REPUBLIC OF KENYA

MINISTRY OF AGRICULTURE,
LIVESTOCK AND FISHERIES

NATIONAL ROOT AND TUBER CROPS DEVELOPMENT STRATEGY 2019-2022

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Foreword

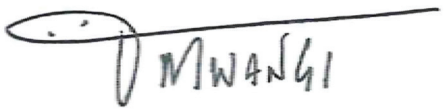
Agricultural growth and development is crucial for Kenya's overall economic and social development. Agriculture directly contributes 24% to the Gross Domestic Product (GDP), about 75% of industrial raw materials and 60% of the export earnings. The Government has outlined in the Kenya Vision 2030, the key role the agriculture sector will play under the economic pillar. The Agricultural Sector Transformation and Growth Strategy has nine flagship pillars aimed at ensuring that the aspirations of Vision 2030 are realized.

The strategies in these two documents aim at accelerating the growth of agriculture sector in order to improve the standard of living of Kenyans by substantially reducing the number of people affected by hunger, famine and starvation. A thriving agriculture sector will lead to increased production, incomes and employment opportunities.

In Kenya, root and tuber crops are important food crops that have gained increased importance due to their role in food security, ability to withstand drought as well as their potential for commercial processing. Currently, the country produces 3.68M MT of Irish potatoes, sweet potatoes, cassava, cocoyams and yams. This is way below the country's potential. For instance, the average yield for Irish potatoes stands at 7MT per ha compared to the potential of 25MT achieved under optimal husbandry practices. Some of the key challenges facing the subsector include: weak and dysfunctional stakeholder institutions, inadequate information, underdeveloped markets, inadequate quality planting materials, low processing levels, low access to financial services, insufficient applied research and technology development.

Past efforts towards development of the root and tuber crops in Kenya have generally focused on development of high yielding varieties that are tolerant to pests and diseases. Other interventions have been made to address availability of planting materials, preservation, processing and improved marketing. However, these attempts have not solved the constraints facing the sub sector.

This strategy has been developed to provide a clear roadmap for sustainable growth and development of the root and tuber crops subsector. Once implemented, it will ensure well functioning producer institutions and markets, availability of quality planting materials, economic volumes and opportunities for processing, employment creation and increased incomes. Implementation of this strategy will take an integrated approach where all stakeholders will be involved in a coordinated manner to achieve the desired results.



Hon. Mwangi Kiunjuri, EGH, MGH
Cabinet Secretary
Ministry of Agriculture, Livestock and Fisheries

Preface

Kenya continues to face periodic food and feed shortages arising from unfavorable weather conditions, poor husbandry practices and lack of adequate quality planting materials. Other factors include weak farmer's institutions and linkages across value chains, overreliance on a limited range of farm enterprises, insufficient information among stakeholders. Smallholder farmers also have limited access to business development services, financial services and appropriate technology packages.

Roots and tubers crops are the second most important food crops after cereals that have the potential to contribute significantly to the food security needs of the Kenyan people. This potential, however, has not been fully exploited. Consequently, this strategy outlines the Government's roadmap on the development of a vibrant root and tuber crops sub sector. The objectives of the strategy are directed towards organizing stakeholders for coordinated access to agribusiness support services, creating forums for partners institutions for continuous collaboration, establishment of efficient data collection and information exchange, development of market supply chain infrastructure for improved marketing of root and tuber crops, continuous development, packaging and dissemination of appropriate technical information and technologies, establishment of an efficient seed system and inputs supply, enhancement of demand driven research and technology development and access to financial services for increased production, productivity and resilience roots and tuber crops production systems. The strategy also aims at ensuring development and enforcement of produce and product standards; promotion processing for improved nutrition, utilization and farm incomes and promoting sustainable roots and tuber crops in a changing climate.

I wish to thank the members of the secretariat and peer reviewers of this document. My appreciation also goes to institutions which provided valuable inputs such as UoN, KEPHIS, KALRO, KIRDI, KIBT, TUK, FCI, KEBS, Cassava Options, County Representatives and Farming Systems. I wish to acknowledge the financial support for the preparation of this strategy received from the European Union through Self Help Africa.

Lastly I wish to affirm my commitment to mobilize adequate human and financial resources to implement this strategy.

Prof. Hamadi Boga
Principal Secretary
State Department for Crop Development and Agricultural Research

Acknowledgement

This strategy has been developed through the contribution and efforts made by all the members of the technical team. Further appreciation also goes to institutions which provided valuable inputs such as UoN, KEPHIS, KALRO, KIRDI, KIBT, TUK, FCI, KEBS, County Representatives and Farming Systems.

Special thanks goes to the Agriculture Sector Support Project for availing resources through the Intergovernmental secretariat.

I also wish to acknowledge the contributions made by all the members of the technical team involved in preparation of this strategy. Special thanks go to the European Union through Self Help Africa for availing resources for completion of this strategy.

Juma Mohamed,
Head
Root and Tuber Crops

Executive Summary

The Agricultural sector is the backbone of the Kenyan economy, directly contributing 24% of GDP and 60% of export earnings. The Strategy is formulated within the context of the current national policies encompassing Kenya Vision 2030, The AFA Act 2013, the Kenya Youth Agribusiness strategy, The Gender Mainstreaming Strategy, the National Seed Policy, the National Food and Nutrition Security Policy and the Potato Strategy 2016-2020. The National Root and Tuber Crops Strategy is the Ministry of Agriculture, Livestock and Fisheries roadmap to revitalize this important sub-sector. The major root and tuber crops grown in Kenya include: Irish potatoes, cassava, sweet potatoes, cocoyams and yams. They are the second most important food crops after cereals and their production in the year 2018 was estimated at 3,684,000 MT with a value of 65.92B KES compared to 2,419,000 tons valued at KES 28.6 billion in 2015.

Kenya has the potential to introduce and exploit a wide array of other root and tuber crops that are widely grown in Asia and South Americas such as African yam-bean, Tuber cowpea, and Peruvian carrot, among others. These crops, if developed and produced in Kenya would enhance food diversification and food security by tapping their unexploited potential.

