes, impact and recommended interventions are outlined. Thus, the Strategy focuses on enhancing human capacity, institutional communication and coordination for the stakeholders involved in the food crops, livestock, and fisheries value chains as key intervention areas to realize the set targets for food loss and waste reduction. Subsequently, the focus areas have been structured into three strategic pillars and three strategic enablers that will guide interventions towards better postharvest management and ultimately contribute to food loss and waste reduction.

The three strategic pillars are:

1. Knowledge, skills, and tools for primary food management;
2. Value chain development services; and
3. Food waste management initiatives.

The three strategic enablers are:

1. Policy, regulations and legislation;
2. Institutional arrangement; and
3. Research and development, and knowledge management.

The Strategy also outlines a framework aimed at ensuring the country has efficient and effective implementation structures and programmes for the management of food losses and waste towards food and nutrition security in sustainable food systems.

1.3 CONCEPT OF FOOD LOSS AND WASTE MANAGEMENT

It is essential that common ground be established, as issues of postharvest losses, food waste, food security and other similar terms, have oftentimes been confused with each other, or are given different meanings within the

concept of postharvest loss management.

The following are definitions of a selected few common terms used in postharvest loss management:

Food loss is the reduction in quantity and quality of food at the upstream stages of the food supply chain – harvest, postharvest, storage, aggregation, primary processing, transport of food. Food loss results from decisions and actions by food suppliers in the chain, excluding retailers, food service providers and consumers (State of Food and Agriculture [SOFA], 2019).

Food waste is the reduction in the quantity and quality of food at the downstream stage of the food supply chain – retail and consumption. It is attributable to decisions and actions by retailers, food service providers and consumers (SOFA, 2019).

Postharvest food loss refers to a decrease in quantity and/or quality of food mass on the supply side of the food chain.

Quantitative food loss refers to the decrease in edible food mass available for human consumption. In physical terms, this is food removed from the postharvest supply chain and not consumed due to spillage and consumption by pests, or due to physical changes caused by alterations in temperature, moisture content and other chemical adjustments, among other causes.

Qualitative food loss is when food loses its quality attributes leading to a loss of economic, social, and nutritional value. The qualitative loss can occur due to incidences of insect pests, mites, rodents, and birds, or from handling, and also from physical and chemical changes in nutrient content. Qualitative loss can also occur from physical and chemical changes in nutrient content, and by contamination with mycotoxins, pesticide residues, insect fragments, or excreta of rodents and birds, and their dead bodies.

The concept of postharvest food loss management therefore brings together all possible forms of approaches across the entire value chain that contribute to reduced levels of losses occurring during and after harvest of grains, fruits, vegetables, oilseeds and all food crops; as well as milk, meat, and other livestock products, and fisheries foodstuffs.

This Strategy therefore builds the framework around handling food postharvest. Food loss and waste will thus be the main challenge the Strategy seeks to address in relation to the activities that influence the reduction of the same within the framework of activities that occur once the food is harvested – from the farm-to the consumer and disposal.

1.4 METHODOLOGY

Through support from the FAO project on *Strengthening Capacities for Enhanced, Safe and Sustainable Postharvest Management of Food,* the initial phase in the development of this Strategy involved a national stakeholder workshop. This was meant to raise awareness on the issues contributing to food loss and waste and gather insights on strategic interventions to address them. The FAO project also recruited a postharvest expert to conduct a desk study, with the objective of gaining

an in-depth understanding of postharvest management in relation to food loss and waste in Kenya. The desk study highlighted the major causes, critical loss and low loss points, and institutional bottlenecks, and made broad recommendations on possible interventions to address PHFLW in Kenya. Following this, through the Ministry of Agriculture and Livestock Development, a multi-stakeholder and multi-sectoral task team was constituted. The members were identified from the Agriculture, Health, Trade and Environment sectors. They represented the government, parastatals, research institutions as well as the private sector. The task team converged several times through workshops and meetings to review the AU Strategy and Kenya draft Strategy. The main agenda for the meetings was to incorporate feedback from wider consultations, and give input and guidance on the review process, offering critical perspectives from the different sectors they represented. The product of the meetings was the zero draft Postharvest Food loss and Waste Management (PHFLWM) Strategy.

The Strategy was then presented to the Sector Working Group (SWAG) on policy within the agriculture technical committee for further input, after which the document was subjected to public participation at county and national levels of government. The stakeholder participation took a systems approach where representation from the value chain actors as well as supportive sectors such as academia, were represented. The 47 counties were grouped into five regional blocs, where the stakeholders were taken through a sensitization session of postharvest management with a focus on food loss and waste, and an overview of the Strategy. Thereafter, the teams were guided on the selection of priority value chains along with identification of critical loss points, contributing factors, and mitigation measures.

The task team then met to review feedback from the consultative forums to incorporate in and improve the draft Strategy. The revised draft was then presented to the SWAG-2, where it was approved for national validation, with all comments addressed.

CHAPTER 2: SITUATION ANALYSIS

2.1 STRATEGIC ALIGNMENT OF ADDRESSING FOOD LOSS AND WASTE

2.1.1 GLOBAL FOOD LOSS AND WASTE STRATEGY

In September of 2015, a historic window of opportunity opened to put the issue of food loss and waste reduction onto the global agenda (Champions 12.3). SDG 12 seeks to "ensure sustainable consumption and production patterns." The third target under this goal (Target 12.3) states: "By 2030, halve per capita global food wasw te at the retail and consumer levels, and reduce food losses along production and supply chains, including postharvest losses" (UN-SDG Agenda, 2015).

2.1.2 CONTINENTAL FOOD LOSS AND WASTE STRATEGY

To support efforts towards addressing food loss and waste, the AU has developed a postharvest management Strategy. The overall objective of the *African Union Commission Post-Harvest Loss Management Strategy* is to effectively guide and coordinate postharvest loss initiatives at the regional and national levels towards achieving reduced postharvest losses in line with the Malabo Declaration and SDG targets (AU PHLMS, 2018).

2.1.3 IGAD STRATEGY

The IGAD Post-Harvest Loss Management Strategy is designed to support and facilitate the management of postharvest losses by the Intergovernmental Authority on Development (IGAD) member states. The IGAD member states must implement interventions to achieve their postharvest loss reduction goals aligned to the Malabo 2025 PHL and the UN SDG 12.3 food-loss and waste-reduction goals (IGAD-PHLMS, 2021).

2.1.4 KENYA AGRICULTURE POLICY

The Kenya Agriculture Policy 2021 provides for reduction of postharvest losses of agricultural produce and products, under objective 3.5.1. It addresses the challenges outlined, which include: inappropriate processing, poor storage and inadequate transport facilities, and unreliable energy supply that adversely impacts processing and storage of agricultural, livestock and fishery products.

2.2 OVERVIEW OF THE STATUS OF FOOD LOSS AND WASTE IN KENYA

The Kenya ASTGS recognizes that high postharvest losses occur across most food value chains as a result of various factors, including poor cold chain management (in perishables) and poor storage (in grains). Thus, losses up to 25 percent have been reported in some key staples (ASTGS 2019-2029). Additionally, the AU Strategy recognizes that food loss and waste (FLW) is one of the major drawbacks in the effort to address food and nutrition security in sustainable food systems (*AU Commission Post-Harvest Loss Management Strategy*, 2018).

To address the problem, there is need for a clear understanding of three key issues regarding PHFLW:

i) the extent of the PHFLW, why it happens (causes), and where it happens in each supply chain (critical loss points);
ii) the impact of the losses (which helps to define the objective of PHFLW reduction); and
iii) measures to reduce FLW and their impacts.

These key issues are briefly described in the sections below.

2.2.1 EXTENT OF FOOD LOSS AND WASTE

Globally, it is estimated that 30 percent of food produced for human consumption is lost or wasted (FAO, 2011; FAO, 2019; UNEP, 2021). The latest report (FAO, 2019) estimates the global average for food loss (FL), which occurs between production and the retail stage, to be 14 percent of the total production. Global food production, supply and consumption systems are not functioning to optimal efficiency. In Sub-Saharan Africa alone, food losses exceed 30 percent of total crop production, representing more than USD 4 billion in value every year. These annual food losses far exceed the total amount of international food aid provided to Sub-Saharan African countries each year (Cambridge University Press, 2015).

In Kenya, approximately 30-40 percent of food is lost from the farm gate to the family table (FAO,2022). Within this estimation, the cereal losses range from 12 percent to 17 percent (IGAD-PHLMS 2021). In monetary terms, FL in Kenya can be extrapolated to amount to Ksh 72 billion lost annually for select crop value chains based on a study done by (FAO (FAO, 2018).

Box 1: Lore et al (2005) estimated the total value of postharvest milk losses in Kenya at USD 17.8 million annually. The Kenya Dairy Board estimated milk losses at the national level in 2008 to be 95 million kg per year (KDB, 2009), which translates to Ksh 2.8 billion at the processor price of Ksh 30 per litre. However, this loss is only attributed to rejection in the formal channel, in which milk passes through the cooperatives and processors. Given that the informal channel handles 80 percent of all the marketed milk (Omore, et al., 1999; Muriuki, 2003), the losses are much higher. A recent study by Ndungu et al (2016) found high prevalence of antibiotic residues, total bacterial counts and adulteration in milk delivered at collection centres in Central Kenya, indicating potential economic losses that farmers may experience as a result of rejection due to low quality. (USAID,2017).

The 2021 food waste index report (UNEP, 2021) indicates that every Kenyan wastes about 100 Kg of food every year, amounting to 5.2 tonnes of food per year. It is also estimated that wasteful consumption accounts for slightly over USD 500 million, annually (Mbatia, 2021).

In determining the extent of PHFLW, it is noteworthy that certain food commodities are more prone to loss than others. For example, FL in cereals and pulses is estimated to be about eight percent, while 22 percent of fruits and vegetables are lost between production and retail stage (FAO, 2019).

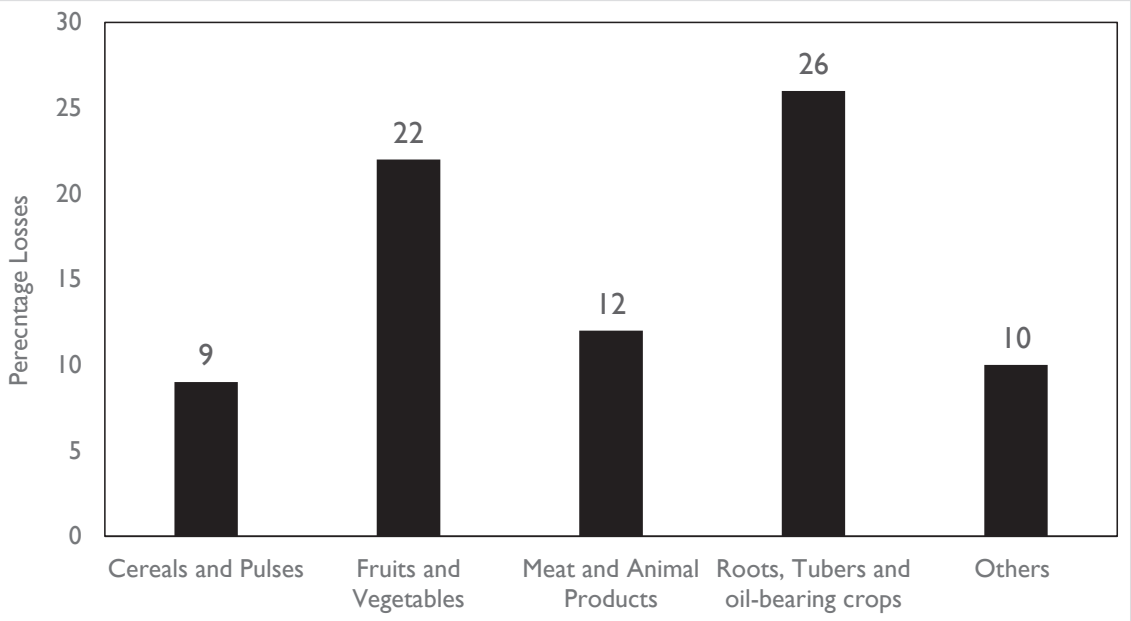


Figure 1: Disaggregation of food loss by commodity groups (Adapted from FAO, 2019)

Anecdotal evidence highlighted in Table 1 provides PHFLW estimates for various commodities or commodity groups. The data is derived from published literature, project reports, key informant interviews, and expert opinions.

Table 1: Estimated food loss and waste for various commodities

No	Commodity Group	Estimated FLW (%)
1.	National overall	30
2.	Cereals	10-12
3.	Pulses	<10
4.	Fruits and vegetables	40-50
5.	Roots and tubers	15-18
6.	Meat (beef)	7-12
7.	Milk (cattle)	10-17
8.	Fish (tilapia)	20-26%

Despite the indicative magnitude of the problem, postharvest management has not received sufficient attention. Tackling the problem requires quantification of the problem (data), targeted interventions, and monitoring the impact of such interventions on FLW reduction.

2.2.2 FACTORS CONTRIBUTING TO FOOD LOSS AND WASTE

Identification of the critical loss points (CLPs) for each supply chain or commodity is important to guide interventions. Critical loss points are places along the food supply chain where FLW is most prominent and have the greatest impact on food and nutrition security. Identification of CLPs requires analysis of specific food supply chains to identify the stages where the highest losses occur and the impact of the losses on the actors

involved. Causes of FLW along the food supply chain are interrelated, such that actions (or lack of action) at one stage of the chain could affect the entire chain. Thus, interventions to address PHFLW should be holistic and not isolated to the apparent causes at a single stage (FAO-HLPE, 2014).

Broadly, the causes of PHFLW can be organized into three levels:

- **Micro-level:** include primary causes of PHFLW, which are attributed to actions (or lack of action) by individual actors at each of the stages of the supply chain – from production to consumption.
- **Meso-level:** include secondary or structural causes of PHFLW attributed to organization or relationships among actors, state of infrastructures, and other factors beyond individual actions. Meso-level causes contribute to the occurrence and extent of micro-level losses.
- **Macro-level:** include systemic issues such as lack of institutional or an enabling policy environment to facilitate proper functioning and coordination of food systems actors. Macro-level causes point towards a food system malfunction (FAO-HLPE, 2014).

An example of categorization of causes at the micro-meso-macro level at the CLPs in the maize supply chain is provided in Table 2. This categorization is important in guiding the solutions to address PHFLW, which are also categorized as micro-meso-macro level solutions.

Table 2: Categorization of causes of PHFLW (micro-meso-macro levels) at critical loss points in the maize supply chain

Critical Loss Point	Harvest and On-farm handling	Storage	Transport
Micro level causes of losses	• Wrong varieties – not tolerant to postharvest pests, lodging resistance • Delayed harvesting due to labour constraints and lack of awareness on right harvesting time • Crop maturation coinciding with onset of rains • Poor shelling practices leading to breakages. • Poor drying practices/insufficient drying leading to spoilage during storage • Losses from birds- during drying especially with prolonged drying • Soiling of grains during harvesting • On-farm theft	• Poor storage facilities and conditions leading to losses from postharvest pests, rotting and aflatoxin contamination. • Limited awareness and on applicable and available storage technologies • Wrong use of technologies	• Spillages due to excessive loading or inappropriate transportation • Re-wetting of grains due to poor transportation practices/ vehicles
Meso level of causes of losses	• Lack of awareness on proper harvest and postharvest handling practices and applicable technologies • Poor organization and coordination of farmers and limited vertical integration of value chain activities • Limited access to credit facilities to enable farmers invest in postharvest technologies for initial on-farm processing e.g. shelling, drying	• Lack of group/community drying facilities • Poorly coordinated delivery system for grain delivery to the NCPB stores • Limited intervention to regulate maize importers who crowd NCPB stores • Limited access to to credit facilities to enable farmers invest in postharvest technologies for on-farm storage	• Poor grain handling practices leading to qualitative and quantitative losses

Macro level causes of losses	• Limited extension services to advice farmers on appropriate maize varieties (less prone to PHL from logging, pest and aflatoxin attack) , educate farmers on PHM • Limited research on appropriate technologies including appropriate varieties • Lack of national policy framework to guide postharvest management	• Lack of policy framework to regulate use of NCPB stores/silos • Limited research on appropriate technologies for grain processing and storage • Lack of policy to incentivize private sector investment in storage service- e.g. standards • Poor infrastructure (roads, electricity) at grain storage, drying centres	• Limited policies to regulate transportation services to ensure quality and safety standards • Poor infrastructure – roads, electricity

Causes of PHFLW can also be categorized as direct and indirect as depicted in Figure 2 (FAO, 2019). The FAO report describes direct causes as those attributed to actions (or lack of action) of individual actors that lead to PHFLW along the chain. On the other hand, indirect causes are more systemic and concern the economic, cultural and the political environments of the food system under which the actors operate, and which may influence their decisions in ways that lead to PHFLW.