Root and tuber crops are an important source of food and feed and play an important role in ensuring food security. They are grown across a wide range of Agro-ecological zones including ASALs have high level of tolerance to drought and heat and are adapted to a wide range of uses as human food, animal feed and serve as raw materials for industry. With climatic change as an emerging phenomenon and its consequences, root and tuber crops offer choices and opportunities as they exhibit higher tolerance thresholds to a variety of stresses such as water and heat stress, water salinity and the emergence of new pests.

The opportunities for the root and tuber crops industry are numerous with high nutritional values, filling in the niche for providing alternative source of carbohydrates and other nutrients to cereals. Alternative use exists in animal feeds industry and as bio energy sources Mechanization technologies are available across the value chain which are being applied by a large number of small scale processors. Large tracks of land is readily available in ASALs for exploitation in production of appropriate root and tuber crops, while their use as rotational crops with cereals can expand production.

The challenges facing the root and tuber crops sub-sector are numerous and include weak stakeholder institutions and linkages between players in the subsector, low and declining productivity, high losses due to pests and diseases, lack of adequate quantities of clean and healthy seeds and planting materials, idle and inefficient land use, inadequate use of farm inputs and modern technology, low access to financial services, poor post-harvest management practices, low levels of processing and marketing inefficiencies. Declining productivity of these crops in some areas has also been caused by adverse weather conditions, poor soil fertility, use of low yielding varieties, low levels of mechanization and poor crop husbandry practices.

This strategy outlines interventions that will address the challenges facing the industry and help create sustainable linkages among collaborating institutions. In its initial two years of

implementation, emphasis will be put on creation of credible stakeholder based institutions with inbuilt sustainability mechanisms at ward, sub county, county and National level. These institutions will be capacity built to implement an efficient seed production and distribution system. The seed system will include improved varieties of roots and tuber crops that have recently been developed by KALRO in collaboration with regional and international research organizations. The improved varieties are drought resistant, high yielding, early maturing, tolerant to various diseases, have improved nutritional content and are highly adapted to the local conditions. The proposed seed system will include development, multiplication, certification and distribution of clean, quality planting materials of the improved varieties.

Transforming roots and tuber crops into a commercially viable enterprise requires organization of production and marketing activities into an all-inclusive participation of all value chain actors. The strategy has identified this as a priority in order to promote private sector participation and investment into the sector to increase production to meet the high and increasing demand in both rural and urban area settings.

Information and services demanded by key value chain players, such as processors and large scale formal marketing enterprises, departmental stores/supermarkets has been lacking altogether. As a result there have been negative perceptions of these crops. The strategy has identified interventions that will develop communication channels with the producers, government institutions and all the other stakeholders to reverse negative consumer perception of root and tuber crops as poor man's diet as well as the low priority given by farmers towards their production.

The implementation of well-structured programmes is expected to yield successful and sustainable strong linkages amongst stakeholder and partnerships across the whole value chain. This will be backed by an efficient management information system that will strengthen an effective and efficient market analysis and response system, closely connected to the systems for development and distribution of appropriate quality seed and planting material and post-farm processing technologies and skills.

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Acronyms and Abbreviations

ADC	Agricultural Development Corporation
AG	Attorney General
ASALs	Arid and Semi-Arid Lands
ASARECA	Association for Strengthening Agricultural Research in East and Central Africa
ASCU	Agricultural Sector Co-ordination Unit
ASDS	Agriculture Sector Development Strategy
ASDSP	Agriculture Sector Development Support Project
ATCs	Agricultural Training Centres
ATDC	Agricultural Technology Development Centres
CDF	Constituency Development Fund
CIP	International Potato Centre
DPM	Directorate of Personnel Management
EPC	Export Promotion Council
FCI	Farm Concern International
FPEAK	Fresh Produce Exporters Association of Kenya
GDP	Gross Domestic Product
GiZ	German Development Cooperation
IITA	International Institute of Tropical Agriculture
IPC	Investment Promotion Council
JKUAT	Jomo Kenyatta University of Agriculture and Technology
HCDA	Horticultural Development Authority
KACE	Kenya Agricultural Commodity Exchange

KALRO	Kenya Agriculture and Livestock Research Institute
KEBS	Kenya Bureau of Standards
KENFAP	Kenya National Federation of Agricultural Producers
KEPHIS	Kenya Plant Health Inspectorate Service
KEPSA	Kenya Private Sector Alliance
KFA	Kenya Farmers Association
KIRDI	Kenya Industrial Research and Development Institute
KRA	Kenya Revenue Authority
MDAs	Ministries, Departments and Authorities
MDG	Millennium Development Goal
MENR	Ministry of Environment and Natural Resources
MFIs'	Microfinance Institutions
MOALF	Ministry of Agriculture, Livestock and Fisheries
MoEP	Ministry of Energy and Petroleum
MOH	Ministry of Health
MoSCA	Ministry of Sports, Culture and the Arts
NT	The National Treasury
MoICT	Ministry of Information, Communication and Technology
MoIED	Ministry of Industrialization and Enterprise Development
MLHUD	Ministry of Land, Housing and Urban Development
MoDP	Ministry of Devolution and Planning
MoPW	Ministry of Public Works
MEACT	Ministry of East Africa Affairs, Commerce and Tourism

MoTI	Ministry of Transport and Infrastructure
MoE	Ministry of Education
MoEWNR	Ministry of Environment, and Natural Resource
MoWI	Ministry of Water and Irrigation
NFSNP	National Food Security and Nutrition Strategy
NGOs	Non-Governmental Organizations
KENOPOFA	Kenya National Potato Farmers Association
KIRDI	Kenya Industrial Research Development Institute
NCPB	National Cereals and Produce Board
NPRC	National Potato Research Centre
PAAP	Strategy Analysis and Advocacy Programme
FAO-UN	Food and Agriculture Organization of the United Nations
WFP	World Food Program
USAID	United States Agency for International Development
ADRA	Inter Diocesan Christian Community Development Services
KENAFF	Kenya National Farmers Federation
AAK	Agro Chemical Association of Kenya
EPC	Export Promotion Council
AON Minet	Insurance Company
APA	Insurance Company
CIC	Insurance Company
ICEA	Insurance Company
UAP	Insurance Company

1.0 INTRODUCTION

1.1 Agriculture and the Kenyan Economy

The agricultural sector is the backbone of the national economy; contributing directly 25% of Gross Domestic Product (GDP), 60% of export earnings and 75% of the country's industrial raw materials. Moreover, through links with manufacturing, distribution and service-related sectors, agriculture indirectly contributes a further 27% of the country's GDP. Indeed, the GDP growth originating from agriculture is at least twice as effective in reducing poverty as non-agricultural GDP. With this strong positive correlation between agriculture sector growth and national economic growth, agricultural growth and development is critical to the overall economic and social development of the country and is expected to drive the economy to the Kenya Vision 2030 projected 10 % annual economic growth over the next two decades.

In addition to being a key driver of national development, agriculture is a means of achieving equity and improving the welfare of a majority of the Kenyan population. The sector employs 80% of Kenya's rural workforce and provides more than 18% of formal employment. Furthermore, even for the urban poor, a majority of them derive their living from agriculture-related activities.

The agriculture sector is relied on to ensure Kenya attains and sustains a food secure status as outlined in the National Food Security and Nutrition Policy (NFSNP). In the Second Medium Term Plan (2013-2017) of the Kenya Vision 2030, transformation of the economy is pegged on, among others, diversification and commercialization of agriculture, food security, a higher contribution of manufacturing to GDP and wider access to African and global markets. This is further accentuated in the Agriculture Sector Transformation and Growth Strategy (ASTGS 2018-2028). The National Root and Tuber Crops Strategy is formulated within the context of these national strategies and policies.

1.2 The Contribution of Root and Tuber Crops

Root and tuber crops are currently the second most important food crop category in Kenya after cereals. The main root and tuber crops produced in Kenya are Irish potatoes, sweet potatoes, cassava, yams and cocoyam's.

Most of the root and tuber crops are very high in nutrients. For example, Sweet potatoes and Irish potatoes are very high in potassium and other minerals, and in addition the orange fleshed sweet potato is high in beta carotene, a precursor of vitamin A. Thus, they have the potential of solving the malnutrition problems that are rampant in most rural households. Vitamin A deficiency for instance causes eye problems and stunting for many children from poor families. Young sweet potato leaves are consumed as vegetables and also as young animal feed and are very rich in minerals and vitamins. Besides general home use, root and tuber crops can

Irish potato pots in protected environment

be processed into a variety of products whose demand has been rapidly increasing due to rapid growth of fast food restaurants and snack bars in both rural and urban areas.

Root and tuber crops are a source of income for many poor households. Sweet potatoes and cassava particularly can grow under harsh climatic conditions and provide cash incomes to households that would not have had anything else to sale. They are also very good in fighting hunger because they are able to stay in the soil during adverse conditions when other crops especially cereals cannot survive. Increased production and processing of root and tuber crops will provide employment to thousands of Kenyans, improve food security and avail raw material for agro processing factories.

1.3 Background Information of Root and Tuber Crops in Kenya

The major root and tuber crops[1] grown principally for human consumption in Kenya are grown across a wide range of Agro-ecological zones (AEZs). Most of these crops are not native to Kenya but were introduced from other continents. Majority of root and tuber crops are consumed fresh. In addition, there are various processed products on the market. These include dried chips, pellets, flour, starch, Ugali, bread, juice, cookies, biscuits, chinchin, pastries, akara, crisps, soaps and composite flours. Irish potato has been heavily commercialized compared to other roots and tuber crops. The history and level of development of the various roots and tuber crops in Kenya is as described below.

Cassava nursery

1.3.1 Irish Potato

The Irish potato (Solanum tuberosum) originated from the high plains of the Andes Cordillera where the Incas cultivated the plant largely for food. It was imported from Europe to Africa by missionaries and thereafter by colonial administrators in the 19th Century.

The European settler farmers introduced the crop in Kenya initially in Kiambu, Murang'a and Nyeri districts in the late 19th Century primarily for domestic consumption and later, for export. Indigenous Kenyan farmers started potato cultivation in 1920 and entered the export market in 1923. New potato varieties and seed potato production were introduced at the National Agricultural Laboratories, Kabete in 1903 and at Plant Breeding Station, Njoro in 1927. The main variety grown during that time was Kerr's Pink.


Sweet potato nursery

[1]According to FAO definition root and tuber crops are the plants yielding starchy roots, tubers, rhizomes, corms and stems. They are used mainly for human food (as such or in processed form), for animal feed and for manufacturing starch, alcohol and fermented beverages including beer.

Processing of potatoes began with the establishment of vegetable dehydration plants in Kerugoya and Karatina to meet the needs of the British armies in Northern Africa and Asia. In order to meet the increased demand for processed products, higher yielding and disease resistant varieties were imported and new cultivation areas in Meru and Molo opened up.

In 1963, the Government undertook to promote potato production in the country by introducing new varieties from Germany and through the establishment of a potato development programme in 1967, streamlined production of certified seeds and disease resistant cultivars. In 1979 the Government through the Agricultural Development Corporation (ADC) in collaboration with Kenya Farmers Association (KFA) initiated a commercially oriented Seed Potato Production Programme to produce and distribute seed potatoes. The increased seed production in the 1980's led to the setting up of a cold storage complex in 1985 in Molo with a capacity of 2,250 tonnes. The ADC and KALRO (now KALRO) played a central role in the production of seed potato. However, after the 1990's, production of seed became a challenge mainly due to subdivision of ADC and KALRO farms and their re-allocation to private individual entities.