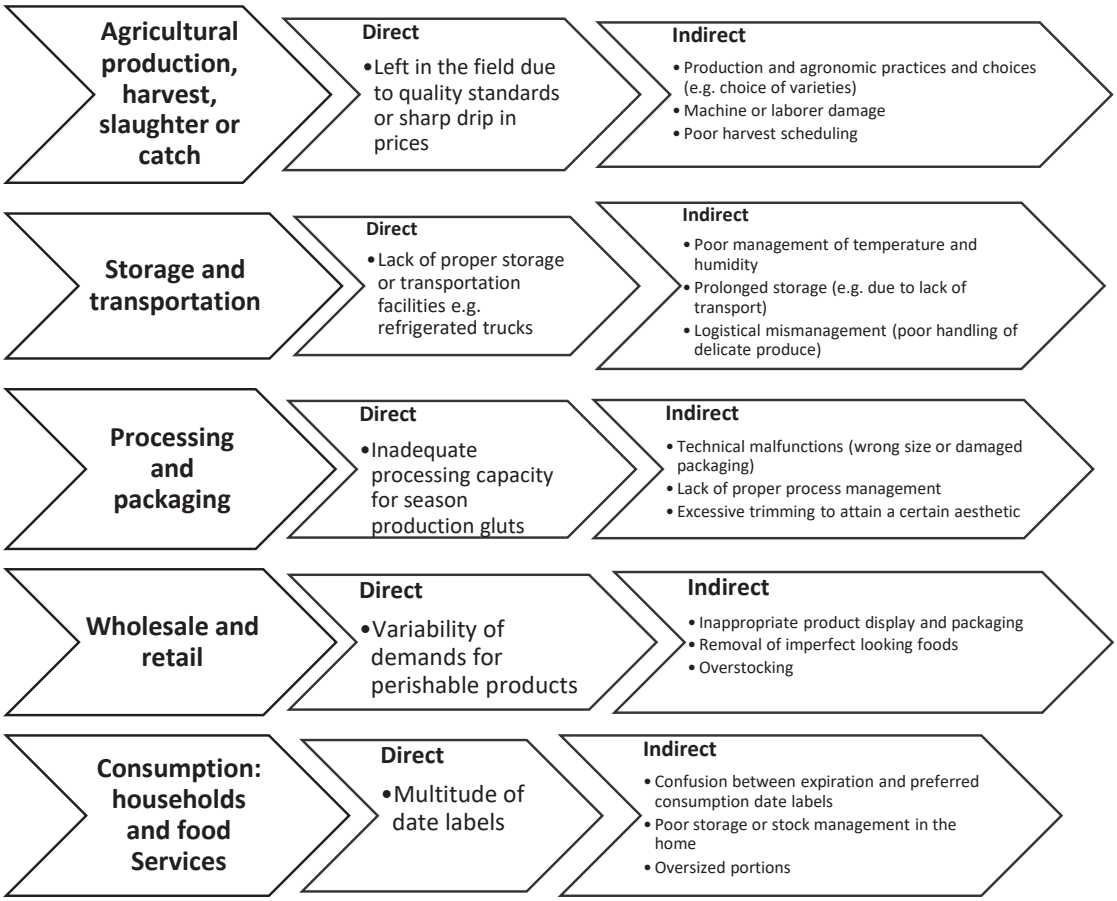
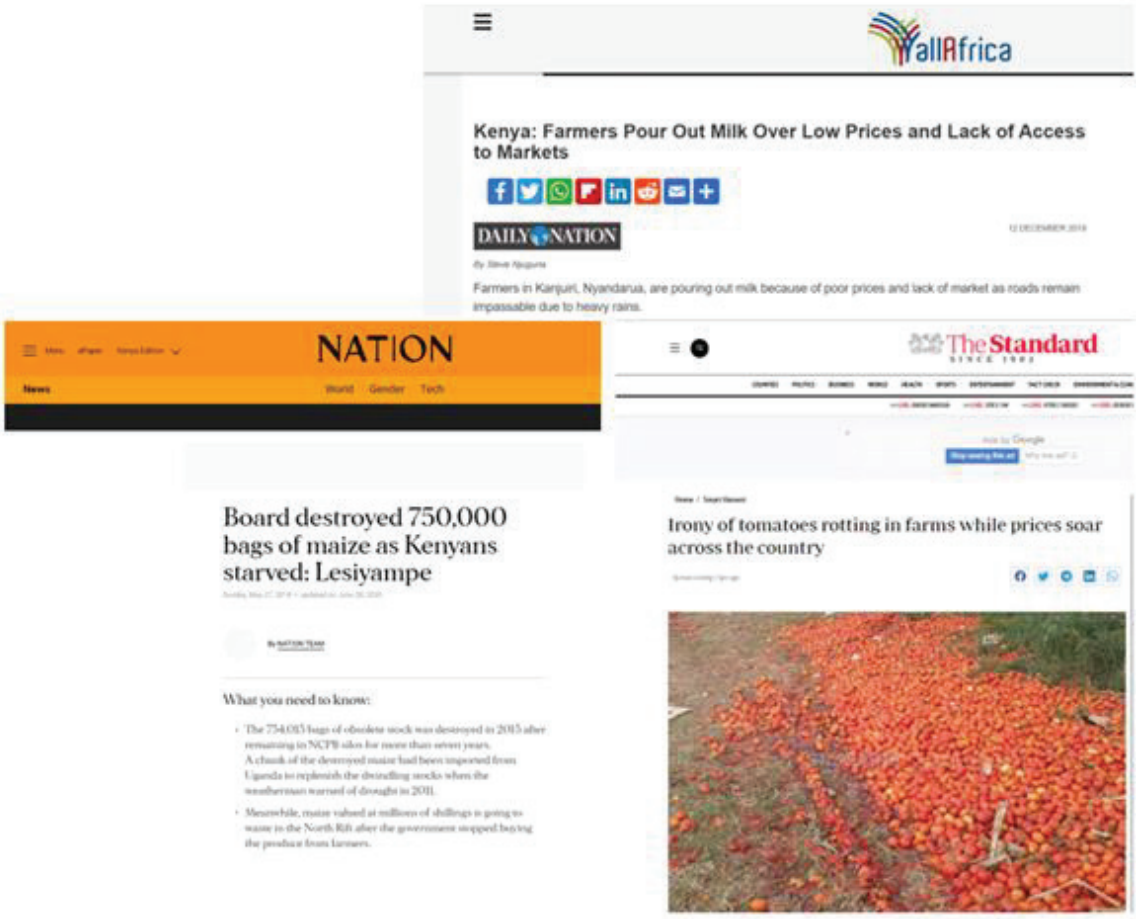


Figure 2: Direct and indirect causes of losses at different stages of the food supply chain (adopted from FAO, 2019)

2.2.3 KEY DRIVERS OF FOOD LOSS AND WASTE IN KENYA

In line with the highlights in the AU Strategy, supported by triangulation of findings from the county public participation and key informant

sessions, food loss and waste in Kenya's context can be attributed to various challenges, which can be summarized and broadly categorized as follows:



1. Limited capacities for primary handling of food

Appropriate tools and equipment, coupled with the right skills and knowledge, are needed for efficient handling of food during the primary stages at the farm level (upstream). Factors that could contribute to food loss at this stage include poor harvesting practices and methods (using manual tools as opposed to mechanical); and improper timing, which affects the biological and physical qualities of produce, as well as their shelf life and keeping quality.

At the farm level, the right skills and tools are needed for primary processing activities such as shelling, threshing, and drying. These processes, if not done properly/optimally, could negatively affect the quality of produce due to breakage, contamination and inadequate drying. On-farm sorting/grading of produce to meet the aesthetic grades and standards demanded by the market is documented to lead to high levels of food loss at the farm level. Other key factors that influence PHFLW levels include packaging material and handling, as well as storage. High levels of rodent and insect infestation as a result of inadequate storage facilities and skills are contributing factors to losses, especially for grains. Poor cold chain management (for perishables) and dry chain management (for grains and other non-perishables) are key drivers of food loss and waste during primary handling. Community conflict and insecurity that leads to theft of produce and/or of killing of livestock, also contribute to PHFLW.

Climate change is an emerging challenge that can greatly contribute to PHFLW directly or indirectly. For example, high temperatures contribute to faster deterioration of perishable food and affect other food supply chain activities. In the recent past, with the increase of floods and drought, there have been cases of high crops and livestock losses, leading to disruption of livelihoods. Erratic weather changes have also directly disrupted production cycles, including harvest preparation and timing. Unexpected rains can force early harvest.

Food safety is a critical factor in addressing food loss and waste, as there are high cases of food rejection/ and or disposal that are attributable to food safety concerns. Primary handling, in particular, is the stage along the value chain where biological and chemical contamination occurs. For example, improper drying increases that chances of aflatoxin in maize. In the fruits and vegetables value chains, chemical residue levels linked to food safety are a major threat to market access. In extreme cases, it results in rejection, which leads to waste. However, in some instances, rejected products are re-introduced in the local market. While this does not pose a waste risk, it creates a health concern and should therefore be addressed.

The factors described above can be attributed to capacity gaps. These include lack of appropriate skills (human capacity) and the technologies required for proper handling of food to preserve quality and minimize loss at farm level.

2. Limited efficiency of value chain development services to address food loss and waste

Facilities that support these activities play a key role in addressing PHFLW through efficient and effective operationalization to ensure best food management.

Proper coordination and linkage of actors is key to the realization of efficiency in food supply chains. Information flow amongst actors at the various stages of the food supply chain is necessary for efficient and targeted movement/distribution of food. Lack of reliable information systems often results in duplication of efforts and exploitation of some of the actors in the food supply chain. Drivers/causes of PHFLW are interrelated, and therefore actors on the chain should function like a well-coordinated conveyor belt, right from the time of harvest until the food commodity is delivered to the end user. Thus, all the services and facilities involved in the delivery of food in the quantity and quality required by the end user, including harvesting, packaging, transportation, postharvest treatments, storage, market conditions, among others, must be optimized and maintained to achieve this goal. Poor coordination of services, poorly maintained facilities and equipment, contribute to food deterioration that leads to quantitative and qualitative losses.

3. Limited food waste management initiatives

This occurs at the retail and consumption stage of food distribution. Factors such as infrastructure, access, availability of facilities, food management within this stage, have direct implications on food waste.

At the consumer level, cultural habits, tastes and preferences influence food waste directly through household decision making, and indirectly by affecting decision making by upstream actors, e.g. in cases of purchasing ugly food.

Limited awareness of PHFLW, as well as low capacity to re-distribute, reuse and recycle food, along with the supporting systems, hinder effective resolution of the challenge. Habits and actions, which in some cases are cultural, contribute to PHFLW. An example is unmeasured food preparation, especially during social and cultural festivities. This, coupled with limited behaviour change communication to change habits and relationships with food in terms of preparation and utilization, purchasing, rural-urban movement during festive seasons, and handling of leftovers, among others, affect food waste levels at especially the household level. Food waste at this stage isn't adequately acknowledged and researched, and thus is overlooked. Yet it plays a key role in food and nutrition security.

Indigenous food waste management practices such as traditional food preservation techniques also need to be well documented. Practices such as salting, smoking, drying, etc, can contribute to food waste reduction at the household level, especially if well researched and upscaled to cottage industry levels. Other interventions to manage food waste include waste separation at source. For example, food waste can be used in the generation of compost, which is then used in the production of more food.

4. Weak coordination of policies, legal and legislative frameworks that support PHFLWM

Currently, there is greater focus on boosting production and promoting markets, and less emphasis on proper postharvest management to preserve the harvest. Therefore, the potential to realize food and nutrition security from increased production is hampered by high postharvest losses. Inadequate budgetary allocation for implementing current policies also exacerbates their ineffectiveness. Weak coordination mechanisms, limited awareness and prioritization of PHFLW, as well as silo operations of various sector players also hinder effective operationalization and implementation of frameworks that support FLWM.

5. Limited/inadequate institutional capacity and collaboration for/on PHFLWM

Various institutions play strategic roles and contribute to PHFLW reduction efforts through their mandates and actions. However, these institutions have limited technical and operational capacities to implement the required interventions. This is aggravated by weak coordination mechanisms of their operations for wider impact. Institutions' capacity to carry out their mandates and implement interventions that contribute to PHFLW reduction is also hampered by limited prioritization and access to credit. This is worsened by low private sector engagement in efforts to reduce PHFLW. The private sector is key in the commercialization of PHFLW reduction technologies/innovations and development of business cases around solutions that address the problem.

6. Weak linkages between research, development, and knowledge management on PHFLWM

Adoption of technologies/innovations to address PHFLW is hindered by cost, unavailability, poor applicability and limited awareness. In some cases, the technologies developed may not be practical or domesticated to address context-specific issues. This not only hinders effectiveness in the local context, but may also lead to low adoption or lack of it. In addition to this, facilities established as research /technology development innovations are poorly maintained and do not run at optimum capacity, thereby contributing to PHFLW.

Apart from the technology-specific factors, there are weak linkages between researchers, technology developers and the intended users. The situation is aggravated by the limited number of public sector extension personnel who are expected to support technology scale-up efforts among farmers and other practitioners. In addition, the capacities of the extension service providers on PHFLWM are generally limited. Facilitation of the extension services to support awareness creation and capacity building is also limited, thereby restraining their reach to food system actors.

Table 3: Summary of issues contributing to food loss and waste

ISSUES		WESTERN REGION	RIFT VALLEY REGION	CENTRAL REGION	NORTH AND EASTERN REGION	COASTAL REGION
Pre-harvest		*	**	**	***	*
Harvest	Tools	**	***	**	*	**
	Skills	**	***	**	**	***
Climate (floods and drought)			*		*	*
Storage	Skills (prep)	**	**		*	*
	Infrastructure and tools	***	**	**		***
Market	Information and systems	**	*	*		
	Infrastructure	**	**			
Agro-processing	Skills	*	*	*	**	**
	Facilities (linkage and utilization)	***	**	**	**	*
Transport	Roads	**	*			
	Tools and equipment	*	**	***	*	
	Skills (handling)					
Food waste – consumption habits						*

KEY: *Number of counties that indicated the causal factor across various value chains-summary in Annex 2.

- Respondent bias is attributable for counties indicating absence of losses, i.e. the priority is dependent on the value chains selected and the critical loss point for the specific value chain.

2.3 IMPACT OF FOOD LOSS AND WASTE, AND SOCIAL, ENVIRONMENTAL AND ECONOMIC DIMENSIONS OF SUSTAINABILITY

FLW has an impact on the three dimensions of the sustainability of food systems: social impact (including food security and nutrition), environmental, and economic impact.

2.3.1 IMPACT OF FOOD LOSS AND WASTE ON FOOD SECURITY AND NUTRITION – THE SOCIAL DIMENSION

Food loss and waste affects all the six dimensions of food and nutrition security: availability, access, utilization, stability, agency, and sustainability. These could all be positively impacted by PHFLW reduction. It is estimated that 3.1 million Kenyans are currently facing severe hunger. In the recently released Global Hunger Index (2022), Kenya's score for hunger averaged 23.5, with the hunger situation categorized as serious. Despite the hunger and malnutrition situation in Kenya, it is estimated that 30 percent of the food produced goes to waste.

Box 2: Contaminated maize destroyed.
Source: NCPB, 2021

Quantities of Aflatoxin contaminated maize destroyed by NCPB in 2013 to 2021 (Tons)

Year	Quantity (MT)
2013	14,017
2015	388
2020	6,231
2021	333
TOTAL	**20,969**

NB: Total NCPB Storage capacity 1.8 million tons

Food saved could potentially increase incomes for the actors along the value chain. In Kenya (and most of SSA), where losses are prevalent closer to the farm (upstream), interventions to reduce food loss among smallholder farmers would have positive impacts on food and nutrition security of the farm households, as more food becomes available (FAO, 2019). In addition, PHFLW reduction further down the food supply chain may improve food and nutrition security for consumers as more food is made available (and affordable) using the same resources.

In Kenya, communities depend on several value chains for food and nutrition security as well as other socio-economic activities such as paying school fees, buying farm inputs (seed, fertilizers, and pesticides), investing in alternative income-generating activities, among other household needs. PHFLW therefore leads to significant shortfall in income, thereby limiting the ability of households to develop other social aspects of their livelihoods (USAID, 2017).

Further to the social linkages to PHFLW, for long-lasting and effective food loss and waste reduction policies and interventions, the underlying socio-cultural, institutional, and economic dimensions of food value chains should be taken into consideration and be systematically integrated. For example, if the preferences and needs of youth, women and PWDs are not considered, the cultural acceptance of proposed solutions and newly introduced technologies and practices aimed at facilitating activities they carry out, are unlikely to be adopted (FAO, 2018). Solutions should therefore

be cognisant of cultural biases and gender roles that influence adaptability and adoption of proposed interventions to address PHFLW.

The challenges that contribute to PHFLW also represent opportunities to develop solutions, most of which can be presented as business cases. Through feasibility studies, these can be tailored and promoted as job creation opportunities, and especially contribute to youth employment and employability.

The **private sector** can play a critical role in the commercialization of these solutions and PHFLWM tools and technologies. They can develop products and solutions that are need specific. This calls for innovative public-private partnerships relating to research and development.

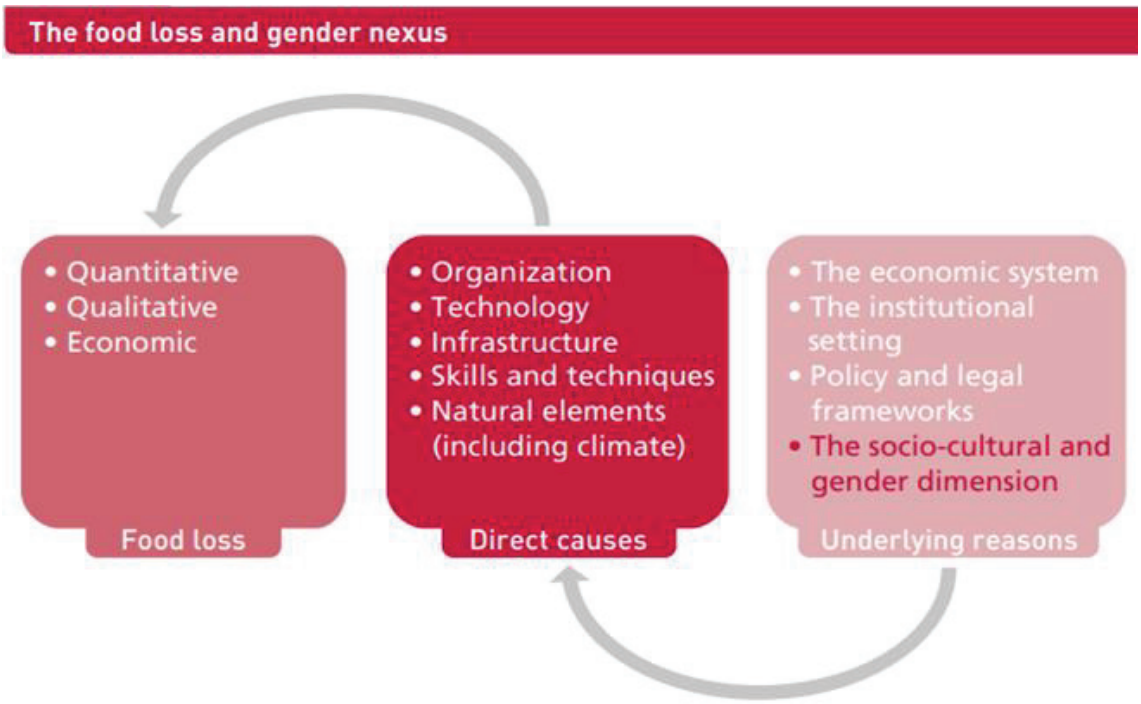


Figure 3: Adapted from FAO 2018; Gender and food loss in sustainable food value chains

2.3.2 IMPACT OF FOOD LOSS AND WASTE ON THE ENVIRONMENT

It is estimated that Kenya generates between 3,000 to 4,000 tonnes of waste per day, much of which originates from urban areas. According to the World Bank, the country's capital, Nairobi, generates between 2,000 to 2,500 tons of waste per day. The portion is significant to the total waste generated in the country because of the city's dense population and high rate of urbanization.

About 70-80 percent of the waste generated in the country is organic, consisting of food waste, agricultural waste, and yard waste, with the remaining waste consisting of inorganic substances such as plastic, paper and metal waste (Fie-consult, 2023). Much of the waste ends up in landfills, the last preferred option for waste management.

Diverting food waste away from landfills is an environmentally friendly option that can significantly contribute to efforts to reduce the carbon footprint, capture renewable energy, and restore the essential nutrients back to the soil. The impact/footprint of PHFLW on the environment can be categorized into three: the carbon footprint (due to greenhouse gas emissions); the land footprint (due to pressure on limited land resource); and the water footprint (due to pressure on water resources). Although local data is not available, it is estimated that PHFLW accounts for eight percent of the total greenhouse gas emissions, and therefore contributes significantly to climate change.

2.3.3 ECONOMIC IMPACT OF FOOD LOSS AND WASTE

There is an enormous economic value attached to PHFLW that is often overlooked by actors who are affected by it. Lost food means lost income at all levels and for all the actors involved. PHFLW impacts various actors differently depending on their position in the food system/supply chain. At the micro-level, farmers bear most of the costs associated with FLW. Similarly, consumers are negatively impacted by the inefficiency in food systems as they have to pay high prices for food when the supply is affected by PHFLW (FAO-HLPE, 2014).

Box 3: Investing in postharvest technologies is worthwhile. The Net Present Value (NPV) of the research was USD 1.29 billion, with an Internal Rate of Return (IRR) of 28 percent and a Benefit-Cost Ratio (BCR) of 4:1. The positive NPV implies that the proposed investment has an attractive return, given the cautious assumption made on the annual one percent adoption rate and a maximum adoption rate of 10 percent in 10 years. The estimated IRR exceeded the market rate of 10 percent, implying that investing in the PH technologies has the potential to yield higher returns than investing the same capital on alternative investments. A BCR of 4:1 means that the investor can expect USD 4 in benefits for every USD 1 in cost.

Producers are expected to gain from the higher marketable produce resulting from both the saved fruit and the existence of advanced postharvest technologies for storage and processing. Consumers are expected to gain from lower produce prices due to an increase in supply. (Mujuka.E et.al., 2022).

Source: Kenya Policy Briefs, 2021.

Food loss and waste represent economic losses for all actors along the food supply chains, including consumers. It also represents a highly inefficient use of resources (e.g. labour, water, energy and land), estimated at approximately USD 400 billion per year (FAO, 2022), and limited to no returns on investment.