1.3.2 Cassava

Cassava (*Manihot esculentum*) comprises numerous species, with the centre of origin being South America. It was introduced to Africa by Portuguese navigators at the end of the 16th century, spreading rapidly into West Africa, Central Africa and the countries bordering the Gulf of Guinea, from where it penetrated inland via the basin of River Congo into Eastern Africa. By the end of 19th Century, it was well adopted and adapted in Kenya as an important traditional food crop growing in many areas and across various agro-ecological zones of the country.

Cassava is a crop of the lowland tropics and does best in a warm, moist climate with mean temperature ranges from 25 to 29°C. Cassava does well with rainfall of between 1000-1500 mm per year; but is well adapted to cultivation under conditions of drought and can profitably be grown in areas where the annual rainfall is as low as 500mm. The crop has low labour requirement. It produces higher amounts of calories per hectare than most tropical food crops. Among the non-cereal crops, cassava comes second to Irish potato as an important source of food, and is ranking fifth after wheat, rice, maize and potatoes in the world.

Cassava is used to make gluten-free flour, animal feed, confectionary products, and a substitute of sucrose in beverages. It is also used in the laundry industry for starching of garments before ironing to give a better look. Cassava is rich in gluten-free carbohydrates, which helps to prevent gluten intolerance and food allergies. Cassava is helpful in reducing cholesterol level owing to the high amount of fiber content. It is a rich source of calcium, manganese, and iron, which is beneficial for pregnant women. Cassava is neutral in taste, and it encourages overeating by providing feeling of fullness.

1.3.3 Sweet Potato

Sweet potato (*Ipomea batatas*) originated from Latin America. It was introduced into many parts of Africa by Portuguese navigators in the 16th Century. It is an important root crop cultivated throughout tropics where there is sufficient moisture to support its growth.

Sweet potatoes can be grown in a wide range of agro ecological zones including low rainfall areas and has low input demand. It is a drought tolerant crop and serves as a food security crop with a high nutritive value. For instance, the orange fleshed varieties (SPK 004, kabode and vitaa) can provide sufficient daily requirements of Vitamin A. They can also be processed into juice, puree or composite flours that can be used in making baked products and weaning foods. The leaves are used as a vegetable and the vines as animal fodder. Due to contemporary health concerns by consumers and the subsequent improvement of its food value in some varieties, its utilization as a snack and for breakfast is on the increase especially in urban areas.

1.3.4 Cocoyams (Arrow roots)

Cocoyams (*Colocasia esculentum* and *Xanthosoma sagittifolium*) popularly known as 'Nduma' originated in South East Asia and the Pacific islands, with the Indian subcontinent and Indonesia also being considered as the primary centres of origin of some varieties. In East Africa however, cocoyams are referred to as arrowroots.

There are more than 200 cultivars of cocoyams worldwide, selected for their edible corms or cormels, or their ornamental foliage. These cultivars fall into two main groups: wetland and upland cocoyams. In Kenya, two species of cocoyams are commonly grown for food: Colocasia esculenta a wetland type commonly referred to as cocoyam, taro, dasheen in which the main corm provide a source of food; and Xanthosamas agittifolium an upland type commonly referred to as tannia, new cocoyam or mbiira which produce numerous corms that are used much like potatoes for cooking and in processing. These local varieties are either purple speckled or white fleshed. Their corms, cormels, stalks, leaves and inflorescence are consumed by humans. In East Africa, cocoyams have traditionally been steamed and eaten as a snack alongside beverages.

Cocoyam is generally cooked by baking or boiling. The starch contained in the large corms is highly digestible (98.8 percent) therefore making it a good source of carbohydrate and to a lesser degree a source of potassium and protein. Corms are used in the production of chips, dehydrated stable commodities, starch, flour, and in non-food application of starch in the manufacture of biodegradable plastics. Cocoyam leaves are rich in proteins, minerals and vitamins A, B, and C and can be cooked and used for human consumption as a very nutritious vegetable, while the root is rich in carbohydrates and minerals. Cocoyam leaf blades and petioles have been used as animal feed.

Cocoyams are good for people allergic to milk or cereals and can be consumed by children who are sensitive to milk (Rothand *et.al.,* 1967). Therefore cocoyam flour and other products have been used for infant formulae in the United States and have formed an important constituent of proprietary canned baby foods.

1.3.5 Yams

The yam (*Dioscorea spp*.) comprises several species of different origins such as Southeast Asia, West Africa, East Africa, Brazil and Guyana. The yam is a thick vine tuber, cultivated throughout the tropics and in parts of the subtropics and temperate zones, comprising of annual and perennial species. The most popular edible yam species are the white yams (Dioscorea rotundata), an annual species that accounts for 90 percent of world production of about 25 million tonnes. Available information indicates that Kenyan yam diversity is represented by a number of cultivars within D. bulbifera (aerial yams), D. minutiflora and D. dumetorum species (Maundu et al., 1999) with D. minutiflora, as the most commonly grown yam.

Yam is important for food security in East and West Africa where 95% of the world production occurs (FAO, 1991), with Nigeria as the leading producer. The tubers principally provide carbohydrates, but also appreciable amounts of vitamins, proteins and minerals. Indeed, protein content found in some species is higher than in maize and rice. The peel of yam is rich in protein and glucose content. It can be used as a feed for small ruminants and has medicinal value. In addition, the crop adapts well to medium and high altitude climatic conditions, survives long dry spells, has flexible harvest schedules and can be stored for up to six months after harvest thus serving as a food security crop. In spite of this potential, the yam is a crop that has been ignored in East and Central Africa region.

1.3.6 Other Roots and Tuber Crops

Other root and tuber crops that have potential for introduction into Kenya include the crops listed in Table 1 below. These crops if developed and produced in Kenya would enhance food diversification and food security by tapping their unexploited potential.

Table 1: Other Potential Root and Tuber Crops

Scientific Name	Common Names	Origin	Present Distribution
Solenostemon rotundifolius and *Plectranthus esculentus*	Native Potatoes(E)	Ethiopia; but of multiple African origin	Cultivated in West, Central and southern Africa. Also reported in East Africa
Sphenostylis stenocarpa (Hochst. ex A. Rich.) Harms.	African yambean, otili	Tropical Africa	Tropical Africa (wild and/ or cultivated)
Vigna vexillata	Tuber cowpea	Pan-tropical regions	Pan-tropical regions
Marantha arundinacea L.	Arrowroot (E) Araruta (P)	Tropical America	Tropical America, Tropical Asia
Alocasia macrorrhiza '(L.), Schott	Giant taro (E)	Asia	Sri Lanka, Southeast Asia, Pacific Islands
Arracacia xanthorrhiza Bancr.	Arraccach, Peruvian carrott (E) Arracacha (P)	Andean highlands from Venezuela to Bolivia	Latin America, in particular South America
Canna edulis Ker.	Achira, Edible canna (E) Achira (P)	Tropical America	Latin America, Asia, Pacific Islands
Oxalis tuberosa Mol *O. crenata.*	Oca (P) Oca, New Zealand Yam(E)	Andean region	Andean region, Mexico, New Zealand
Pachyrrizus spp. (P.Ahipa, P.erosus, P. tuberosus)	yam bean	Andean region	Peru, Bolivia
Polymnia sonçhifolia Smallanthus sonchifolius	Yacon (E), (P) Apple of the Earth	Andean region	South America and Southeast Asia
Ullucus tuberosus Caldas	Ulluco (P); (E)	Andean region	Andean region

Key: E: English **P:** Portuguese

2.0 SITUATIONAL ANALYSIS OF THE ROOTS AND TUBER CROPS SUBSECTOR IN KENYA

2.1 Introduction

Production of roots and tuber crops has remained almost stagnant for a period of 3 years (2012 to 2015) with an average area of 240,000ha while total production averaged 3.3 million MT. but reduced to 2.4MT in 2016 .The main factors for this near stagnation are the unavailability of clean quality materials for planting and marketing constraints. However the situation has increased in both acreage and volume to 322,050Ha and a production of 3.68M MT with a value of 65.92B. The area under Irish potatoes increased from 99,475ha in 2012 to 217,315ha in 2018 while production increased from 1,436718MT to 1,867,376MT over the same period.

For sweet potatoes, although the area under the crop has declined marginally from 66,971 ha in 2012 to 64,293 ha in 2018, the production reduced markedly from 859,549MT to 763,643MT in 2014, but has steadily increased to 871,010MT in 2018.

The area under cassava production has been declining; from 73,144ha in 2012 to 63,725 in 2014 and subsequently to 40,422ha in 2018. Similarly production declined from 930,922MT to 571,845MT, in 2015, but has increased to 945,827MT 1n 2018. This increase in productivity could be attributed to availability of high yielding planting materials and capacity building on good agronomic practices. In the case of coco-yams and yams, although the area under the crops declined the production increased significantly (30%) during the same period. These trends are summarized in the table below.

Table 2: Production Trends of Roots and Tuber Crops (2012-2016)

Commodity	Area (Ha)			Production (MT)				
Year	**2012**	**2013**	**2014**	**2012**	**2013**	**2014**	**2015**	**2016**
Irish Potato	99,475	104,560	115,604	1,436718	1,667,690	1,626,027	1,172,262	1,150,112
Sweet Potato	66,971	58,509	61,067	859,549	729,645	763,643	1,232332	697,324
Cassava	73,144	65,634	63,725	930,922	935,089	858,461	709,926	571,845
Cocoyams	2,869	3,654	2,155	26,716	45,346	27,619	-	-
Yams	874	998	1,210	10,143	13,569	20,028	-	-
TOTAL	**245,345**	**235,368**	**245,775**	**3,266,060**	**3,393,352**	**3,297,792**	**3,114,520**	**2,419,281**