At the macro level, PHFLW contributes to unrealized economic gains, including returns on public investment in agriculture and infrastructure. As more resources are invested in fruitless efforts, less of the resources are available for other sectors.

Interviews with public and private sector decision-makers indicate that many of them may not be aware or may not believe there is a solid “business case” for reducing PHFLW. For instance, the associated costs of food loss and waste may be buried in operational budgets, accepted as the “cost of doing business,” or considered not worth the investment needed to achieve reduction (SGD 12.3 Champions, 2018). However, with effective advocacy and development of frameworks that highlight the opportunities, the

private sector can leverage on the challenge and promote financial and non-financial initiatives in the form of business cases and models that can address PHFLW.

2.4 ADDRESSING FOOD LOSS AND WASTE

2.4.1 SWOT AND PESTEL ANALYSIS ON FOOD LOSS AND WASTE MANAGEMENT IN KENYA

SWOT (strengths, weaknesses, opportunities, and threats) and PESTLE (Political, Economic, Social, Technological, Legal, and Environment) analyses described below involve examining the environment in which the Strategy will be implemented or operationalized. The environment can either facilitate or hinder the realization of the objectives and goal of the Strategy.

The results of the SWOT and PESTEL analysis are outlined below:

Table 4: SWOT analysis

STRENGTHS	WEAKNESSES
(1) Availability of partners addressing PHFLW. (2) High productivity of key value chains. (3) High investments in the agri-sector. (4) Specialized regulatory bodies- KEBS, KEPHIS, KDB, HCD, among others. (5) Vibrant technology and digital innovation. (6) Strong research and innovation capacities.	(1) Weak coordination and implementation of multi-disciplinary policies that address PHFLW. (2) Low prioritization for postharvest management. (3) Limited awareness on PHFLW. (4) Inadequate investment to support PHFLW interventions. (5) Duplication of efforts on PHFLWM. (6) Limited incentives for PHFLW reduction efforts. (7) Informal waste collection systems. (8) Poor attitudes and cultural habits on food waste management.
OPPORTUNITIES	**THREATS**
(1) Financing frameworks for climate change mitigation initiatives. (2) Existence of policies and strategies that support interventions against PHFLW. (3) Vibrant private sector. (4) Youthful population to take up jobs/ business cases that support PHFLWM. (5) Strong research and technology development. (6) Agribusiness potential in PHFLW reduction activities. (7) Scalable evidence-based impact of PHFLW management technologies and investment .	(1) Higher cases of weather variability and limited access to the predictions by value chain actors, to enable them make informed decisions (2) Highly volatile markets, e.g., changing consumer habits, price fluctuations. (3) Emerging pests and diseases. (4) Socio-cultural conflicts and insecurity. (5) Competition from imported products.

Table 5: PESTEL analysis

Political	Economic	Social	Technological	Environmental	Legal
1. Member of global, regional and sub-regional bodies that support FLW initiatives. 2. Political interference in identification and placement of value chain development services.	1. Strong private sector. 2. Enabling environment for business development. 3. Structured value chains and presence of value chain development services. 4. Inter-county trade. 5. Member of regional trading blocs.	1. Strong cultural habits influencing food loss and waste. 2. High youthful population. 3. Innovative and creative population.	1. Modern technologies for food loss and waste management. 2. Digital platforms for information sharing.	1. High focus on climate mitigation and adaptation.	1. Supportive legal frameworks for food safety.

2.4.2 FOOD LOSS AND WASTE MANAGEMENT INTERVENTIONS

Guided by the issues flagged by the continental Strategy for PHFLW reduction, various solutions to address causes and drivers have been proposed. According to the FAO-HLPE (2014), solutions to PHFLW reduction can be grouped into eight broad categories as follows:

1. Appropriate technologies to support actions that need to be taken by the food system actors, e.g. include solar drying, cold storage, processing.
2. Good practices by the value chain actors, e.g. proper handling, hygiene.
3. Capacity building at all levels to ensure all actors have the right technical knowledge and skills to take the right action.
4. Coordination in value chains: all actors at all nodes of the value chain have interacting responsibilities and actions that in turn influence PHFLW at stages before or after any node. Solving the problem at one node will not suffice if the preceding or the prior action is not addressed.
5. Valorization of food/ food by-products.
6. Promoting behaviour changes for all actors: decisions are ultimately made by people. Habits, patterns, social norms also play a role in PHFLW and its reduction thereof.
7. Investment: the funds needed to support the postharvest actions and could be through government financing and budget allocation, as well as private sector investment.
8. Coordination of policies and actions.

Solutions to the PHFLW can be categorized as micro, meso, or macro, based on the level of intervention. Therefore, the eight categories of solutions listed above can be further described as tabulated in Table 6.

Table 6: Categorization of PHFLW reduction solutions into micro, meso, and macro levels

Categories	Levels		
	Micro	Meso	Macro
Investments	Private investments in production, postharvest businesses, and food services	• Financial mechanisms • Collective private investments • Public investments	• Support to financial mechanisms • Infrastructure • Enabling environment • Proper incentives
Good Practices	Good practices in production and postharvest	• Capacity building • Training	• Support to capacity building • Multi-stakeholder initiatives
Behavioural Change	Behavioural change in businesses and consumers	• Corporate social responsibility • Community and local engagement	• Raising awareness • Multi-stakeholder initiatives
Coordination inside food chains		• Food chain approach • Relationships with other actors in the food chain	• Enabling environments (contractual rules and incentives) • Policies
Valorization of foods and by-products		• Food processing • Valorization of surplus foods and of by-products	Support and incentives for implementation of a hierarchy of uses
Coordination of policies and actions			• Policies • Multi-stakeholder initiatives

Based on the above description of PHFLW reduction solutions at the micro, meso, and macro levels, Table 7 illustrates examples of solutions in the maize value chain.

Table 7: Solutions to reduce postharvest losses (micro, meso and macro) at the critical loss points in the maize value chain

Critical Loss Point	Harvest and On-farm handling	Storage	Transport
Micro level causes of losses	• Use of appropriate varieties less prone to postharvest pests, lodging • Timely harvesting at recommended stage/ moisture content, mechanized harvesting where possible • Proper timing of plant season/ early planting • Proper shelling practices- use of shellers • Proper drying to the right – MC before storage • Use of available drying technologies to hasten drying. • Drying grains on clean surfaces/ canvas to avoid contamination. • Proper handling practices to minimize grain soiling	• Proper storge facilities and conditions to reduce pest infestation and contamination. • Invest in applicable storage technologies e.g. hermetic storage- hermetic bags, metal silos • Storage grains in well aerated stores/ rooms • Subscribe to the warehouse receipt systems in no storage facilities	• Proper transport systems at all levels- from the farm through to the market • Use well-covered containers (bags or baskets) during transport to prevent spillage • Use clean containers/ packaging material to prevent contaminations

Meso level of causes of losses	• Farmer training and sensitization on proper harvest and postharvest handling practices- discourage stooking and drying in direct contact with the ground. • Sensitization of farmers on applicable technologies for shelling, drying, storage to reduce losses and contamination. • Organize farmers in groups- to establish and access community storage and use facilities such as dryers, shellers as groups * economies of scale. • De-risk smallholder farmers to enable access to credit facilities for farmers to invest in postharvest technologies for on-farm storage	• Community drying/ storage/bulking centers equipped with the right technologies – re-drying, packaging, storage and engage youth as service providers. • Expound and build up on the warehouse receipt systems to involve SMEs, development partners, county governments e.t.c • Better management of the NCPB stores where farmers can sell their surplus grain- minimize losses at NCPB. • Value chain development and organization	• Value chain development and organization – training and sensitization of all actors on proper grain handling practices to minimize quantitative and qualitative losses
Macro level causes of losses	• Awareness creation on appropriate varieties • Policy framework- refine and implement postharvest loss reduction Strategy. • Research on appropriate technologies e.g varieties, drying, aflatoxin detection and enhance linkages to end users • Develop policies to attract youth into agribusiness opportunities in the maize value chain e.g. initial processing such as service provider model for shelling	• Policy framework- refine and implement postharvest loss reduction Strategy i.e. storage interventions • Research on appropriate technologies e,g low cost storage technologies • Polices to incentivize private sector investment in storage systems. • Policies to attract youth into agribusiness opportunities. • Infrastructure development (roads, electricity) grain storage and drying centers	• Policies to regulate transportation. • Development/ improvement of infrastructure – roads, electricity

2.4.3 FOOD LOSS AND WASTE REDUCTION INITIATIVES IN KENYA

There are various programmes and initiatives funded and/or supported by the Government of Kenya and its partners to address food loss and waste – directly or indirectly. These initiatives are generally guided by the food loss and waste hierarchy (Papargyropoulou et al. 2014) described in Figure 4.

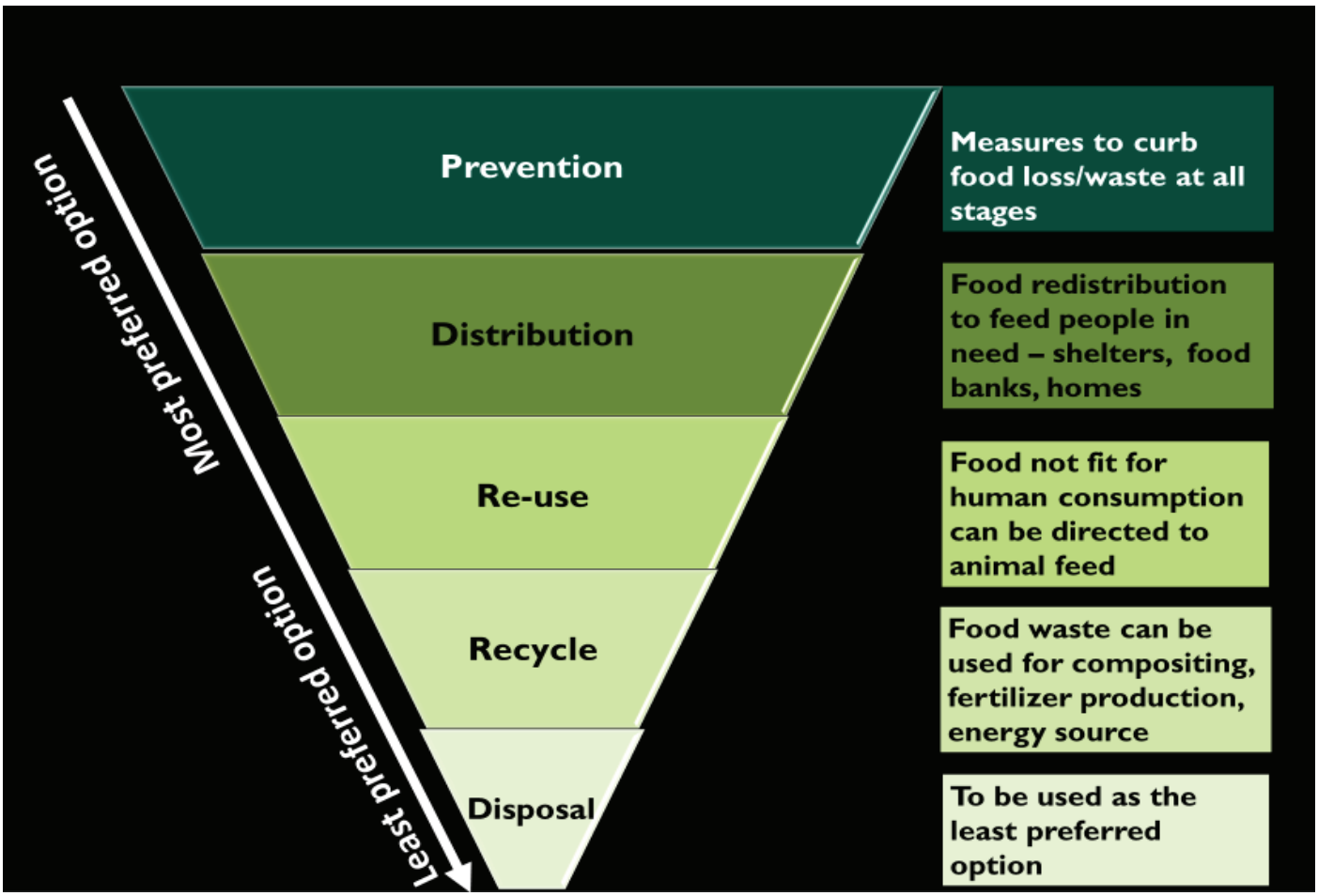


Figure 4: The food waste hierarchy

The hierarchy proposes prevention, redistribution, recycling and disposal in order of preference as environmentally friendly options for food loss and waste management. As a priority, the food system should strive to ensure that food produced for human consumption is consumed. Nevertheless, in situations where food loss/waste is unavoidable, the system should then maximize the best possible value from the waste.

Prevention

Prevention of food loss and waste entails addressing the causes/drivers of PHFLW at all stages of the supply chain. It is by far the most preferred and environmentally friendly way to combat the challenge of food waste.

Redistribution

Edible food should first and foremost be used to feed humans. In this regard, food waste from commercial food operations, including grocery retailers, restaurants, processors and other food handlers, and which is still fit for consumption, should be supplied to food banks and other charities who will then make it available to hungry people.

Recycling

This is the third most preferred measure to curb PHFLW. Recycling makes use of the food waste through composting to divert it from the landfills.

Disposal

All efforts must be made to ensure that landfills are the last destination for food suitable for humans.

Some of the emerging food loss and waste reduction initiatives in Kenya are geared towards prevention, re-use/redistribution and recycling as guided by the PHFLW hierarchy. Examples include food waste recycling options such as use of the **black soldier fly** to turn food waste into alternative feed and conversion of food waste into biofuel products such as artificial firewood and briquettes. These actions contribute to a better environmental ecosystem and regenerative agriculture within the context of circularity, where agrifood waste is transformed into an input such a bio-fertilizer and bio-char.

Examples of initiatives in food redistribution include **digital food sharing platforms where linkages are created between** areas of surplus and those of scarcity. Food redistribution is also exemplified through food banking, where the stakeholders involved work closely with relevant food supply chain actors with surplus/food for redistribution (such as retail stores, aggregators and traders/exporters) to collect food that would otherwise go to waste, and avail it to vulnerable communities. Food waste composting and vermiculture have been promoted as better alternatives to landfills, as the compost is used to improve soil health for better productivity.

The PHFLWM initiatives described above (and others) present business opportunities at the various stages of the agro-food value chain and related sectors to the food system. These businesses provide opportunities for youth and women engagement. PHFLW solutions such as food waste recovery through black soldier fly, enhancing market linkages and agro-processing, are quick wins for youth. Within an enabling policy environment and incentives to pick the business cases, these initiatives can be scaled up to target youth and SMEs with the right skills.

Detailed examples of PHFLW reduction initiatives (based on the PHFLW hierarchy) in Kenya's various value chains is provided in Annex 2.

2.5 MULTI-SECTORAL APPROACH TO ADDRESS FOOD LOSS AND WASTE

2.5.1 OVERVIEW

Food loss and waste is a problem that requires a multi-disciplinary approach to solve. Solutions such as improved market efficiency, enhanced transport systems, storage, value addition and processing, energy generation, awareness creation and food safety, all need collaboration among sectors such as agriculture, health, education, environment, energy, infrastructure, and development. To coordinate these sectors effectively and efficiently, the food systems approach will be used as explained in various sections that follow.

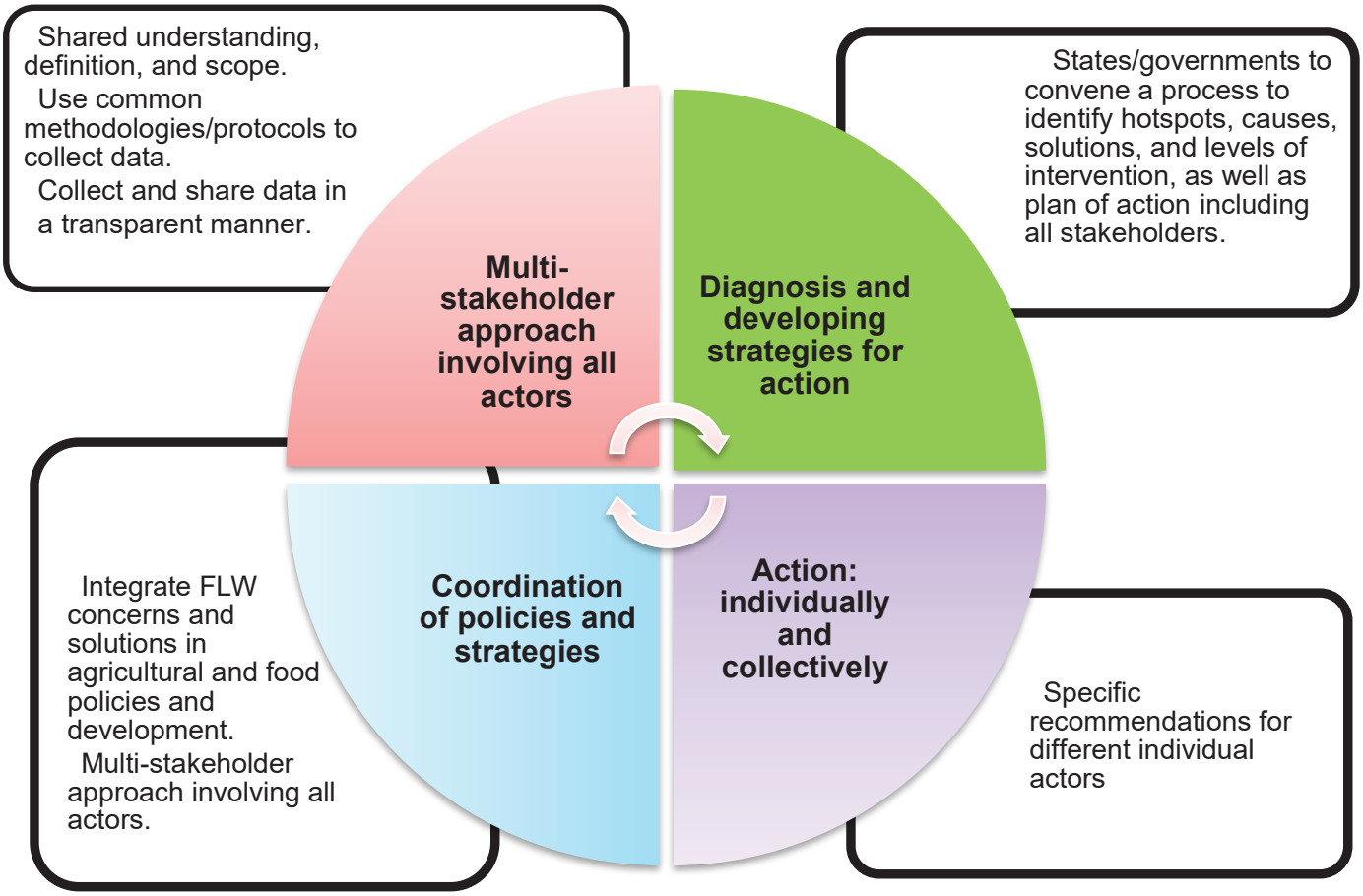


Figure 5: Adopted from FAO-HLPE, 2014

2.5.2 FOOD SYSTEMS

Food systems (FS) encompass the entire range of actors and their interlinked value-adding activities in the production, aggregation, processing, distribution, consumption and disposal of food products that originate from agriculture, forestry or fisheries, and parts of the broader economic, societal and natural environments in which they are embedded (FAO,2018). The outcomes of a food system must therefore also include the economic and social wellbeing, food and nutrition security, and environmental sustainability, all described with a feedback mechanism. The diagram below provides a diagrammatic representation of the system lens approach.