***Source**: MOALF&I, 2017*

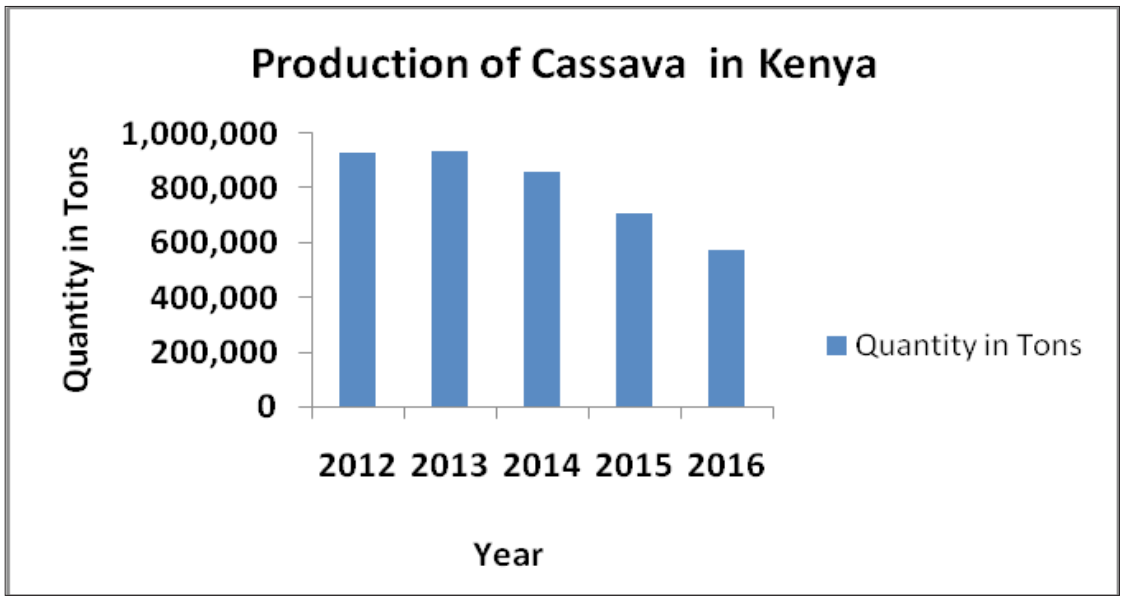

Figure 1: Cassava production trend

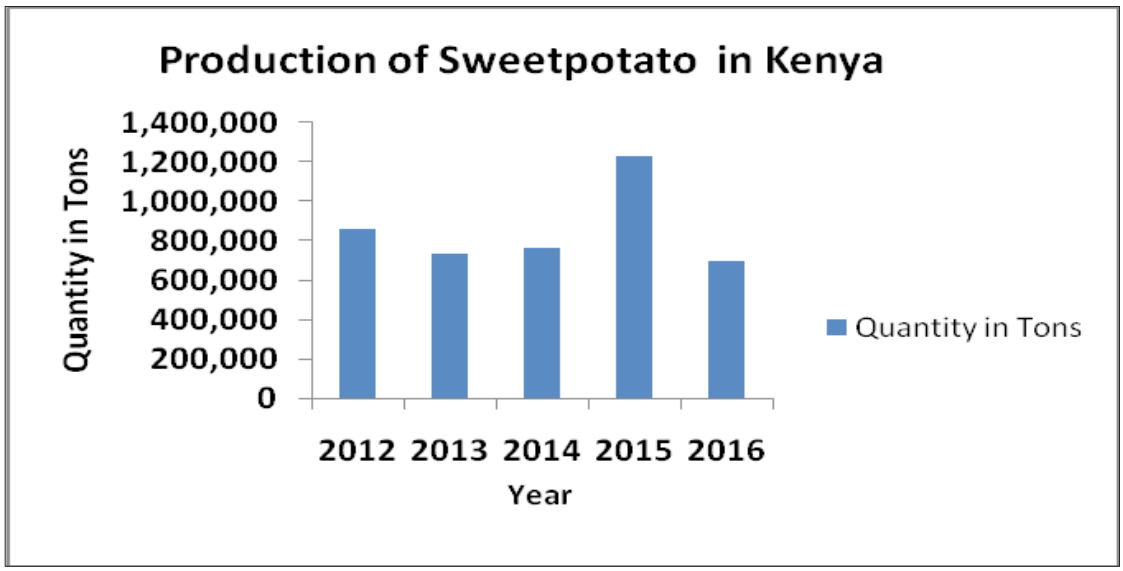

Figure 2: Sweet potato production trend

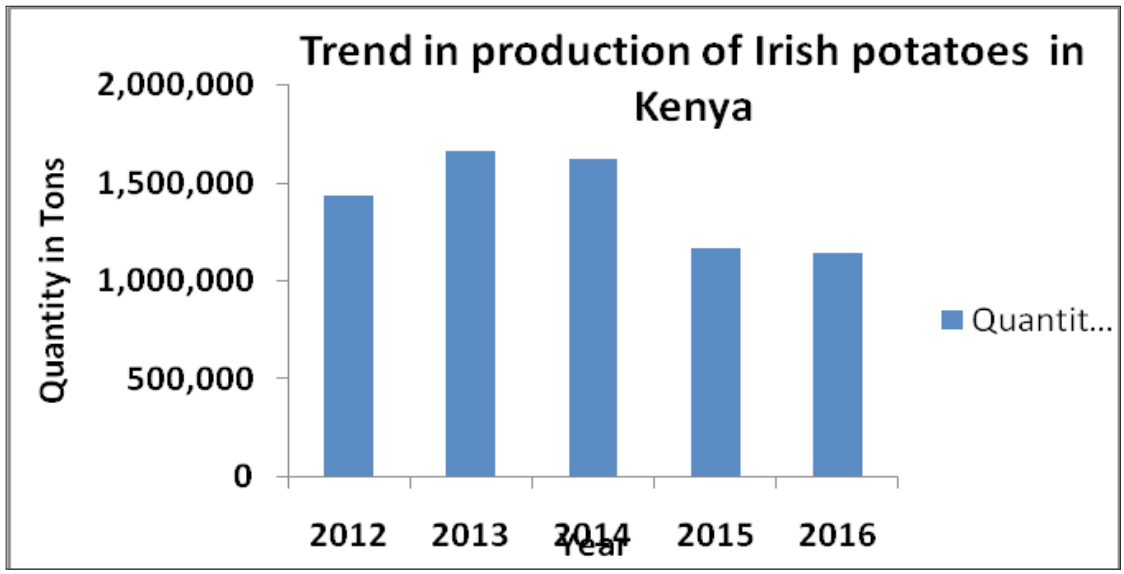

Figure 3: Irish potato production trend

Despite policy focus on improving food security and according to the World Food Programme (WFP) Kenya is still classified as a food insecure country. Nationally, over 2 million children (35%) are stunted. The national per capita energy supply per day is less than the recommended rates of 2,250 Kcal/day per active African adult male equivalent and for many, the basic diet is inadequate in terms of diversity and quality (this includes both macronutrients, such as carbohydrates, proteins and fats, as well as micronutrients including vitamins and minerals). Recognizing the broad scope of food security and nutrition related information, the counties will be supported in their efforts to gather and manage crucial data and information. Cross-county data will be brought together into special databases, and in some cases supplemented with more specific indicators, to allow for integrated and holistic food security analysis. Examples of such cross-sectoral databases include those maintained by the early warning system, the KNBS poverty database and KenInfo.

Kenya has and will continue to put in place innovative emergency response mechanisms aimed first and foremost at saving lives, linked with strategic efforts towards recovery, rehabilitation, restoration of livelihood systems, and development. These include input support and special measures for the protection and management of livelihood assets, particularly in Arid and Semi-Arid Lands (ASALs).

There is hardly any data collected or published on production trends for other root and tuber crops especially cocoyam and yams in the country. There is need to carry out a baseline survey on production and utilization of these roots and tuber crops.

According to a study published by Rockstrom et al (Rockström et al. 2009) from the Stockholm Resilient Center, Kenya is projected to experience severe water challenges occasioned by reduced rainfall, catchment degradation and over exploitation of ground water . This water stress is projected to have a severe impact on food production, further aggravating the food insecurity in the country. It is therefore, paramount for the agricultural sector in the country to consider a great shift from the traditional staple crops that require heavy water investments in their production to more drought and heat resistance crops that can augment the staple crops. It is also important that the sector should find ways and means to incorporate them within the dominant food supply chains.