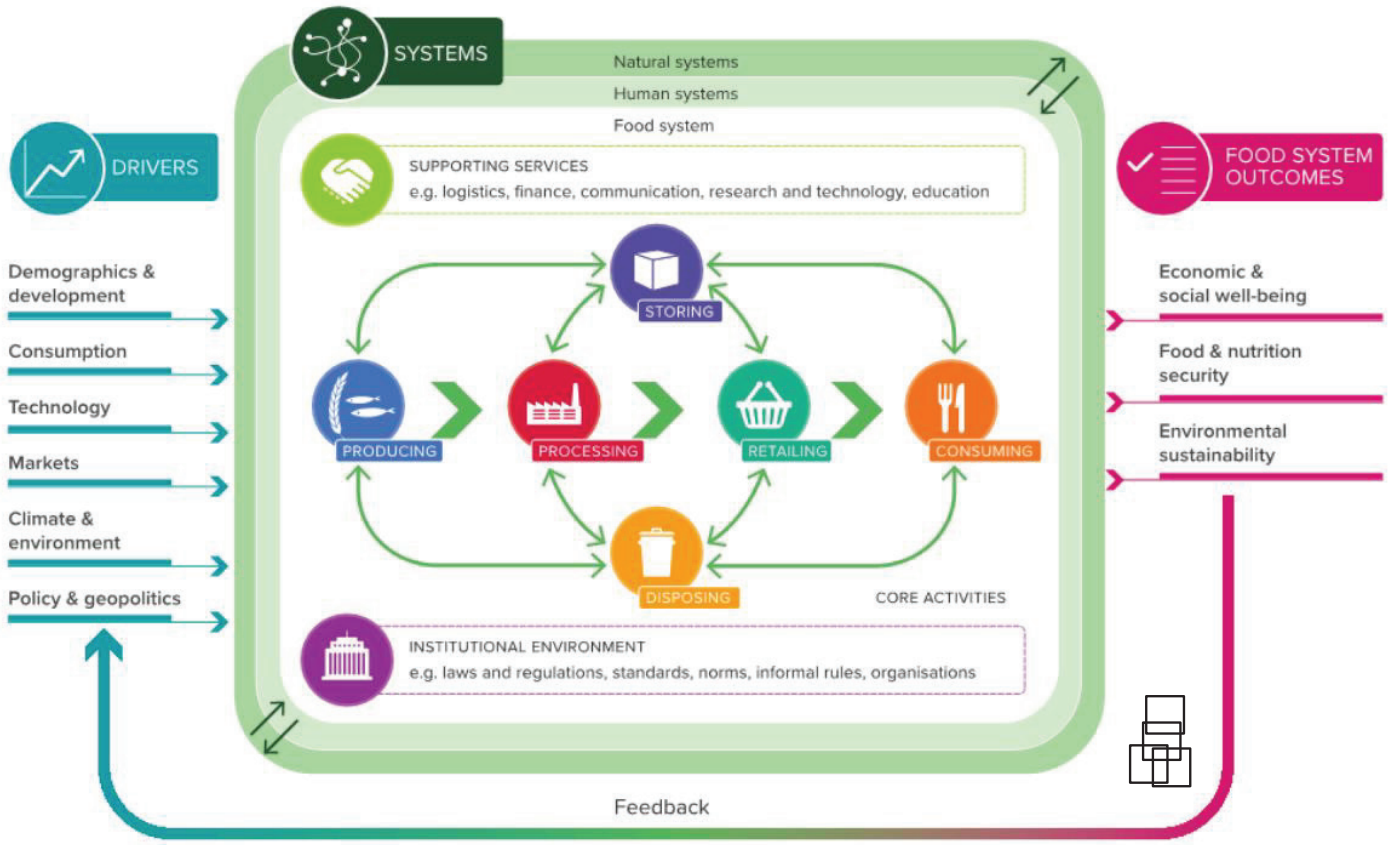


Figure 6: Diagrammatic representation of the food systems lens approach (adopted from Foresights for Food)

Food loss and waste is often presented in relation to the sustainability of food systems, or rather to their unsustainability, either because of unsustainable food systems or as a cause of them. Research indicates that a reduction of PHFLW would lead to food systems being more sustainable, with positive economic, social, and environmental outcomes outweighing the cost of action. They reflect the fact that the optimum pathway for sustainability is not zero food loss, but a situation with substantially less PHFLW from the current levels.

2.5.3 KEY SECTORS AND THEIR STAKEHOLDERS CONTRIBUTING TO STRATEGY IMPLEMENTATION

To support coordination of the key sectors and their stakeholders, the Power Interest Grid (PIG) was applied to categorize and prioritize different commodity/core value chain and food system actors, from both government and private sectors, based on how they influence postharvest management in the country. Stakeholders were grouped into different categories: logistic institutions and providers, educational and academic institutions, producer organizations and individuals, regulatory bodies and agencies, regional bodies, extension providers, marketing agencies, development partners and NGOs, research institutions, and government ministries. The roles of some of these key PHLW management stakeholders are described in section 2.6.

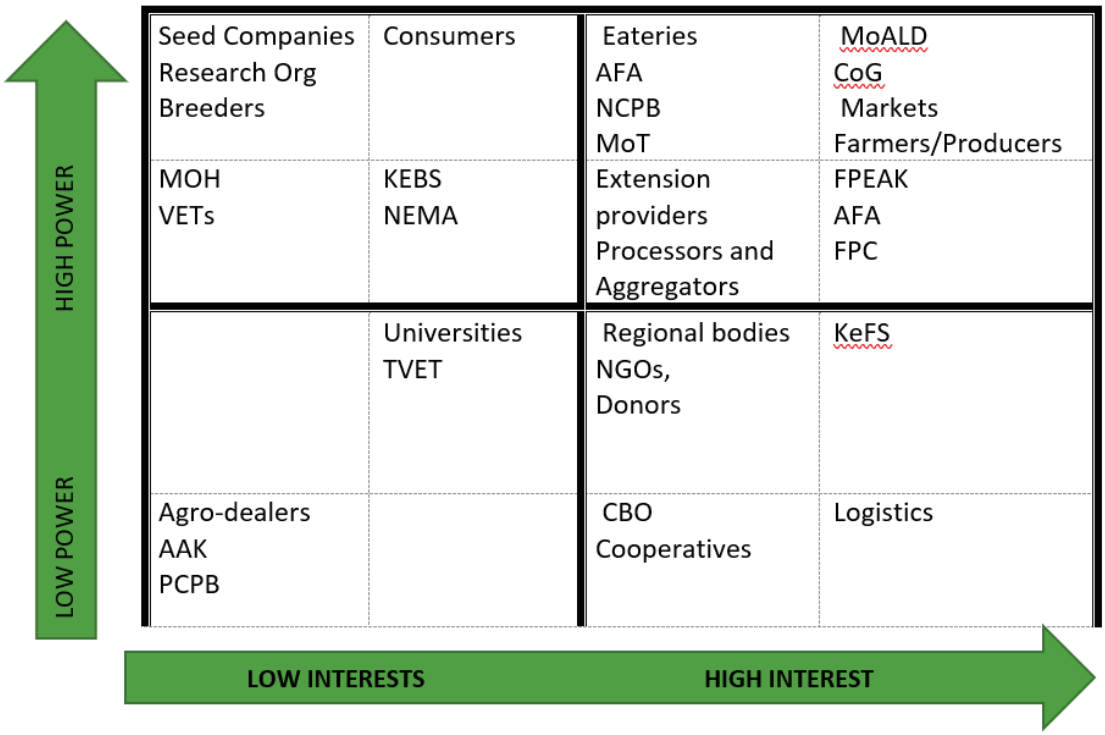


Figure 7: Power interest grid of sector stakeholders

2.6 ROLES OF DIFFERENT STAKEHOLDERS IN ADDRESSING FOOD LOSS AND WASTE

2.6.1 PUBLIC SECTOR INSTITUTIONS

2.6.1.1 Key National Government Ministries, Departments and Agencies

a) Ministry of Agriculture and Livestock Development

Agriculture is the main sector spearheading activities that influence the food system. Looking at core value chain activities from production to waste disposal of food products, agriculture plays a role in how they are shaped. Food waste, therefore, is directly affected and affects agricultural activities and investments. Activities upstream such as pesticide use, timing of planting, pre- and postharvest handling, and on farm events, are mainly undertaken by farmers. Downstream activities such as value addition and agro-processing, handling, storage and marketing by other agri-value chain actors, can be supported through the Ministry of Agriculture and Livestock Development, and other relevant sectors.

The Strategy on PHM management will be domiciled within the Plant Protection and Food Safety Directorate (PP&FSD). The Directorate works in collaboration with other relevant institutions and partners such as KALRO, ICIPE, FAO, universities, CABI, KEPHIS, PCPB, NEMA, and private sector players, among others. It also enforces relevant legal frameworks, such as the Plant Protection Act.

b) Ministry of Mining, Blue Economy and Maritime Affairs

Fisheries and aquaculture sector is greatly affected by PHFLW, which occur at multiple stages of the fish supply chain. At capture, these include discards, and while on board, the handling matters. Changes in climate that affect

the water temperatures as well as how fish is handled post-capture are a key challenge facing the sector. They are exacerbated by the high perishability and sensitivity of fish to high temperatures once harvested. Therefore, the fisheries sector players are key beneficiaries of interventions such as cold storage and drying technologies, capacity building interventions on food safety and handling, value addition and agro-processing, all outlined within this Strategy. The ministry will therefore play a critical role in the rolling out of the activities under the strategic pillars.

c) Ministry of Health

Food safety is an aspect of public health. It has a high degree of influence on social and economic factors related to food and nutrition security. Prevailing gaps and bottlenecks result in high cases of foodborne illnesses and high incidents of interceptions and rejections of Kenyan exports for failure to meet international food safety standards. For local consumption, rejections, especially for maize, are high due to food safety concerns, and thus a high contributor to food losses. Food safety is also a critical issue of concern during food redistribution, which is a key intervention in food waste reduction. The MOH provides policy on the management of communicable and non-communicable diseases, including those that are food borne. The Ministry delivers its mandates under the provisions of two main Acts of Parliament – the Public Health Act Cap 242, and the Food, Drugs and Chemical Substances Act Cap 254 of the Laws of Kenya.

d) Ministry of Investments, Trade and Industry

Market and market systems are key factors contributing to PHFLW. The Ministry of Investments, Trade and Industry would therefore play a key role in developing systems that aid accessibility of markets through enhanced linkages, and build both tangible and intangible frameworks that support the flow of food thereof. Food losses due to export rejection need collaborative efforts between trade and agriculture that promote the farmer as well as the traders/exporters, while developing policies that are cognizant of the effects on food losses and the impact thereof. The support also includes establishing processing plants to promote value addition and agro-processing; networks to transport food commodities; market infrastructure and the accompanying facilities; storage amenities; planning for distribution systems; and allocating funds for investments in PHFLW reduction interventions.

e) Ministry of Environment and Forestry

Food waste occurs at the retail and household level. Much of it is disposed of at the level of incurrence – markets, hotels and households. This is therefore domiciled in the State Department of Environment, which coordinates waste collection and disposal. Interventions on waste utilization such as extracting e-energy from waste, waste separation to isolate food waste for energy or composting, will therefore need to be coordinated effectively and efficiently by the sector players.

f) Ministry of Co-operatives and Micro, Small and Medium Enterprises Development

Co-operatives support linkages of actors across and along value chains, and thus contribute to the efficiency and effectiveness of agri-food systems. Food

loss and waste reduction call for collaboration and partnerships, looking at the interdependencies and interlinkages along the agri-value chain actions that influence PHFLW. Solutions to PHFLW include aggregation to enjoy economies of scale and better access to BDS. The ministry will therefore play a key role to support mainstreaming of key recommendations and linkages to FLWM solutions proposed in this Strategy.

g) Other MDAs

Other ministries that play a key role in PHFLW reduction include **Ministry of Labour and Social Protection**, which supports food redistribution to the vulnerable through initiatives such as food banking and soup kitchens; **Ministry of Education**, to raise awareness and support behaviour change, given that schools have the potential to shape food waste management habits that are implemented at the household level. Some issues around PHFLW stem from lack of awareness and socio-cultural norms, which can be addressed through behaviour change communication and development of programmes in schools such as the 4-k clubs. The **Ministry of Energy and Petroleum** support investment in energy for running agro-facilities such as storage, aggregation and market centres, agro-processing and utilization of food waste for energy.

2.6.1.2 County Governments

a) Council of Governors

The Council of Governors (CoG) is established under Section 19 of the Intergovernmental Relations Act of 2012. The CoG comprises the Governors of the 47 Counties. Its main functions are the promotion of visionary leadership; sharing of best practices; offering a collective voice on policy issues; promoting inter-county consultations, such as inter-county trade to support food re-distribution; encouraging and initiating information sharing on the performance of county governments with regard to the execution of their functions; and collective consultation on matters of interest to county governments. The CoG has the capacity to establish a common position and marshal effort towards the adoption of the Kenya Postharvest Management Strategy for Food Loss and Waste Reduction.

b) County Government Departments

The respective departments responsible for crops, livestock, fisheries, health, trade and environment in each county are responsible for their developmental mandates. The departments will be critical in implementing strategies relating to devolved functions and also working with non-state actors in capacity building and promotion of PHFLW reduction practices.

2.6.2 RESEARCH INSTITUTIONS

These include national research institutions such as KALRO, universities, KEMFRI and regional research bodies such as ILRI and ICIPE, primarily mandated to focus on research in the agricultural sector. In the context of postharvest loss and waste management, they are involved in conducting in-depth investigations to understand the dynamics around specific commodity value chains and provide the best solutions on how to manage both the underlying extrinsic and intrinsic factors. The findings are made

public through various means or domains for implementation by the end users. Research institutions play a critical role in conducting research and evaluating diverse technologies for use in managing postharvest loss and waste in different commodity value chains. A critical area is the development of environmentally-friendly technologies and biological products.

2.6.3 PRODUCERS

Along the food commodity value chains, small, medium and large-scale producers strive to ensure safe and acceptable products are available for both local and international markets. Producers are critical in providing feedback on the effectiveness of technologies developed by the innovators (researchers and academia) for the management of postharvest losses and wastes. Producers also play a key role in postharvest management. They influence PHFLW through activities such as input use, especially chemicals that affect perishability and acceptability by market standards; and timeliness of harvest, which also impacts on perishability. They are also a major consumer of capacity building initiatives, both in terms of knowledge and in-kind of postharvest services and technology.

2.6.4 WORKERS

Agricultural produce, more often than not, is delicate. Therefore, mishandling causes damages that reduce the quality of produce and may lead to rotting. This is also an issue of food safety. Throwing the food around carelessly may lead to contamination. The attitude towards food and business is important, as workers need to handle the produce with care, and with the understanding that the commodities are a source of income to the farmer. Thus, farmers could point out and supervise how the produce is harvested, packaged, offloaded, loaded, and other related activities, to ensure the harvest is handled with care. The training and capacity building, as well as the technology and tools the Strategy proposes, will be key to these stakeholders.

2.6.5 ACADEMIA

These include universities, technical and vocational education and training (TVET) institutions, agricultural training centres, primary and secondary schools – where tailor-made short courses, long-term training programmes, sessions and skilled-based studies on postharvest management (PHM) are offered for different target groups. They are involved in building human capacity, and conducting research on or to inform development of new PHM technologies and approaches for the identified problems. The institutions play a key role in curricula development and offer technical advice to guide PHM.

2.6.6 LOGISTICS

These include transporters and food handlers for offloading; and facilities and equipment involved in produce management from production to consumption and waste disposal. Through adherence to recommended standards and guidelines on logistics and ethical considerations to consumer rights, environmental safety, quality and quantity associated with direct handling of food, and the mechanical and biological damage

that may be incurred while food is in transit, they can minimize PHFLW. The actors involved in logistics are direct beneficiaries of technologies such as cold trucks and proper packaging as food is transported along the value chain.

2.6.7 EXTENSION SERVICE PROVIDERS

These are different actors from public and private sectors, who support dissemination of knowledge, skills and attitude to the food system players. Since agriculture is a devolved function, county governments are the major stakeholders responsible for providing extension services and management approaches for crop, fisheries and livestock value chains. Non-governmental and other non-state agencies such as CBOs, FBOs and input dealers, supplement government efforts in providing extension services. These services are key in ensuring information from research and about emerging technologies and solutions that support PHM, reaches the targeted beneficiaries.

2.6.8 MARKETING AGENCIES/ PRODUCER ORGANIZATIONS

Organizations such as FPEAK, RETRAK, FPC, EAGC, NPCK, KENAFF and NCPB, among others, offer tailor-made training and postharvest services to enable producers access certain food product markets. They ensure the products meet the required standards and considerations set by the market or consumers. These institutions and organizations can therefore support their members in PHM through sharing of information on best practices and providing PHM services to minimize food rejection. They can also lobby for an enabling framework, especially in trade policies that directly affect their businesses.

2.6.9 DEVELOPMENT PARTNERS

The donor community and non-governmental agencies such as FAO support the country through the Ministry of Agriculture and Livestock Development (MoALD) through resource mobilization and funding, and also provide technical expertise. They were involved in the development of this postharvest loss management Strategy. The Strategy will be a legal policy document for the country. Partners play a key role in the implementation of strategies by mainstreaming and aligning their respective project deliverables to the indicators/activities highlighted, thereby contributing to the overall objective of the Strategy.

2.6.10 REGULATORY BODIES/AGENCIES

These play a critical role in safeguarding and enforcing the adherence to sanitary and phytosanitary standards that include environmental protection, food safety from production to consumption, hygiene standards for consumer rights and responsible use of pesticides. Key regulatory institutions in the food crops value chain include KEPHIS, PCPB, NEMA, KEBS, and AFA. Along fisheries and livestock value chains, the key agencies are KDB and KFS.

CHAPTER 3: GOALS, OBJECTIVES AND STRATEGIC INTERVENTIONS

3.1 PURPOSE OF THE STRATEGY

The purpose of this Strategy is to guide and monitor national postharvest management interventions towards reduction of food loss and waste. As Kenya is also a member of the sub-regional, regional, and global bodies that monitor the progress on postharvest food loss and waste (PHFLW), the Strategy will also contribute to the reporting at these levels.

3.2 STRATEGIC FOCUS

The Strategy focuses on PHFLW management (PHFLWM). It takes a systems approach in the identification of the underlying causal factors and the necessary interventions, and their implementation. The areas of intervention focus on the various nodes in the food value chain, across the micro, meso, and macro levels. They cover three dimensions – social, economic, and natural environment – for all the five strategic pillars. Its scope is therefore the agrifood system and how sustainability can be enhanced to improve management of food to reduce loss and waste.

3.3 VALUES AND PRINCIPLES

The Strategy is underpinned by the following set of core values that will guide action:

(i) Cooperation
(ii) Transparency and accountability
(iii) Inclusivity
(iv) Collaboration and partnerships
(v) Innovation
(vi) Sustainability
(vii) Equity
(viii) Results-oriented.

3.4 OVERALL STRATEGIC OUTCOME

Contribute to improved food and nutrition security and livelihoods through 50 percent food loss and waste reduction by 2028.

3.5 STRATEGIC AREAS OF INTERVENTION

The strategic issues identified are multi-sectoral and multidimensional, and as such, the outlined interventions take a multi-pronged approach. The food systems approach is one that allows for solutions to take into consideration multiple factors in all the three dimensions of sustainability as well as issues along the core value chain. Addressing PHFLW will require efficient and effective coordination of sectors beyond agriculture, as some key contributing factors are domiciled in other systems, such as infrastructure, health, education, environment, and trade. The issues were also identified at the micro, meso, and macro levels. As such, each intervention identifies actions across all the three levels.

The key areas of intervention have thus been identified as three key strategic pillars and three strategic enablers. They are:

1. Knowledge, skills and tools for primary management of food;
2. Value chain development services;
3. Frameworks and guidelines for food waste management;
4. Policy, regulations and legislation;
5. Institutional arrangements;
6. Research, development, and knowledge management.

3.5.1 STRATEGIC PILLARS

Strategic Pillar 1: Knowledge, skills, and tools for primary food management

Strategic Objective 1: Strengthen food management at harvest, on-farm postharvest and primary processing

Strategic Issue 1.1: Limited capacities for primary management of food

Strategy 1.1: Promote adoption of appropriate postharvest management for food loss reduction technologies, innovations, and practices

1.1.1. Support access to credit for financing adoption and utilization of technologies
1.1.2. Mainstream PHFLM messaging on extension services.
1.1.3. Strengthen linkages to appropriate PHFLM service providers.
1.1.4. Support peer-to-peer learning through knowledge exchange programmes on PHFLM.
1.1.5. Commercialize PHFLM technologies, innovations, and practices.
1.1.6. Create awareness on PHFLM technologies, innovation, and practices.

Strategy 1.2: Capacity-build stakeholders on pre-harvest and on-farm postharvest management

1.2.1. Map relevant stakeholders and conduct a training needs assessment on PHFLM.
1.2.2. Develop targeted PHFLM curriculum and training materials.
1.2.3. Train trainers and value chain actors on PHFLM.
1.2.4. Develop reference material for value chain actors on PHFLM to guide practices.
1.2.5. Support access to facilities, tools and equipment for capacity building/application.

Strategic Pillar 2: Value chain development services

Strategic Objective 2: Strengthen value chain development services.

Strategic Issue 2.1: Limited efficiency of value chain development services.

Strategy 2.1: Support establishment and/or facilitate linkages to existing storage, aggregation, processing, marketing and distribution facilities

2.1.1. Map and assess the capacities of existing storage, aggregation, processing, marketing and distribution facilities in relation to PHFLWM.

2.1.2. Develop guidelines to address gaps in relation to PHFLWM in the facilities.

2.1.3. Facilitate linkages to existing storage, processing, marketing, and distribution facilities by actors.

2.1.4. Support development of cottage industries for value addition and agro-processing.

2.1.5. Support logistics services to minimize PHFLW.

2.1.6. Integrate and link information systems with end users.

2.1.7. Support development and implementation of maps profiling seasonal and spatial availability of food commodities.

Strategy 2.2: Develop systems for establishment and maintenance of storage, aggregation, processing, marketing and distribution facilities for food

2.2.1. Review and develop guidelines for design, establishment and maintenance of storage, processing, marketing and distribution facilities.

2.2.2. Undertake regular maintenance of the storage, aggregation, processing, marketing and distribution facilities.

2.2.3. Support access to finance for establishment and maintenance of storage, processing, marketing and distribution facilities.

2.2.4. Establish multi-stakeholder committees for maintenance of public storage, aggregation, processing, marketing and distribution facilities.

Strategy 2.3: Build the capacity of actors undertaking secondary processing, marketing and food distribution related activities

2.3.1. Map relevant stakeholder and conduct a training needs assessment on PHFLWM.

2.3.2. Develop targeted PHFLWM curriculum and training materials.

2.3.3. Train trainers and value chain actors on PHFLW.

2.3.4. Develop reference material for value chain actors on PHFLWM to guide practices.

2.3.5. Enhance access to tools and equipment for food related secondary processing, marketing, and distribution activities.

2.3.6. Incorporate PHFLW reduction and management practices in the facilities management committees.

Strategic Pillar 3: Frameworks and guidelines for food waste management

Strategic Objective 3: Develop guidelines and frameworks for food waste management.

Strategic Issue 3.1: Lack of guidelines and frameworks for food waste management.

Strategy 3.1: Promote behaviour change towards food waste redistribution, reuse, recycling

3.1.1. Conduct assessment of factors contributing to behaviours that lead to food waste.

3.1.2. Develop resource materials and tools for awareness creation and sensitization of actors on food waste.

3.1.3. Mobilize resources for food waste awareness and sensitization activities.

3.1.4. Conduct sensitization on food waste through various forums and communication channels.

Strategy 3.2: Develop mechanisms for redistribution, reuse, recycling of food

3.2.1. Develop guidelines for food redistribution, reuse and recycling.

3.2.2. Support market segments to promote positive consumer purchasing habits, e.g., create awareness on date labelling, promote ugly foods, discount store sales.

3.2.3. Promote and identify innovation of appropriate business models for redistribution, reuse and recycling.

3.2.4. Establish linkages to finance and BDS for investment in redistribution, reuse and recycling.

Strategy 3.3: Capacity building on redistribution, reuse and recycling of food

3.3.1. Review and map available capacity building material on redistribution, reuse and recycling.

3.3.2. Enhance/develop capacity building material on redistribution, reuse and recycling of food.

3.3.3. Train and build capacity for efficient redistribution, reuse and recycling of food.

3.3 4. Facilitate development of support mechanisms and infrastructure for redistribution, reuse and recycling of food.

3.3.5. Facilitate the development of a legal and regulatory framework on redistribution, reuse and recycling of food.

3.5.2 STRATEGIC ENABLERS

Strategic Enabler 1: Policy, regulations, and legislation

Strategic Objective 4: Strengthening coordination and implementation of existing policies and legislative frameworks on PHFLWM.

Strategic issue 4.1: Weak coordination of policies, legal and legislative frameworks that influence PHFLWM.

Strategy 4.1: Raise awareness among policymakers and other relevant stakeholders on existing agri-food sector policies, regulations and strategies that relate to postharvest food loss and waste management (PHFLWM).

4.1.1. Conduct policy reviews that contribute or influence PHFLW.

4.1.2. Develop policy briefs from existing PHFLWM-related policies, strategies and regulation.

4.1.3. Convene sensitization platforms for policy makers on PHFLW-related policies and actions thereof.

Strategy 4.2: Establish coordination mechanisms for implementation of policies, strategies, and regulation in the agrifood sector that relate to PHFLWM.

4.2.1. Formalise the establishment of a PHFLWM multi-sectoral and multi-stakeholder coordination platform.

4.2.2. Develop inter-departmental PHFLWM action plans.

4.2.3. Promote industry self-regulation mechanisms on PHFLWM interventions.

4.2.4. Prioritize implementation of PHFLWM policies and interventions.

4.2.5. Establish inter-governmental (national and counties) and multi-stakeholder communication mechanisms on PHFLWM.

Strategy 4.3: Identify and review gaps in the legal and regulatory frameworks relating to PHFLWM

4.3.1. Map and conduct reviews of legal and regulatory frameworks that have implications on PHFLWM.

4.3.2. Develop/harmonize guidelines and frameworks that have implications on PHFLWM.

Strategic Enabler 2: Institutional arrangement

Strategic Objective 5: Enhance capacities and collaboration among institutions (MDAs, private sector and non-state actors) involved in PHFLWM.

Strategic Issue 5.1: Limited institutional capacities and collaboration on PHFLWM

Strategy 5.1: Strengthen collaboration and partnerships among institutions

5.1.1. Stakeholder mapping and analysis of PHFLWM initiatives.

5.1.2. Coordinate sensitization and information sharing forums on PHFLWM initiatives.

5.1.3. Establish institutional coordination platform for PHFLWM initiatives.

5.1.4. Support engagement mechanisms for public, private partnerships on PHFLWM initiatives and interventions.

Strategy 5.2: Strengthen institutional capacity on PHFLWM

5.2.1. Assess various institutions and organizations capacity on implementation of PHFLW interventions.

5.2.2. Develop institutional implementation guidelines for PHFLWM initiatives.

5.2.3. Support capacity building and/or development of institutions on PHFLWM.

Strategy 5.3: Promote public and private financing and investment in PHFLWM interventions

5.3.1. Conduct feasibility studies for identification of PHFLWM business cases/opportunities for financing and investment.

5.3.2. Develop resource mobilization and fundraising Strategy for PHFLWM initiatives.

5.3.3. Prioritize allocation of resources and monitor investments on PHFLWM initiatives.

5.3.4 Support access to finance and development of financing mechanisms for PHFLWM institutional initiatives.

Strategic Enabler 3: Research and development, and knowledge management

Strategic Objective 6: Strengthen linkages between research and development with knowledge management.

Strategic Issue 6: Weak linkages between research and development and knowledge management

Strategy 6.1: Support and upscale the development of PHFLWM technologies and innovation

6.1.1. Conduct a PHFLWM technology needs assessment.

6.1.2. Map out existing PHFLWM technologies and innovations, and develop a database.

6.1.3. Develop context-specific PHFLWM technologies.

6.1.4. Support/establish technology development centres on PHFLWM.

Strategy 6.2: Support incubation and commercialization of PHFLWM technologies.

6.2.1. Enhance linkages between research/academia and industry to facilitate partnerships for commercializing technologies and innovations.

6.2.2. Assess factors influencing adoption of PHFLWM technologies to foster technology uptake.

6.2.3. Support market development (Product, Price, Place and Promotion) for technologies to enhance uptake among users.

Strategy 6.3. Establish a data and information management system for PHFLW

6.3.1. Develop/adopt/harmonize, and pilot methodologies for collection of data on PHFLW.

6.3.2. Support training on data collection.

6.3.3. Support/facilitate collection of data and information on PHFLW for development and dissemination through information products.

6.3.4. Establish and coordinate a data repository for PHFLW initiatives and technologies.

3.5.3 RESULTS CHAIN

Outcome: Livelihoods and living standards of Kenya's population transformed through enhanced food security and incomes by creatiing an enabling environment and sustainable natural resource management.

VISION Impact	**Contribute to improved food and nutrition security and livelihoods by 2028.**					
GOALS Intermediate outcome	**Increased food availability, accessibility, affordability, and incomes**					
OVERAL OBJECTIVE Immediate outcome	**Reduced food loss and waste in Kenya**					
STRATEGIC PILLARS AND ENABLERS	**SP1: Knowledge, skills, and tools for primary management of food**	**SP2: Value chain development services**	**SP3: Frameworks and guidelines for food waste management**	**SE1: Policy, legal and legislation frameworks**	**SE2: Institutional arrangement**	**SE3: Research and development, and knowledge management**
STRATEGIES	1.1 Appropriate food loss reduction Technologies, Innovations and Practices (TIPs) adopted. 1.2 Improved capacities of stakeholders on pre-harvest and on-farm postharvest management.	2.1 Facilitated establishment of storage, aggregation, processing, marketing, and distribution facilities and created linkages. 2.2 Developed/ updated systems for establishment and maintenance of storage, aggregation, processing, marketing and distribution facilities for food loss and waste management. 2.3 Improved capacities of actors undertaking secondary processing, marketing, and distribution of food-related activities.	3.1 Positive behaviour change towards food waste redistribution, reuse, recycling promoted. 3.2 Mechanisms for redistribution, reuse, recycling of food developed. 3.3 Improved stakeholder competencies and skills on redistribution, reuse and recycling of food.	4.1. Improved awareness among policy makers and other relevant stakeholders on existing agrifood sector policies, regulations and strategies that relate to postharvest food loss and waste management (PHFLWM). 4.2. Coordination mechanisms established for implementation of PHFLWM policies.	5.1. Collaboration and partnerships strengthened among institutions. 5.2. Institutional capacity strengthened on PHFLWM. 5.3. Public and private financing and investment on PHFLW interventions promoted.	6.1 PHFLWM technologies and innovations generated. 6.2 PHFLW reduction and management technologies incubated and commercialized.

3.6 PRIORITY VALUE CHAINS FOR THE PHM STRATEGY

To support monitoring and tracking of progress on FLW, the regional blocs identified priority value chains of focus. However, other value chains can also be targeted within various programmes and initiatives. The selected value chains were identified based on the following criteria: volume of production within the zone; number of counties they are present in; number of food system actors involved; and levels of losses – opportunity for interventions.

This Strategy has adopted a structure with initiatives that are applicable across all value chains. This also allows for domestication of the Strategy at the county level and to work with the prioritized value chain as well as other value chains of interest.

The prioritized value chains with the regional clusters include:

Western region: Sweet Potato; Africa Leafy Vegetables and Fish

Rift-Valley region: Maize, Milk and Irish Potato

Eastern region: Meat (Dairy and Beef), Mango and Tomato

Central region: Avocado, Milk and Tomato

Coastal region: Watermelon, Mango and Green Grams

CHAPTER 4: STRATEGY IMPLEMENTATION

The successful implementation of this Strategy will require the collective and concerted efforts of all relevant State and non-State actors at national and county government levels, to effectively deliver the interventions outlined in Chapter 3 under the various strategic pillars and enablers. In addition, the implementation of the Strategy will require deployment of resources, mitigation of risks that may adversely affect implementation, reviewing of implementation progress, and generation of data, information and knowledge to better inform action and future programming.

This chapter highlights the coordination and implementation functions, financing mechanisms, risk analysis and mitigation, monitoring and evaluation, and information and knowledge management. It also provides for a review of the Strategy document.

4.1 COORDINATION AND IMPLEMENTATION FUNCTIONS

Effective implementation of the Postharvest Management Strategy for Food Loss and Waste Reduction will require coordination of the efforts of various actors in order to focus and synergize the efforts and Strategy interventions outlined in Chapter 3. The respective line Ministries, Departments and Agencies at the national level will be responsible for their assigned mandates in line with existing Executive Orders and Statutory provisions, and will focus on enhancing compliance; strengthening institutional capacities; provision of PHFLW management services; promoting good practices, standards, and technologies; and internal monitoring, evaluation and reporting on individual responsibilities.

At the county level, the respective departments for agriculture, health, and trade will continue to be responsible for their assigned mandates in relation to PHFLW. The departments will be responsible for the mobilization of stakeholders and awareness creation; development and implementation of programmes on PHFLW; capacity building and training of county-based food value chain actors and players in PHFLW; and supporting adoption of appropriate PHFLW reduction technologies, innovations, and practices.

There will be established a National Committee on Food Loss and Waste Management at the national level. At the devolved level, there will be established County Committee on Food Loss and Waste Management. In keeping with the intergovernmental coordination mechanisms established to coordinate national and devolved functions, the National and County Committees on PHFLWM shall work through their respective JASSCOM and CASSCOM structures.

4.1.1 NATIONAL COMMITTEE ON FOOD LOSS AND WASTE MANAGEMENT

At the national level, the National Committee on Food Loss and Waste Management will undertake overall coordination of Strategy implementation. The National Committee on Food Loss and Waste Management will establish Technical Working Groups (TWGs) with clear

responsibilities, clustered into thematic areas and with terms of reference aligned to the six strategic pillars and enablers, namely: harvest, on-farm postharvest and primary processing; secondary processing, marketing and distribution; consumption, redistribution, reuse and recycling; policy and regulations; institutional arrangement; and research, technology and knowledge management.

The National Committee on Food Loss and Waste Management will be responsible for the following:

1. Overall coordination of Strategy implementation.
2. Collective determination and advising the line Ministries and agencies, as appropriate, on measures to be undertaken to reduce PHFLW.
3. Development of the national action plan and supervising its adoption.
4. Assessing progress and steering the consolidation of reporting and reports on the achievement of Strategy implementation results (outputs and outcomes).
5. Facilitating sector-wide (food loss and waste) linkages with regional or international initiatives.

The National Committee on Food Loss and Waste will comprise the following institutions and actors:

1. Line ministries responsible for crops, livestock, fisheries, health, trade and industry, and environment.
2. Research and academia.
3. State Agencies, including AFA, KeFS, KEBS.
4. Representative of the Agriculture Sector Network (ASNET).
5. Representatives of processors and manufacturing organizations.
6. Representative of Civil Society Organizations.
7. Representatives of development partners
8. Representative of hoteliers' organizations.
9. Representatives of food transporters/logistics organizations.
10. Representative of Kenya Consumers Network.
11. Representatives of agriculture, health, trade and environment related/affiliated UN organizations.
12. Representatives of farmers and growers' organizations.
13. Representatives of food traders.

4.1.2 COORDINATION AND COMMUNICATION STRUCTURE

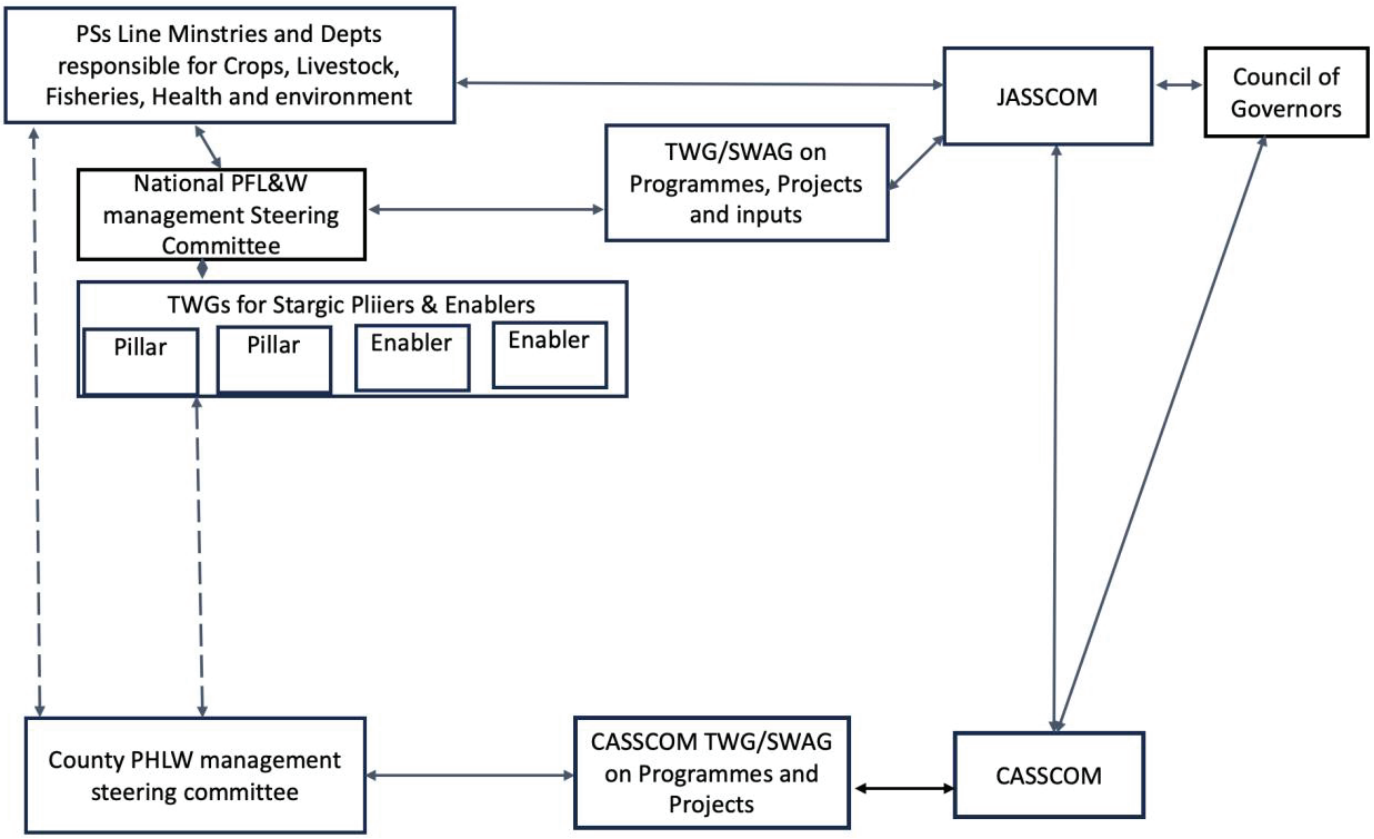


Figure 8: Coordination structure adopted from Inter-Governmental JASSCOM arrangement

4.1.3 COUNTY COMMITTEE ON FOOD LOSS AND WASTE MANAGEMENT

Each county will establish a County Committee on Food Loss and Waste, which will be responsible for the following:

1. Domestication and mainstreaming of PHFLWM in County Integrated Development Plans (CIDPs) and coordination of development of annual work plans.
2. Overall county coordination of domesticated Strategy implementation.
3. Collectively determining and advising the respective CECMs, as appropriate, on measures to be undertaken against PHFLW.
4. Developing the county action plan and supervise its adoption.
5. Assessing progress and steering the consolidation of reporting and reports on the achievement of Strategy implementation results (outputs and outcomes).
6. Facilitating regular communication and flow of information on food loss and food waste management across the county.
7. Facilitating sector-wide intra and cross-county linkages on PHFLWM.