Roots and Tuber Crops production faces a number of challenges including the following: Inadequate clean seed production and accessibility (price, infrastructure, middlemen, quantity & quality); Unconducive policy environment; Poor financial services (insurance, credit, loans); low mechanization (availability of specialized machinery, cost, quality); Poor crop husbandry practices (lack of clean planting materials and tools, fertilizer application); Poor soil and water management (inappropriate use of fertilizer, water and other agro-chemicals, soil erosion and poor tillage method/conservation agriculture); Changing climatic conditions (erratic rainfall, droughts); Poor harvesting methods (mechanical damage, poor packaging/carrier, time of harvesting, lack of site segregation); Poor transportation methods (mode and containers possibility of cross contamination, cleanliness of transport containers, public transport); Storage (poor storage -time, temperature, humidity). Lack of separation of

products at the storage stage, lack of curing; Inadequate field heat reduction (both physical and physiological damage); Storage facilities (poor and non-specialized) and field infestation.

2.2 Analysis of Strengths, Weaknesses, Opportunities and Threats for Roots & Tuber crops

The table below summarizes the strengths, weaknesses, opportunities and the threats that this strategy must take into account in designing interventions for the development of the roots and tuber crops subsector.

Table 3: SWOT Analysis Roots and Tubers

Strengths	**Weaknesses**
• Harvesting period easily staggered • Can be grown over a wide range of AEZs • Improved varieties which are high yielding and nutritious available • Produce and product standards developed for Irish potato, sweet potato and cassava • Drought tolerant and water efficient • Existence of relevant technical capacity	• Highly susceptible to diseases • Produce very bulky & perishable • Scarcity of quality Seeds/ Planting materials • Mode of propagation easily spreads diseases • Negative perception of the roots and tubers as the poor man's crops • Weak enforcement of regulations and standards • Disorganized marketing system for root and tuber crops
Opportunities	**Threats**
• Political goodwill • Goodwill from clients and partners • Devolution • Growing demand for natural foods • Provide alternative source of carbohydrates and other nutrients to cereals • Growing demand for industrial use • Mechanization technologies available across the value chain • Existence of large number of small scale processors • Thriving catering service industry • Growing local and international markets • Vibrant financial sector • Funds for support of climate smart crops and presence of development stakeholders/BDS available	• Competition from imports • High levels of Linamarin (Glycocides) in cassava • Emerging pests and disease • Climate change

2.3 Strategic Issues in Root & Tuber Crops

Transforming root and tuber crops into commercially viable enterprises requires organization of the seed system, production, processing and marketing activities and an all-inclusive participation of all value chain actors. The following are challenges that have constrained the transformation of the subsector.

2.3.1 Weak and disjointed Value Chain leadership structures

In the past, the Government and other stakeholders have put more effort in supporting the producers to form organized groups for ease of access to agribusiness services. However, little effort has been made for other value chain nodes and actors such as input manufacturers and suppliers, transporters, traders and processors. Other players have made own initiatives to come together to addresses their respective interests. The result has been weak linkage between these value chain actors hence production is not informed by market demands and requirements. This has generated a deficient flow of information along the value chain which has been utilized by certain market agents to benefit them, ultimately generating systemic inefficiencies along the value chain. In most cases, actors' seek individual solutions in the short term instead of thinking of initiatives that promote the sector's competitiveness in the medium or long term. This translates into strained relations between actors along the chain characterized by low trust, self-interest, and a limited capacity to assume strategic initiatives as a chain.

At the same time, most existing rural organizations are weak in managerial capacity to identify and analyze critical points in their chains, build relationships with others and find key strategies or actions to improve their business. This is mainly because there is lack of clear guidelines for mobilization and formation of these organizations. Equally important is the fact that most of the management team members are expected to offer services on voluntary basis. Further, there are no deliberate efforts to build capacity of these organizations to improve their skills and knowledge before engaging them.

2.3.2 Weak linkages between partner institutions and legal framework

The government policy objective is to ensure an adequate institutional and legal framework, and to mobilize sufficient resources in order to achieve the objectives of the national food and nutrition security. The existing institutional coordinating mechanisms are weak and poorly implemented. This renders the institutions inefficient and all ineffective.

The Service providers and other development agencies in root & tuber crop subsector are focused on a single line in the chain. These services reach producers in poorly coordinated form, resulting in duplication of efforts in some areas and gaps in others. As a result, support currently received by the root & tuber value chains is not effective to increase its competitiveness. There is, therefore, need to develop formal national or county institution/ stakeholder frameworks for coordinated promotion and regulation of the root and tuber crops subsector. Furthermore, past and recent initiatives on the development of guiding strategy frameworks and implementation programmes have been uncoordinated and tended to target specific root and tuber crops leaving out others.

2.3.3 Data and Management Information System for root and tuber crops

The subsector is characterized by unreliable data. The ministry website has limited data on root and tuber crops. Past agricultural projects and programmes have not given priority to production and marketing data collection among their activities. Despite the fact that demand for these crops is high and increasing this, information on market requirements is not available to the producers while on the other end processors do not have information on volumes, production areas and varieties on demand with specific quality attributes. Stakeholders and other government institutions also require reliable data to assist in planning purposes. Lack of reliable and timely data and information affects sustainable production and consistent supply of these crops. Despite recent improvements, market information systems remain inadequate to serve the needs of various users of agricultural information.

2.3.4 Marketing and market infrastructure for root and tuber crops

Little promotion has been done for root and tuber crops in the domestic and international markets. There exist a large number of markets across the counties that have remained underutilized and lacking basic infrastructure and utilities. Great efforts have been put in developing new markets ignoring these traditional established markets. There have been minimal efforts to involve the market players in the management of markets leaving the responsibility to local authorities and informal groups whose interests are cess collection and maximizing on profits. There are minimal efforts in developing capacity for the market staff in revenue collection skills and customer care.