The County Committee on Food Loss and Waste Management will comprise the following institutions and actors:

1. Departments for agriculture, health and trade.
3. Regional/county offices serving AFA, KeFS, KEBS.
4. Representative of ASNET at the regional level.

5. Regional office of Kenya Association of Manufactures.
6. Representative of civil society organizations at the regional level.
7. Representative of development partners working within the county.
8. Representative of hoteliers' organizations at the regional level.
9. Representative of food transporters/logistics organizations working within the county.

4.2 FINANCING MECHANISMS

The resources required for funding of this Strategy will be two-pronged: resources for undertaking the Strategic interventions specified under the strategic pillars and enablers in Chapter 3; and, resources for coordination, M&E, reporting and development of knowledge management tools.

Financial resources to implement the interventions specified under the strategic pillars and enablers in Chapter 3 will be allocated and spent by implementing actors in line with their commercial or public interests along the food supply chain. The actors will be required to enhance allocation of resources to address the interventions that cover PHFLWM as outlined in the interventions. Additionally, PHFLWM projects and programmes funding arising from or aligned to the Strategy will benefit from resources mobilized from a variety of sources through private sector activities, externally funded independent projects, or institutional partner activities. Efforts will be made to align such projects and programmes to the Strategy, which will be domiciled within the line ministries or departments responsible for crops, livestock, health, trade or environment, depending on respective focus areas and mandates in the Strategy implementation.

4.2.1 GOVERNMENT FUNDING

The Government at the national and devolved levels, through budgetary allocation, will enhance the level of funding to address public interventions in line with their respective functions, mandates and responsibilities outlined in the Constitution 2010 and Executive Orders issued from time to time. Resources from government will focus on creating an enabling environment for the private sector to address food loss and waste reduction strategies through enabling policy, strategies and regulatory frameworks; capacity building of actors; research, technology generation and promotion of innovative approaches to FLWM; and coordination of actors in the PHFLWM space.

Government will also be responsible for mobilizing resources from partners to support targeted programmes and projects on PHFLW reduction, and where necessary, provide fiscal and other incentives for greater adoption and use of sustainable PHFLWM practices. The committees and the national and county levels will ensure the mainstreaming of PHFLWM actions in all agriculture, health, trade and environment programmes, where applicable.

4.2.2 RESOURCE PARTNER SUPPORT

The Government and other actors will continue to advocate and mobilize resources from development partners. The Strategy will be used as a selling point to mobilize resources for various projects and programmes targeted at addressing PHFLW. The Government and other stakeholders will lobby

development partners in current agriculture, health, trade and environment related programmes that do not consider or will not have mainstreamed PHFLWM practices, to do so and allocate more resources to address PHFLW. Each of the line ministries or departments responsible for crops, livestock, health, trade or environment or county governments, depending on respective focus areas and mandates for Strategy implementation, will either separately or jointly where applicable, design programmes and projects, and lobby for funding from the development partners to finance interventions under the Strategy.

4.2.3: PRIVATE SECTOR SUPPORT

Private sector actors involved in food value chains will continue to invest in measures that check PHFLW. Commercial entities and non-profit institutions engaged in the food value chains will continue to allocate and spend financial resources to implement the strategic interventions specified under the strategic pillars and enablers in Chapter 3, in line with their commercial or public interest. These actors will be required to enhance allocation of resources to address the interventions that cover PHFLWM as outlined in the interventions.

4.3 RISK ANALYSIS AND MITIGATION

Table 8: Risk and mitigation matrix

RISK	PROBABILITY OF THE RISK	IMPACT OF THE RISK	MITIGATION MEASURES
Limited buy-in of the food loss and waste Strategy by various Stakeholders	Medium (due to low general awareness on food safety and weak stakeholder institutions organized around food safety)	The food loss and waste Strategy will not be prioritized and implemented	Enhanced stakeholders' awareness on the PHFLWM Strategy
Inadequate government goodwill in implementing the Strategy	Low (due to food loss and waste reduction being a priority in the BETA)	Delayed/low implementation of the Strategy	Advocacy Development of policy briefs
Failure to operationalize institutional framework for Strategy implementation coordination	Medium (due to existence of sector players with core functions and mandates on food loss and waste reduction)	Disjointed implementation of the Strategy	Development of the national steering committee
Inadequate information and data to support adaptive management and future programming on food loss and waste management	Medium (due to unavailability of piecemeal data in various players' participation in PHFLWM) Medium (Availability of piecemeal data in various players' participation in PHFLWM)	Wrong reports and decisions on food loss and waste reduction	Collating and validating data on PHFLW Developing a centralized data management repository on PHFLWM
Inadequate market infrastructure and systems	High (due to unstructured marketing system)	Disruption of produce and products in the supply chain Lack of organized marketing systems	Lobbying both levels of government to develop infrastructure Strengthening farmer cooperatives Strengthening access to market information

Inadequate technology generation, dissemination, and adoption	Medium (due to weak linkages between research and extension, and inadequate funding for research development and dissemination)	Low adoption of technologies and innovations on PHFLW reduction	Creating a strong linkage between research and extension Increasing funding for research development and dissemination

4.4 MONITORING AND EVALUATION

To ensure effective Monitoring and Evaluation (M&E) of progress towards achievement of the objectives of the food loss and waste reduction Strategy, a robust monitoring and evaluation system is vital. An effective monitoring and evaluation system will ensure accountability to stakeholders and evidence-based decision making, facilitate learning, and ultimately contribute to improved food and nutrition security and poverty reduction.

Further to this, and building on the global SDG 12 target on responsible production and consumption, in particular the food loss and food waste indices as well as the regional AU Post-harvest Loss Management Strategy, under which Kenya reports, this Strategy will seek to align all monitoring and evaluation tools.

4.4.1 MONITORING AND EVALUATION

The monitoring and evaluation system will have three main functions:

1. **Implementation monitoring to track progress towards achievement of food loss and waste reduction Strategy outputs.** This will entail monitoring activity milestones based on the work plan, budgets and targeted output indicators. Regular assessment of implementation of various activities and initiatives will be undertaken to ensure tracking and continuous alignment with the Strategy objectives.

   The Strategy recommends a scoping assessment to determine baseline values of key performance indicators (KPIs). This is a crucial step in providing benchmarks for future comparisons and performance towards achievement of set targets. The assessment should be conducted at the outset to aid in setting clear and measurable targets for monitoring and progress towards food loss and waste reduction.
2. **Result monitoring to establish changes at outcome and impact level resulting from the food loss and waste reduction interventions.** Evidence generated from key performance indicators at outcome and impact level will demonstrate the effectiveness of the food loss and waste reduction Strategy and greater overall impact.
3. **Facilitate continuous learning and improvement of outcomes of the food loss and waste Strategy.** Monitoring and evaluation will enable the Strategy to be adaptive and flexible. By identifying changing trends and emerging challenges, the food loss and waste reduction Strategy will be reviewed to remain relevant and effective.

A detailed monitoring and evaluation framework for the food loss and waste reduction Strategy with clearly defined indicators, their corresponding means of verification and the assigned responsibility, is presented in Annex 1.

4.4.2 REPORTING

Reporting structures outlining formats and frequencies for providing updates on the Strategy implementation progress, with clear outputs and outcomes results/indicators, as well as the associated means of verification, will be established. Stakeholders with specified information needs will be identified and reports tailored to address different requirements. Reports will be structured to also ensure findings from monitoring and evaluation activities can be used to continuously improve Strategy implementation and inform decision-making.

4.5 INFORMATION AND KNOWLEDGE MANAGEMENT

The goal of knowledge management is to ensure that the right knowledge is available to the relevant actors and stakeholders at the appropriate time, leading to better decision-making, improved innovation, and increased productivity. Knowledge management (KM) under the Strategy will focus on identifying, capturing, organizing, storing, retrieving, and sharing knowledge products to enhance Strategy implementation performance and effective future programming around PHFLWM initiatives. Knowledge management will foster an environment that encourages the efficient and effective flow of knowledge among actors and stakeholders within the PHFLWM landscape.

The Knowledge Management Policy for Kenya provides for a multipronged approach towards achieving a knowledge-based economy as highlighted in the Kenya Vision 2030. The Policy aims at building platforms for knowledge exchange by encouraging cooperation among knowledge-generating institutions and development agencies.

This will entail coordination and structuring data collection, analysis, reporting and dissemination in line with the Strategy implementation progress through indicator tracking. Under the Strategy, knowledge management will focus on knowledge creation; capture; organization; storage; retrieval; sharing/transfer; learning and training; validation; governance; and performance measurement. Using the report framework and other knowledge tools, the committees established at the national and devolved levels of government will coordinate knowledge management initiatives.

The Strategy has outlined a reporting framework that will link the county and national governments to identify actions that are strategically aligned and contribute to achieving the desired results. The linkage between the national and county level focal persons and task team has been put in place to ensure organization of data and information in a structured manner to facilitate accessibility, sharing amongst stakeholders for effective and efficient planning, coordination, monitoring and evaluation of the sector; and to establish a support platform for policy, management and investment decisions.

4.6 STRATEGY REVIEW

This Strategy will be reviewed at the end of the five-year period or earlier, whenever it may be deemed necessary, pursuant to policy changes or emerging issues and priorities.

ANNEXES

ANNEX 1: IMPLEMENTATION MATRIX

IMPACT		Contribute to improved food and nutrition security and livelihoods by 2028.									
INTERMEDIATE OUTCOME		Increased food availability, accessibility, affordability, and income.									
IMMEDIATE OUTCOME		Reduced food loss and waste in Kenya									
Strategies	**Actionable activities**	**Indicator**	**Means of Verification**	**Responsibilities and Institutions**			**Priority Timelines and the indicative budget (KES. Millions**				
				National Government	**County Government**	**Other stakeholders**	**YR1**	**YR2**	**YR3**	**YR4**	**YR5**
Strategic Pillar 1: Knowledge, skills, and tools for primary food management											
Strategic Objective 1: Strengthen knowledge, skills and tools for primary food management (harvest, on-farm post-harvest and primary processing)											
Strategic Issue 1.1: . Limited capacities for primary management of food (harvest, on-farm post-harvest and primary processing)											
Strategy 1.1 Promote adoption of appropriate post-harvest management for food loss reduction technologies, innovations, and practices (TIPs).	1.1.1 Support access to credit for financing adoption and utilization of technologies	Number of technologies, innovations and practices accessed through financing mechanisms.	MoV: Survey reports	a) Establish linkages with financial service providers at the national level b) Establish financing schemes and modalities for PHFLM. c) Collaborate and promote involvement of financial institutions.	a) Establish linkages and partnerships with end users at the county b) Operationalize financing mechanisms	Private sector investment	3	3	3	3	3
	1.1.2 Mainstream Postharvest Food loss management (PHFLM) messaging on extension services.	Number of extension services with messaging on PHFLM TIPs.	MoV:. Survey reports, Annual training reports.	a) Develop messages and messaging material on PHFLM.	a) Disseminate messages and messaging material.	a) Co-facilitate development of training material c)Utilize messaging material in programming.	1	1	1	1	1
	1.1.3 Strengthen linkages to appropriate PHFLM service providers.	No of linkages established with PHFLM service providers	MoV: Reports, Partnership agreements	Facilitate linkages to PHFLM service providers	Facilitate linkages to PHFLM service providers	Facilitate linkages to PHFLM service providers. Utilize linkages	8	5	5	5	8
	1.1.4 Support peer-to-peer learning through knowledge exchange programs on PHFLM	Number of knowledge exchange programs on PHFLM undertaken	MOV: Knowledge exchange programs reports	Coordinate peer-to-peer programs	Facilitate linkages of peers-to-peer knowledge exchange platforms Conduct peer-to-peer knowledge exchange programs	Facilitate linkages of peer-to-peer	4	4	4	4	4
	1.1.5 Commercialization of PHFLM technologies, innovations, and practices.	Number of TIPs commercialized.	MOV: Investment reports	Develop standards for commercialization of TIPs. Promote private sector investment	Facilitate operationalization of commercial TIPs	Private sector investment	10	15	20	15	15
	1.1.6 Create awareness on PHFLM technologies, innovation, and practices.	Number of value chain actors with increased awareness on PH/FLM TIPs	MoV: Training reports	Develop awareness creation programs	Operationalize awareness creation programs	Participate and co-facilitate in awareness creation programs	200	150	150	100	100
Strategy 1.2 Capacity build stakeholders pre-harvest and on-farm post-harvest management	1.2.1 Map relevant stakeholder and conduct a training needs assessment on PHFLM.	Number of stakeholders mapped and training needs assessments conducted on pre-harvest and on-farm post-harvest management -PHFLM	MoV: Capacity needs assessment report	Coordinate the mapping exercise.	Conduct the mapping exercise	Participate in the survey	80	0	0	0	0

	1.2.2 Develop targeted PHFLM curriculum and training materials.	Number of curricula and training materials on PHFLM developed	MoV: Curriculum, Training materials	Develop training material	Utilize training material and curriculum	Utilize training material and curriculum	20	5	5	5	5
	1.2.3 Training of trainers and value chain actors on PHFLM	Number of ToTs and value chain actors with increased knowledge on PHFLM	MoV: Training reports	Conduct training of TOT	a) Identify TOT b) Train value chain actors	a) Participate in training. b) Co-facilitate trainings	5	2	2	2	2
	1.2.4 Develop reference material for value chain actors on on-farm PHFLM to guide practices	Number of reference materials on PHFLM developed	MoV: Training reports	Develop reference material- guidebooks	Disseminate reference material	a) Utilize reference material. b) Support dissemination of reference material	15	5	5	5	5
	1.2.5 Support access to facilities, tools and equipment for application	Number of value chain actors with access to PHFLM facilities, tools and equipment.	MoV: Survey reports	Facilitate linkages.	Establish linkages	Utilize linkages	4	4	4	4	4
Strategic Pillar 2: Value chain development services											
Strategic Objective 2: Strengthen value chain development services											
Strategic Issue 2.1: Limited efficiency of value chain development services											
Strategy 2.1 Support establishment and/or facilitate linkages to existing storage aggregation, processing, marketing and distribution facilities.	2.1.1. Map and assess the capacities of existing storage aggregation processing, marketing, and distribution facilities in relation FLWM.	Number of aggregation processing, marketing, and distribution facilities mapped and assessed for capacities in relation to FLWM.	MoV: Assessment reports	a) Coordinate mapping exercise b) Develop criteria and guides for mapping exercise.	Conduct survey	Participate in survey	5	0	5	5	0
	2.1.2. Develop guidelines to address gaps in relation to FLWM in the facilities	Number of guidelines developed to address gaps in relation to FLWM in the facilities.	MoV: Guideline documents	Provide best practices to address gaps	Adopt and adapt developed guidelines to address gaps.	a) Participate in the development and implementation of the guidelines. b) Apply the guidelines.	5	2	2	2	2
	2.1.3. Facilitate linkages to existing storage, processing, marketing and distribution facilities by actors.	Number of linkages to existing facilities by end users established.	MoV: Performance review reports	a) Coordinate linkages to value chain development services. b) Promote private. sector investment.	Establish linkages to value chain development services.	Utilize the value chain development services. Private sector investment.	5	5	5	5	5
	2.1.4. Support development of cottage industries for value addition and agro-processing.	Number of cottage industries supporting value addition and agro-processing developed.	MoV: Performance review reports	a) Develop frameworks and guidelines for development of cottage industries. b) Promote private sector investment	a) Mobilize funds for funds to support the cottage industries. b) Identify business cases for investment. c) Private sector linkages	Private sector investment	12.5	12.5	12.5	12.5	12.5
	2.1.5. Support logistics services to minimize FLW.	Number of logistic service providers supported to minimize FLW.	MoV: Training reports	a) Develop capacity building material for logistic service on addressing FLW. b) Training logistics bodies on addressing FLW.	Training of logistics service providers at the counties	Participate in training	10	3	3	3	3
	2.1.6 Integrate and link information systems with end users.	Number of linkages established between information systems and end users.	MoV: MoUs/ Reports	a) Develop and coordinate information systems. b) Develop information platforms outreach plan	a) Operationalize outreach plan. b) Establish linkages with end users	Utilize information systems	10	10	10	10	10

	2.1.7 Support development and implementation of maps profiling seasonal and spatial availability of food commodities.	Number of maps showing seasonal and spatial availability of food commodities developed.	MoV: Maps	a) Develop the mapping template b) Coordinate mapping exercise	a) Conduct survey	a) Participate in the survey. b) Co-facilitate the survey.	5	5	5	5	5
Strategy 2.2 Develop systems for establishment and maintenance of storage, aggregation, processing, marketing and distribution facilities for food.	2.2.1. Review and develop guidelines for design, establishment and maintenance for storage, processing, marketing and distribution facilities.	Number of guidelines reviewed/ developed	MoV: Guidelines document	a) Coordinate the review process- review methodology. b) Develop best practices for the guidelines	a) Conduct survey b) Operationalize guidelines.	a) Participate in review process. b) Co-facilitate review process. c) Apply guidelines developed	3	3	3	3	3
	2.2.2. Undertake regular maintenance of the storage, aggregation, processing, marketing, and distribution facilities	Number of aggregation, processing, marketing, and distribution facilities with increased uptime.	MoV: Performance review reports	Monitor and facilitate maintenance of facilities	Monitor and facilitate maintenance of facilities	Maintain facilities appropriately.	3	3	3	3	3
	2.2.3. Support access to finance for establishment and maintenance of storage, processing, marketing, and distribution facilities.	Amount of finances invested in aggregation, processing, marketing and distribution facilities	MoV: Financial reports	a) Develop financing programs and mechanisms for enhanced utilization of the facilities. b) Promote private sector investment	Facilitate linkages to finance	Private sector investment	5	5	5	5	5
	2.2.4. Establish multi-stakeholder committees for maintenance of public storage, aggregation, processing, marketing and distribution facilities	Number of functional committees for maintenance of public aggregation, processing, marketing and distribution facilities	MoV: Minutes of committee meetings	Establish national platforms	Establish county platforms	Participate/join platforms	5	5	5	5	5
Strategy 2.3 Capacity building actors undertaking secondary processing, marketing and distribution food related activities.	2.3.1. Map relevant stakeholder and conduct a training needs assessment on FLWM.	Number of stakeholders in secondary processing, marketing and distribution mapped and assessed for capacity needs on FLWM.	MoV: Capacity needs assessment report	Coordinate mapping exercise and develop needs assessment templates.	Conduct survey	Participate in survey	15	0	0	0	0
	2.3.2. Develop targeted FLWM curriculum and training materials	Number of curriculum and training materials on FLWM developed.	MoV: Curriculum, Training materials, Training reports	Develop training material for value chain development service practitioners.	Utilize and disseminate training material – through partners.	a) Participate in training b) Facilitate training	10	4	4	4	4
	2.3.3. Training of trainers and value chain actors on FLWM.	Number of ToTs and value chain actors with increased knowledge on FLWM.	MoV: Training reports.	Develop training manuals	Conduct training for value chain actors on FLWM		10	3	3	3	3
	2.3.4. Develop reference material for off-farm value chain actors on FLWM to guide practices.	Number of reference materials on FLWM developed for off-farm value chain actors.	MoV: Reference material.	Develop reference material; record templates, guidebooks	a) Mobilize funds for dissemination of reference material and disseminate the material	Utilize reference material	5	2	2	2	2

	2.3.5 Enhance access to tools and equipment for food related secondary processing, marketing and distribution activities.	Number of actors with access to tools and equipment for food related secondary processing, marketing and distribution activities.	MoV: Performance review reports	a) Facilitate linkages between tools and equipment and the end users	a) Avail tools and equipment b) Establish the linkages between tools and equipment with ends users	Utilize tools and equipment	5	5	5	5	5
	2.3.6. Incorporate FLW reduction and management practices in the facilities management committees.	Number of FLW reduction and management practices in the facilities management committees adopted.	MoV: Report on facilities management practices	Develop guidelines for incorporation of FLW reduction and management for the facilities	Train and equip management facilities management committees on FLW reduction and management.	Appropriately apply guidelines	5	3	3	3	3
Strategic Pillar 3: Frameworks and guidelines for Food waste management											
Strategic Objective 3: Develop guidelines and frameworks food waste management											
Strategic Issue 3.1: Lack of guidelines and frameworks for food waste management.											
Strategy 3.1 Promote behavior change towards food waste re-distribution, re-use, recycling.	3.1.1. Conduct assessment of factors contributing to behaviors that lead to food waste.	Number of assessments conducted on factors contributing to behaviours that lead to food waste.	MoV: Assessment reports	a) Coordinate assessment. b) Develop tools and templates for the assessment.	Conduct survey	Participate in the survey	4	4	4	4	4
	3.1.2. Develop resource materials and tools for awareness creation and sensitization of actors on FW.	Number of resource materials and tools developed for awareness creation and sensitization of actors on FW	MoV: Reports on resource materials; awareness creation reports	a) Develop training manuals and models for the awareness creation and sensitization. b) Mobilize funds for development of resource materials	Adapt and domesticate resource materials for awareness creation and sensitization	a) Co-facilitate development of resource materials for sensitization and awareness on FLW	10	3	3	3	3
	3.1.3. Mobilize resources for FW awareness and sensitization activities.	Amount of resources raised for FW awareness and sensitization activities.	MoV: Financial Reports	a) Develop programs and initiatives for sensitization and awareness creation on FLW. b) Mobilize private sector investment.	Mobilize for partnerships and support for awareness creation and sensitization activities	Facilitate and participate in awareness creation and sensitization activities.	5	5	5	5	5
	3.1.4. Conduct sensitization on FW through various forums and communication channels	Number of actors with enhanced awareness on FW through sensitization forums	MoV: Sensitization Reports	Coordinate sensitization and awareness creation.	Conduct awareness creation and sensitization activities.	Participate in sensitization and awareness creation activities.	3	3	3	3	3
Strategy 3.2 Develop mechanisms for re-distribution, re-use, re-cycling of food.	3.2.1 Develop guidelines for food re-distribution, re-use and re-cycling.	Number of guidelines developed for food re-distribution, re-use and recycling.	MoV: Review reports	Provide best practices for re-distribution, re-use, re-cycling of food.	Adopt and adapt developed guidelines for re-distribution, re-use, re-cycling of food.	Participate in the development and implementation of the guidelines	8	3	3	3	3
	3.2.2 Support market segments promote positive consumer purchasing habits e.g., awareness on date labeling, promote ugly foods, discount store sales	Number of market segments supported to promote positive/ food waste reduction consumer purchasing habits.	MoV: Promotion review reports	a) Conduct market segment identification b) Develop tools and messages to support various market segments promote positive consumer behavior	Disseminate tools and messages	Promote and utilize messaging	2	2	2	2	2

	3.2.3 Promote and identify innovation of appropriate business models for Re-distribution, Re-use and Re-cycling.	Number of business models identified and promoted	MoV: Promotion/ Program reports	Facilitate business linkages	Support innovation and building business cases	Private sector investment	10	5	5	5	5
	3.2.4 Establish linkages to finance and BDS for investment in redistribution, re-use and recycling.	Number of linkages to finance and BDS established	MoV: Feasibility Reports, Business plans, Contracts signed and executed	a) Facilitate Linkages for finance and investment. b) Mobilize for resources to support food waste related initiatives c) Establish funds to support redistribution, re-use and recycling. d) Develop programs and projects targeting food redistribution, re-use and recycling.	a) Establish linkages to finance and BDS b) Implement programs and projects targeting food redistribution, re-use and recycling. c) Mobilize resources to invest and support food redistribution, re-use and recycling.	Private sector investment.	15	3	3	3	3
3.3 Capacity building on Re-distribution, Re-use and Re-cycling of food.	3.3.1 Review and map available capacity building material on re-distribution, re-use and re-cycling-RRR.	Number of capacity building material mapped and reviewed.	MoV: Capacity building material mapping and review report	Coordinate review process.	Conduct review process	Participate and co-facilitate in review process	5	5	5	5	5
	3.3.2. Enhance/ develop capacity building material on re-distribution, re-use and recycling of food	Number of capacity building materials enhanced / developed on re-distribution, re-use and recycling of food.	MoV: Reports, Capacity building materials	Develop training material and standards for the training material	a) Participate / contribute to development of training material b) Adapt and Adopt training material	a) Contribute to development of training material b) Co-facilitate development of training material	8	2	2	2	2
	3.3.3. Train and build capacity for efficient re-distribution, re-use and recycling of food.	Number of actors with enhanced capacity on re-distribution, re-use and recycling of food.	MoV: Trainings and capacity building reports	Conduct capacity building on efficient re-distribution, re-use and recycling of food.	Capacity building on efficient re-distribution, re-use and recycling of food.	Develop and implement code of conduct	3	3	3	3	3
	3.3 4. Facilitate development of support mechanisms and infrastructure for re-distribution, re-use and recycling of food.	Number of mechanisms and infrastructure for re-distribution, re-use and recycling of food developed.	MoV: Re-distribution, re-use and recycling of food framework development report.	Provide guidelines and frameworks for development operationalization of mechanisms and infrastructure for re-distribution, re-use and recycling of food.	Adopt and adapt developed guidelines and frameworks mechanisms and infrastructure for re-distribution, re-use and recycling of food.	Participate in the development and implementation of the guidelines. Adhere to frameworks and guidelines.	10	3	3	3	3
	3.3.5. Facilitate the development of a legal and regulatory framework on re-distribution, re-use and recycling of food.	Number of legal and regulatory framework for re-distribution, re-use and recycling of food enacted .	MoV: A legal instrument (Act or Regulation).	Develop guidelines and framework	a) Sensitize stakeholders on guideline and frameworks. b) Monitor implementation of guidelines and frameworks	Appropriately adhere to frameworks and guidelines	3	3	3	3	3

Strategic enabler 1: Policy, regulations and legislation											
Strategic Objective 4: Strengthening coordination and implementation of existing policies and legislative frameworks on PHFLWM.											
Strategic issue: Weak coordination of policies, legal and legislative frameworks that influence PHFLWM											
Strategy 4.1. Raise awareness among policymakers and other relevant stakeholders on existing agri-food sector policies, regulations and strategies that relate to postharvest food loss and waste management (PHFLWM)	4.1.1 Conduct policy reviews that contribute or influence PHFLW.	Number of policies reviewed	MoV: Policy review report	Coordinate and conduct policy reviews	Conduct policy reviews	Participate in survey	3	3	3	3	3
	4.1.2. Develop policy briefs from existing PHFLWM related policies, strategies and regulation:	Number of policy briefs developed	MoV: Policy briefs	Develop policy briefs	Participate in the development process	Participate in the development process	20	0	0	0	4
	4.1.3. Convene sensitization platforms for policy makers on PHFLW related policies and actions thereof	Number of policy makers with enhanced awareness on PHFLW	MoV: FLW sensitization reports	a) Mobilize for funds to support convening of the sensitization platforms at national level b) Develop outlines and modalities for convening of policy makers c) Organize and conduct national sensitization forums for policy makers	a) Mobilize for funds to support convening of the sensitization platforms at county level. b) Conduct sensitization campaigns for policy makers in counties	a) Participate in the platforms. b) Co-facilitate the convening	50	50	50	50	50
Strategy 4.2. Establish coordination mechanisms for implementation of policies, strategies, and regulation in the agri-food sector that relate to PHFLWM	4.2.1 Establish a PHFLWM multi-sectoral and multi-stakeholder coordination platform.	Number of platforms established. Number of active members onboarded on the PHFLWM platform.	MoV: Platform database and review reports	a) Establish multi-sectoral and multi-stakeholder coordination and monitoring mechanisms at the national level. b) Monitor and coordinate implementation	Coordinate multi-sectoral and multi-stakeholder coordination mechanisms at the county level	Contribute through and adhere to partnership mechanisms	3	3	3	3	3
	4.2.2. Develop inter-departmental PHFLWM action plans.	Number inter-departmental PHFLWM action plans developed.	MoV: Action plans	Coordinate and facilitate action plan development processes and the action plan	a) Participate in action plan development process. b) Adopt, adapt, and operationalize action plan	a) Participate in action plan development process b) Mainstream action plan in programs and initiatives	3	3	3	3	3
	4.2.3. Promote industry self-regulation mechanisms on PHFLWM interventions.	Number of industry self-regulation framework (ISR) promoted.	MoV: Service level agreements , Partnership agreements, Reports	Develop frameworks and guidelines for self-regulation	Sensitize value chain actors on guidelines for self-regulation	Appropriately adhere to guidelines	15	0	0	0	3
	4.2.4. Prioritize implementation of PHFLWM policies and interventions	Number of policies / interventions implemented	MoV: Review Reports	Develop program, projects and support projects on FLWM	a) Sensitize partners on PHFLWM programming b) Develop program, projects and support projects on PHFLWM	Develop program, projects and support projects on FLWM	15	3	3	3	3

	4.2.5 Establish inter-governmental (National and Counties) and multi-stakeholder communication mechanisms on PHFLWM.	Number of intergovernmental and multi-stakeholder communication mechanisms established	MoV:, County/ National government reports	a) Identify national focal persons b) Develop communication framework (for information sharing and feedback. c) Establish coordination unit on FLWM.	a) Identify focal persons b) Adapt and adopt communication framework	Contribute and work with national and county focal persons.	17	0	0	0	0
Strategy 4.3 Identify and review gaps in the legal and regulatory frameworks relating to PHFLWM	4.3.1. Map and conduct reviews of legal and regulatory frameworks that have implications on PHFLWM	Number of reviewed legal and regulatory frameworks	MoV: Review reports	Coordinates the mapping and review	Conduct the mapping and review	Conduct and participate in the mapping and review					
	4.3.2. Develop/ harmonize guidelines and frameworks that have implications on PHFLWM	Number of guidelines and frameworks harmonized/ developed	MoV: Guidelines document	a) Coordinate the harmonization process. b) Develop standards and methodology for the review process. c) Develop guidelines and frameworks for PHFLWM	a) Operationalize frameworks for harmonization b) Develop modalities for implementation of harmonized frameworks c) Sensitize partners and stakeholders on harmonized frameworks	Adhere to harmonized legal and regulatory frameworks	8	2	2	2	4
Strategic enabler 2: Institutional arrangement											
Strategic Objective 5: Enhance capacities and collaboration among institutions (MDAs, private sector and non-state actors) involved in PHFLWM											
Strategic issue: Limited institutional capacities and collaboration on PHFLWM											
5.1. Strengthen collaboration and partnerships among institutions.	5.1.1. Stakeholder mapping and analysis of PHFLWM initiatives.	Number of stakeholders mapped and analyzed on PHFLWM initiatives	MoV: Stakeholder Mapping Report	a) Coordinate the mapping exercise b) Develop mapping criteria and methodology c) Mobilize funds for mapping exercise.	Conduct mapping exercise	Participate in the mapping exercise	10	4	4	4	4
	5.1.2 Coordinate sensitization and information sharing forums on institution led PHFLWM initiatives.	Number of institution sensitization/ information sharing forums	MoV: Sensitization reports	a) Mobilize for funds to support convening of the sensitization platforms at national level b) Develop outlines and modalities for convening of stakeholders' makers	Mobilize for funds to support convening of the sensitization platforms at county level	a) Participate in the platforms. b) Co-facilitate the convening	250	0	0	0	0
	5.1.3. Establish institutional coordination platform for PHFLWM initiatives.	Number of platforms established for coordination, number of institutions subscribing/ participating on the platform	MoV: Platform database	a) Develop guidelines for multi-sectoral and muti-stakeholder institutional coordination platform on PHFLWM b) Coordinate establishment of the platforms and national level c) Establish linkages with county platforms	a) Adapt guidelines for institutional coordination b) Monitor and coordinate institution interventions	Participate in established frameworks and platforms	3	3	3	3	3
	5.1.4. Support engagement mechanisms for public, private partnerships on PHFLWM initiatives and interventions.	Number of PPP coordination mechanisms established on PHFLWM	MoV: Report, MOUs, SLAs	a) Develop frameworks for joint initiatives in PHFLWM initiatives b) Mobilize funds for the joint initiatives	Mobilize funds for joint initiative on PHFLWM	Develop and participate in joint initiative on PHFLWM.	200	0	0	0	0

5.2. Strengthen institutional capacity on PHFLWM	5.2.1. Assess various institutions and organizations capacity on implementation of PHFLWM interventions	Number of institutions assessed for capacity to implement PHFLWM interventions	MoV: Assessment Reports	a) Coordinate assessment. b) Develop tools and templates for the assessment.	Conduct survey	Participate in the survey	15	0	0	0	0
	5.2.2 Develop institutional implementation guidelines for PHFLWM initiatives.	Number of institution implementation guidelines for PHFLWM developed	MoV: Implementation guideline documents	Develop guidelines	Participate in guidelines development of institutional led PHFLW initiatives	Participate in guidelines development of institutional led PHFLW initiatives	5	2	2	2	2
	5.2.3. Support capacity building and/or development of institutions on PHFLWM.	Number of institutions with enhanced capacity on PHFLWM	MoV: Capacity building Reports	Conduct training of trainers	Conduct training of institutional staff tasked/working on PHFLW related initiatives.	Participate in training	5	4	4	4	4
5.3. Promote public and private financing and investment on PHFLWM interventions.	5.3.1 Conduct feasibility studies for identification of PHFLWM business cases/ opportunities for financing and investment.	Number of feasibility studies conducted on PHFLWM business cases/ opportunities for financing and investment	MoV: Feasibility study reports	a) Develop frameworks and criteria for business feasibility on FLW interventions.	Operationalize frameworks and conduct feasibility studies	Participate and co-facilitate feasibility studies	45	0	0	0	0
	5.3.2. Develop resource mobilization and fundraising strategy for PHFLWM initiatives.	Number of resource mobilization strategies developed for PHFLWM initiatives	MoV: Fundraising strategy Reports	Develop frameworks and strategy.	Domesticate resource mobilization strategies for investments in FLWM business cases	Private sector investment Participate in development of strategy- industry demand	115	0	0	0	0
	5.3.3. Prioritize allocation of resources and monitor investments on PHFLWM initiatives.	Number of PHFLWM initiatives receiving resources/ investments, Amount of investments allocated for PHFLWM	MoV: Program review reports	a) Facilitate investment linkages b) Resource allocation for FLWM business cases	Establish investment linkages	Private sector investment					
	5.3.4 Support access to finance and development of financing mechanisms for PHFLWM institutional initiatives.	Number of incentives and concessions for the financing mechanisms/ Number of financing partnerships	MoV: Reports, Financing agreements	a) Coordinate and mobilize private sector investment. b) Facilitate linkages for financing. c) Develop financing modalities	a) Establish linkages with financial institutions. b) Raise awareness of available financing mechanisms.	Develop private sector financing mechanisms for FLWM initiatives	25	5	5	5	5
Strategic enabler 3: Research and Development, and knowledge management											
Strategic Objective 6: Strengthen linkages between research and development with knowledge management											
Strategic issue 6: Weak linkages between research and development and knowledge management											
6.1 Support and upscale the development of PHFLWM technologies and innovation.	6.1.1 Conduct a PHFLW technology needs assessment.	Number of PHFLW technology and knowledge needs assessment conducted.	MOV: Needs assessment report	Coordinate needs assessment- develop tools and methodology	Conduct needs assessment	Participate in needs assessment	5	2	2	2	2
	6.1.2 Map out of existing PHFLWM technologies, and innovations and a develop a database.	Number of PHFLWM technologies and innovations mapped and included in inventory / database.	MOV: Database review reports	A) Coordinate mapping – data collection tools and parameters b) Develop database c) Establish data input mechanism – inter-government, multi-sectoral and multi-stakeholder	Conduct mapping exercise	Participate in mapping exercise	100	0	0	0	0

	6.1.3. Develop context specific PHFLW management technologies.	Number of context specific PHFLWM technologies developed.	MoV: Technologies development reports	Develop standards for PHFLWM technologies	Establish linkages between contexts/needs and technology developers	Utilize appropriate technologies	5	0	0	0	0
	6.1.4 Support/ establish technology development centers on PHFLW management.	Number of PHFLWM technologies development centers established.	MoV: Reports	a) Develop guidelines for establishment of the centers b) Coordinate the operationalization of the centers c) Mobilize resources for establishment of the centers	a) Establish technology development centers. b) Establish linkages between end users and technology development centers.	Utilize the technology development centers.	25	5	5	5	5
6.2 Support incubation and commercialization of PHFLW management technologies.	6.2.1 Enhance linkages between research/ academia and industry to facilitate partnerships for commercializing technologies and innovations.	Number of partnerships established for commercialization of technologies and innovation.	MoV: IPR agreements/ MoUs and reports	Develop guiding principles for linkages	Coordinate linkages	Establish linkages	3	3	3	3	3
	6.2.2 Assess factors influencing adoption of PHMFLWM technologies to foster technology uptake.	Number of assessments conducted.	MoV: Assessment report	Develop assessment methodology and parameters	Conduct assessment	Participate in assessments	3	3	3	3	3
	6.2.3 Support Market development (Product, Price, Place and Promote) for technologies to enhance uptake among users	Number of PHFLWM technologies sold.	MoV. Sales report	a) Coordinate market surveys to identify entry point. b) Promote private public partnerships c) Provide incentives for market development	Conduct market surveys	Regularly participate in surveys on awareness of market information	15	15	15	15	15
6.3. Establish a data and information management system for PHFLW.	6.3.1 Develop/ adopt/harmonize and pilot methodologies for collection of data on PHFLW.	Number of data collection methodologies develop/adopted/harmonized and piloted.	MoV: Data collection framework/ Methodologies.	Develop standardized protocols for FLW data collection.	Apply and sensitize partners on the standards methodologies for FLW studies	Apply and use methodologies	15	0	0	0	0
	6.3.2 Support training on PHFLW data collection	Number of enumerators with enhanced capacity on PHFLW data collection	MoV: Training reports	Develop training manuals	Conduct training	Participate and co-facilitate training	5	5	5	5	5
	6.3.3 Support/ facilitate collection of data and information on PHFLW for development and dissemination through information products.	Number data collection exercises conducted with results disseminated through information products	MoV: Data validation reports	a) Coordinate data collection b) Develop standards for information material	a) Coordinate data collection b) Develop information material b) Disseminate information material	a) Co-facilitate data collection through various programs and projects b) Utilize information packages/material	15	15	10	10	10
	6.3.4. Establish and coordinate a data repository for PHFLW initiatives and technologies.	Number of data repository for PHFLW initiatives and technologies established and coordinated.	MoV: Database/ repository review report	a) Develop guidelines for updating and maintaining the database	A) Input data into the repository b) Coordinate data sourcing	Share data	0	0	250	0	0

ANNEX 2: COUNTY PUBLIC PARTICIPATION FEEDBACK

WESTERN REGION			
Issues	**Feedback**		
	Sweet Potato	**ALVs**	**Fish**
Loss entry points	Production, farm level, storage, transport, market	Production, transport, storage, market	Catch/farm levelling, processing/landing site, transportation, market, household/consumption
Causes of the losses	Production: Pest and diseases (moles – vine and root damage); lack of GAP (minimal weeding-cost; injury while handling, variety); drought and hailstones. Farm levelling: Handling injury, farm levelling index and timing. Storage: Sorting, packaging-mode and material, limited storage facilities. Transport: Poor infrastructure, mode of transport, limited value addition facilities. Market: Handling, oversupply, and seasonality (competition from other products).	Production: Inadequate farm levelling techniques; poor farm level timing; poor handling – no shade or cooling technology/ packhouse; minimal sorting. Transport: Poor methods (mode and infrastructure). Storage: Limited capacity for use of correct material and skills. Market: Limited infrastructure; poor handling.	Poor storage facilities; poor processing methods; poor transport facility; poor road-network: high cost of production; inadequate processing; poor infrastructure; poor meal planning (food waste).
Main interventions	Resistant varieties; value addition; observe correct farm level index; establish infrastructure, tools and equipment for farm levelling.	Aggregation; capacity building and awareness creation; proper packaging and modes of transport; improve road network and infrastructure; appropriate storage; value addition and agro-processing; consumer training on preparation and preservation.	Capacity building and sensitization; invest in cold rooms at landing sites and aggregation centres.
Support required	Research and outreach, government, farmer groups and development partners coordination.	Extension, farmer organizations (groups and cooperatives), policies, laws and regulations on handling and transportation.	Formation of fish stakeholder forums, budgetary allocation for PHM&W management coordination.
Suggested interventions	Capacity building, specialized tools and equipment, storage facilities, market linkages and cooperatives, and support development of cottage industries.	Capacity building, preservation technologies	Subsidizing production cost – competitive prices against imports. Waste to energy utilization** Value addition of other fish products**.
Cross-cutting issues	Nutrition and gender roles across the value chain	Cultural influence on consumption partners, nutrition and promotion of commodity.	Environment sensitivity.

** Expert inclusion

RIFT REGON			
Issues	**Feedback**		
	Maize	**Milk**	**Irish Potato**
Loss entry points	Pre-farm level, farm level, transport, shelling, and storage.	Farm level(milking), transport, storage, market.	Farm level, transport, processing, market, consumer.
Causes of losses	Inappropriate seed variety; poor farm level methods and tools; pest and diseases; erratic weather changes; poor timing for farm level period; poor transport methods and infrastructure; poor storage facilities and shelling; exposure to rodents; poor drying technologies; poor bagging and lack of appropriate storage facilities	Wrong equipment and technique, leading to spillage; contamination (poor hygiene); adulteration (quality loss); limited value addition capacity (knowledge and technology), poor infrastructure (road, electricity, and storage).	Lack of knowledge on seed varieties, pest and diseases; poor timing and farm level techniques; low mechanization; poor packaging; poor transportation; limited storage; limited markets (access and facilities).
Interventions done	Sensitization and capacity building, research (seed variety); WRS and aggregation stores; promotion of new technologies(aflasafe); calibration of machines (shelling).	Milking machines, capacity building on milk handling, milk testing to curb adulteration.	Capacity building on chemical use and GAP.

Support required	University and academia research and linkage to utilization; construction of warehouses/cereal stores (decentralized **).	Policy – domestication for implementation.	Government investment in the value chain – partnerships to support GAP.
Suggested interventions	Extension services, access to metallic silos, proper use of hermetic bags**.	Infrastructure development, cooling facilities, agro-processing**.	Standardized packaging; market cooling systems; local fabricated peeling equipment (processing); KEPHIS linkage and awareness on seed certification; regulate chemical use; extension; fund research and link it to final user; market regulation; storage facilities; promote value addition.
Cross-cutting issues	Gender and social inclusion		

CENTRAL REGION			
Issues	**Feedback**		
	Avocado	**Milk**	**Tomato**
Loss entry points	Production, farm level, storage, packaging, transport.	Farm level, storage, transport.	Farm level, storage, transport.
Causes of losses	Pest and diseases, handling injury, farm level timing, poor packaging and transport means, handling**, *theft*, limited packaging facilities, poor market systems.	Unhygienic handling; limited access to technology and tools for mechanization and for storage and transport (cooling, metal containers); inadequate processing.	Seed quality, price fluctuations, poor handling, limited storage facilities, *theft*, poor packaging material, glut, over-stocking (traders).
Interventions done	Pest and diseases control, capacity building on IPM technology, regulation of farm level schedules, training on GAP.	Training on handling, milk coolers, milk processing (private & government), milk tankers – transport systems.	Provision of certified seed and appropriate variety; storage, capacity and awareness on chemical use; training on value addition; linkages to cold storage; preservation-drying; value addition (jam, sauce).
Support required	Research and farmer training; market and post-farm level regulation (HCD, KEPHIS, PCPB),	Collaboration for coordinated interventions; strengthen V.C development; support and linkage from relevant institutions (KALRO, Dairy Board).	
Suggested interventions	County multi-purpose value addition centres; cold chain management; market access (knowledge, regulation, ability [scale] – export) **; value addition** (oil), fire briquettes**.	Aggregation.	Training on alternative uses (utilization of value added products); alternative use of waste – BSF, animal feed, fertilizer, value addition (increase scale and awareness/training); establish cottage industries, designated food transport material/means, food waste recycling plant.
Cross-cutting issues	Organizational mandated PHL management, guidelines, seasonality.	Infrastructure; road networks; policy sensitization and awareness; linkages – multi-sectoral and partnerships; licensing and streamlining milk industry; testing- labs.	Infrastructure, youth inclusion and incentives through value addition.

EASTERN AND NORTH-EASTERN REGION			
Issues	**Feedback**		
	Meat/Milk- Goat and Cattle	**Tomato**	**Green grams**
Loss entry points	Farm level.	Farm level.	Farm level, storage and marketing.
Causes of losses	Disease, drought, theft, poor market linkages, limited capacity to utilize facilities**, cultural barriers, low quality feeds**, limited/inappropriate transport methods + market distance, poor slaughter technique.	Pest and disease, handling injury, limited value addition, poor packaging material, high temperature.	Pest and labourer/handling, limited technology (knowledge and equipment).
Interventions done	Vaccination, pasture establishment –production and storage (feed management), destocking.	Research on resistant variety.	Mechanized threshing and polishing –KCEP-CRAL; value addition, aggregation (farmer organization).

Support required	Operationalization of milk value addition plants.	Formation of common market interest groups, joint planning and implementation, coordination networks, collective CIDP participation.	
Suggested interventions	Adaptive livestock breeds, processing facilities, value addition (non-traditional products** + consumer awareness), research on breeds/ing, infrastructure development, disease** (proper medication), milk handling technique and technologies.	Capacity building – skills and facilities for value addition and agro-processing; more research on resistance; proper use of chemicals**; improve packaging, (cooling/storage facility/agro-processing).	
Cross-cutting issues	Power dynamics (especially market), limited extension; political interference with location of facilities; gender; youth engagement; cultural biases and barriers (land ownership); insecurity; floods.	Mechanization and technology.	Climate change.

	COASTAL REGION			
Issues		**Feedback**		
	Fish	**Watermelon**	**Mango**	**Green gram**
Loss entry points	Farm level, storage, market, consumption.	Farm level, transport, market.	Farm level, transport, market, processing.	Farm level, storage.
Causes of losses	Limited preservation technique, technology and facilities; limited knowledge on value addition.	Weak market linkage, poor farm level methods, poor road network, mismatch of market demand and supply (glut), erratic weather patterns, limited storage facilities.	Handling damage, poor technique (shaking to farm level); pest and disease; poor grading and sorting; limited storage facilities; limited processing skills; erratic weather.	delayed farm levelling, threshing method, storage preparation/equipment, household wastage.
Interventions done	Aggregation/group to access finance; training on value addition and packaging; cooling facilities.	Aggregation-farmer cooperative; value addition**.	Capacity building on orchard management, farm levelling techniques, market linkages, packing skills, value addition, aggregation.	GAP; capacity building on farm levelling-timing, moisture content, threshing technique (polishing and grading); storage material (hermetic bags); aggregation-for market access.
Support required	Sensitization and capacity building on policies and regulatory standards; multi-sectoral coordination.	Financing**.	Infrastructure, internet based services – enhance market access.	CASSCOM and CSG coordination.
Suggested interventions	Government investment support V.C development; Awareness creation – consumption and nutrition.	Market led production.	Capacity building – skills and tools for processing; local processing facility; cold storage facilities; modern agro-marketing**.	Access to right material – tarpaulin, dehullers, destoners, hermetic bags; reduce exposure visibility; improve road infrastructure, market information system, technology development and dissemination.
Cross-cutting issues	Awareness creation.	Market power dynamics.	Map opportunities for youth and women.	Nutrition and economic balance, consumption patterns – awareness creation.

**. Markets with proper facility – waste segregation, cold room.

ANNEX 3: PROPOSED ACTIONS AS PER THE VALUE CHAIN NODES AND ACTORS

Different actors:

Actor	Action
Farmer	**Market-led production:** This is when the farmers produce food based on the demand (variety of produce and quantity). This method will ensure that what the farmer produces has market demand. This is to avoid instances where a farmer produces food and it goes to waste because the market is unable to absorb it. Information on what the market wants and how much of it, plus the customers' tastes and preferences, is important. **Planning and timing**: Through this, the farmer is able to work backwards and ensure the produce enters the market at optimal time. Working backwards means the farmer identifies what time is best, i.e, when the supply is low (competition) and prices are optimum to make better returns and sell off the produce efficiently. **Diversification of crop:** This acts as a buffer in case one crop is affected. The other crop can ensure an inflow stream of income. **Technology:** This is applicable in production practices that improve efficiency. Mechanization can also improve efficiency (quality and reduced losses) and reduce labour costs. **Good agricultural practices:** This contributes to high yields through better management of the crop. This will help reduce losses that are a result of poor farm management. Good agricultural practices include regular watering and proper fertilizer application, and ensuring the crop matures properly and on time – a factor that will optimise the shelf-life of the produce downstream. **Capacity building:** This is to increase awareness about food loss and waste, and good postharvest management practices to reduce losses/waste. This can be achieved by training farmers how to best handle the produce from harvest time right up to when they sell the produce. **Climate smart agriculture:** Due to the effects of climate change on agriculture, that in most cases if not checked lead to immense losses, e.g through flood or drought, it is necessary to ensure the farmers are trained how to ensure good harvest. Important considerations include water preservation, drying (using solar methods), proper harvest timing to minimize damage, and appropriate storage. **Crop insurance:** This acts as a buffer to crop failure, where the farmer will get an income in case the crop fails due to natural calamities. **Record keeping:** This is for planning purposes, to identify the areas with high leaks, and to also accurately calculate how the business is doing. This helps in establishing which areas to improve on. **Aggregation:** This increases the bargaining power and cuts down costs through economies of scale. To invest in expensive equipment and sell produce in bulk, farmers can aggregate their efforts to improve on business efficiency. Produce loss at the farm level can be offset by investment in storage facilities and transporting a substantial amount.
Casuals	**Training on handling:** How the produce is handled affects its quality. More often than not, agricultural produce is delicate. Therefore, mishandling leads to damages that reduce the quality and may lead to rotting. This is also an issue of food safety. Throwing the food around carelessly may lead to contamination. **Attitude towards food and business:** Farm workers need to handle produce better and not just do the job for money. It is important that they are made to develop concern for the produce as a source of income for the farmer. The farmers could point out and supervise how the produce is harvested, packaged, offloaded, loaded and other handling activities to ensure all is handled with care.

Actor	Action
Middlemen/ Contractors	**Ethics:** The process of business engagement between the farmer and the broker/contractor should follow a set framework of operation, such as the one outlined by the horticultural crops directorate. Advocacy for farmers can be done through county government representatives to ensure they are not taken advantage of and to reduced instances of fraud. Contract farming is a concept that all key players should be taught so that each plays their roles in a guided framework. Contract farming has brought about positive change in linking farmers to markets. There is still some room for improvement to ensure it is run smoothly. This can contribute to minimization of product rejection by pack-houses and contracted buyers.
Transporters	**Technical innovations**: To ensure produce quality at the collection point is the same on arrival, investment in machinery and technologies that will facilitate the process and keep the produce fresh is needed. Apps can be used to communicate collection times and monitor produce movement. Cold chains can be developed, such as refrigerated trucks, to keep the produce fresh. **Handling and food safety:** Produce placement and cleanliness of the vessel contributes to its safety and minimizes damage. **Packaging material:** Different products require different packing materials, e.g, sacks for potatoes and crates for tomatoes, depending on perishability of produce and duration of travel. The appropriate material/carrier will help reduce damage that may lead to spoilage of the produce.
Government	**Policy:** Policies facilitate operations by providing overall guidelines to be followed by all players in the food value chain. Policies on food loss and waste could enhance inter-county trade, whereby excess produce can be bought off by counties with deficits. Policies can also be used to influence taxes and subsidies and lower production cost to improve competitiveness within the region. Also important is effective regulation of value chains processes and actors. **Market access:** The government supports creation of markets and facilitation of activities that link farmers to the market, e.g, through roads, electricity and other support sectors. The government regulates markets and lobbies for external markets. The government also has bodies that govern the export industry, and can influence how much farmers are able to export. **Investment in infrastructure:** Market infrastructure and road networks facilitate the promotion of a good environment for the value chains to operate at optimum levels. A good road to the farm that improves access for the farmer to the market or contractor/transporter/broker to the farm can make the difference between food losses or not. Aspects of market structure such as drainage and shade also affect the shelf life of produce. **Extension services:** This is required to train farmers and ensure knowledge and information on increasing production and better management of food as a resource is passed on through services of extension officers. Extension services will create more awareness and give tips on how to reduce loss and waste, e.g, how to store produce to reduce storage waste and losses. **Research**: This will provide insights into areas that need improvement and identify methods of improving them for greater efficiency along the food value chain; not just food loss and waste, but all matters affecting the food value chain.
Extension/ trainers	**Trainers of trainers model:** This is where trainers are trained before they train the farmers. In this forum (where the trainers are trained), they are equipped with the skills and material required to train farmers. **Standardization of training tools, material and content:** This is to ensure the farmer is not confused. It is to ensure the farmer does not use different methods that contradict each and end up lowering productivity. Such topics include and are not limited to pesticides, CSA, GAP, handling, which packaging material to use, good postharvest management, among others. **Private extension services:** Collaboration with the private sector will increase the number of trainers to motivate farmers and encourage good agricultural practices.

Actor	Action
Private sector	**Market access:** This concerns investment by private investors trading in the agricultural sector by being the market themselves, or being an intermediate market for urban retailers. **Finance:** This is through funding loans and grants that provide alternative resources to farmers. **Value addition:** Many investors buy raw produce and add value through processing and making it easier for consumers to use the produce. Value addition has largely been taken up by businesses which are not necessarily farming entities, but contribute greatly to the agricultural sector through manufacturing and trade and other strategic sectors, by using agro-produce to do business. Others work to improve the efficacy of the food value chain, e.g, through logistics and ICT to improve the flow of information along the chain.

Different stages of the food value chain:s

Stage of the value chain	Action
Harvest	**Mechanization:** Some traditional methods like hand-picking can be mechanized to reduce damage and loss, and improve efficiency. Mechanization can also be improvised. For example, while harvesting produce, instead of using bare hands, farmers could use proper tools, e.g, buckets for cereals/fruits/vegetable etc, reducing the amount of produce that fall to the ground. **Timing:** The time produce is harvested affects its perishability. This is because of factors such as ripening, moisture content, and maturity levels. An example is (POD PRODUCE like beans). Once ready, the pods dry up and burst open, allowing the seeds to fall off. The longer it takes to harvest once it's ready, the higher the loss levels. **Resources:** A limitation to harvesting is when resources are scarce, particularly labour. **Skills:** How to harvest, when to harvest, what tools to use and how to use them are all factors that are important in guiding farmers to maximize harvest efficiency.
Drying and threshing	Techniques on how to dry produce using appropriate equipment should be promoted. The time to harvest directly affects the drying process. This is because the produce moisture content varies with its maturity. Methods and equipment: The methods used – traditional versus non-traditional – and equipment, could result in increased or reduced food loss. For example, drying and threshing directly on the ground results in spillage and contamination, as opposed to drying on a raised covered surface, or using mobile dryers that ensures minimal spillage. Equipment such as moisture meters can be used to ensure produce has been dried properly before storage or packaging. To access large scale-drying facilities, farmers can aggregate their produce.
Sorting	Farmers need sensitization on the importance of sorting. Sorting involves grading according to the market standards as well as the varieties, as this affects the prices. Information on these market standards is needed by the farmers to guide them through the sorting process. Sorting equipment can be used to minimize handling damages and spillage. Grading policies can be developed to reduce rejects as well as standardize grades. This is to ensure all produce harvested, if suitable for human consumption, is consumed. Produce such as tomatoes, which are graded by size, tend to have many rejects for the small ones. These can be used for juicing and making paste.
Packaging	Good packaging skills are needed to minimize damage. Different products require different packaging materials. Therefore, farmers need to be informed on what material to use for the produce, such as crates for fruits instead of sacks. The right packaging material is sometimes too costly for the farmer, hence they use more affordable alternatives. Subsidies can be given for some materials, especially when the production is really high. Such materials can be made to last long, so that farmers use them across multiple seasons. Hermetic bags and crates are good examples.

Stage of the value chain	Action
Storage	Storage facilities should have set standards of construction and maintenance. The hygiene – cleaning of the facility and aeration – are matters to be taken seriously, to minimize contamination. In cases of airtight storage, the facility should be sterilized prior to loading, and the product inspected and treated appropriately before it is put in storage. Preservation techniques should be emphasized. Moisture content, pesticides application and all pre-storage preparations must be done properly to ensure the produce quality is maintained. Proper storage also promotes food safety.
Transport	Improved road networks will enhance access to markets by farmers and traders. Shorter transport times will reduce losses and waste which would be incurred due to overheating during transit. Cold storage technology is applicable, especially for perishables. This prolongs shelf life, and slows down ripening and spoilage while produce is in transit. Handling produce while loading, offloading, and during transit directly affects produce. Handling produce carelessly results in damage or spoilage, and rejection or rotting, when the product arrives. Casual workers should be sensitized on the value of produce they handle. The market vendors and farmers should also be sensitized on the implication of how they handle produce and be encouraged to supervise these activities when outsourced. To reduce the cost of transport and to attract buyers, farmers can aggregate the produce to benefit from economies of scale. Communication and information along the food value chain is very critical for logistical arrangement. What is needed, where, and in what quantity, determine the route transporters take to the different markets, and directly affects the farmers.
Market	Farmers should practise market-led production. That is, produce once the market is determined, to ensure when harvested, the produce will be bought. This can be done through market survey and even contract farming (in which case the contractor is the market). Information on produce prices, market locations, opportunities, taste and preferences, can be put into a database and shared with farmers to guide their production decisions. Infrastructure of the market, the drainage, the shade, and storage for perishables, all contribute to functioning of the market and the durability of produce around food safety. With poor drainage, markets flood and contaminate produce. With no shade, produce is exposed to extreme weather elements, which in most cases shorten the shelf life. Cooperative for farmers to sell their produce: This is especially so for private investors who buy produce to process further. Forming a cooperative will increase the bargaining power for the farmers. It will also make economic sense for private investors to collect produce from a central collection point. Policy on export along with training on produce quality for farmers (in line with market data – local and international) will enhance the export of produce by local producers. The lack of information and the knowledge on the international standards is a huge barrier to entry for local farmers to the international market.

For more information,contact:

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KENYA POSTHARVEST MANAGEMENT STRATEGY FOR FOOD LOSS AND WASTE REDUCTION