Market information collection and dissemination is mainly one parameter – prices leaving out vital market data and information such as volumes traded, source of produce, transport costs, produce quality and safety. In addition, these markets are not linked to facilitate flow of market information and produce. Similarly, majority of roots and tuber crops producers are mainly involved in production and selling but not marketing. There have been minimal efforts in deliberate and aggressive market promotion. Formal and informal cross border trade in root and tuber crops produced in neighboring countries is common. The informal cross border trade makes it difficult to keep track of the overall traded volumes and values of various root and tuber crops.

Poor physical infrastructure limits efficient food distribution and market access by farmers in areas with excess production. Market space and facilities to handle food products in many markets in both urban and rural areas are insufficient, resulting in high levels of waste and spoilage. Many markets have insufficient management and maintenance personnel although local authorities often collect fees or levies.

2.3.5 Lack of an efficient sustainable quality seed and planting materials production and distribution system

Seed is one of the most important farm inputs. A farmer's harvest depends a lot on the quality of seed planted. Whereas grain crops are propagated through true-to-type seed which is easily conserved, root and tuber crops are propagated through bulky and highly-perishable vegetative parts. The 'superior' characteristics of grain crops have attracted huge

private sector investments. This is not the case for root and tuber crops such as sweetpotato, potato and cassava.

Seed technology development in Kenya is a mandate of KALRO, certification of seed is carried out by KEPHIS while multiplication is the mandate of ADC and other registered seed merchants. The seed systems are well developed for cereals, pulses, fruits and vegetables. However, the roots and tuber crops seed systems are poorly developed due to their vegetative nature of propagation. KALRO develops high quality basic seed varieties for roots and tuber crops which are released occasionally, but these technologies remain on the selves due to poor or lack of funding by the government despite demand from producers. Out of the five roots and tuber crops in Kenya, Irish Potato is the only crop that once had a functioning formal seed system.

There are no organized seed systems for cassava, sweet potatoes, and coco yams causing the value chains to remain rudimentary due to unavailability of clean certified quality seeds. The seed potato production and distribution system involves Kenya Seed Company (KSC), Agricultural Development Corporation (ADC) and Kenya Farmers Association (KFA). The Agricultural Development Corporation has the mandate for breeder seed (basic seed) multiplication and bulking seed potatoes for farmers. However, due to financial constraints they have few out growers and their capacity to produce potato seed is hampered by lack of adequate land. However, the government purchased more land (700 acres) for ADC to increase on their capacity. Total seed storage capacity exists in KALRO - Tigoni with a capacity of 40 tons and at ADC Molo with a capacity of 2250 tons. In spite of this, the locations of cold storage facilities are still far from potato producing areas. Additional capacity is currently under development by the private sector and other players in the seed potato supply chain. With the collapse of the system only a few farmers (less than 4%) have access to quality clean seed. These farmers are forced to collect certified seed potato directly from seed multipliers and sometimes from KALRO centres which are not evenly distributed in majority of the Irish potato producing counties. Majority of farmers (94%) access the seed through the informal seed potato system -seed sourced from poor quality farm saved seed.

2.3.6 Inadequate skills, appropriate technologies and technical information on root and tuber crops

Despite the presence of a number of national and international research institutions which have developed appropriate technologies on roots and tuber crops, the adoption and dissemination of these technologies remains low. The country also lacks a Centre of excellence to provide for specialized skills training on roots and tuber crops husbandry and value addition. Extension services and technology transfer for crops is a function of County Governments in collaboration with other private extension service providers while capacity building, technical assistance and dissemination of standards are the functions of the National Government. The services have been faced with inadequate financing by both levels of government.

2.3.7 Low utilization and agro-processing of root and tuber crops

Root and tuber crops are generally consumed in their fresh form in households, institutions and food service establishments. Their production and consumption is affected by availability of other food crops as well as perception. For example, utilization of cassava and sweet potatoes is affected by the negative perception by some communities who consider them "a poor man's crop". Cassava consumption is further limited by the fear of high levels of cyanide contained in some varieties. The Irish potatoes are mostly prepared and consumed as chips in food outlets.

Processing of sweet potatoes and cassava is done through chipping and milling to make composite flours while some processors are making puree from sweet potato which is used in the confectionary industry. Past efforts in promotion of processing has focused on purchase of equipments and machines for producer groups. This approach has not been successful as majority of these equipments and machineries remain idle or underutilized. Processing increases the market worth of tubers, improves producer prices, stimulates farm production and achieves sustained rural livelihood improvements.

A significant proportion of the roots and tuber crops produce is lost due to post-harvest spoilage and wastage, including in some cases from toxin causing micro-organisms. Due to their nature, tubers like Irish potato seed need cold storage, Diffused Light Store (DSL) and or ambient. Cassava roots quality deteriorates rapidly after 24 hours of harvesting, they therefore need to be cooked or processed as soon as they are harvested. The dried chips can be stored in a cool dry place for future use or further processing into flour and other industrial products such as starch.

2.3.8 Inadequate research and technology development for the root and tuber crops

Research on root and tuber crops is largely undertaken by the public sector at KALRO-Tigoni Centre in collaboration with the International Potato Centre (CIP) and local universities. Currently, focus on research remains on two attributes i.e. pest and disease resistance/tolerance and yield only. Research on technologies for value addition and product development have not been adequately addressed.

Various improved varieties of cassava have been developed in recent years by KALRO in collaboration with EARRNET and IITA which are high yielding, early maturing, tolerant to cassava mosaic disease. Emergence of new problems such as cassava brown streak disease (CBSD) and spiraling whitefly *(Aleurodicus dispersus)* has eroded the gains made from release of Cassava Mosaic Disease (CMD) tolerant varieties. Research through biotechnology specifically bioengineering is facing ethical challenges and is closely monitored by the National Bio safety Authority (NBA).

Disease and pest resistance, early maturing and drought tolerance varieties have been developed and adapted to the local conditions. However, the main challenge is the multiplication and distribution of the clean, quality planting material.

There is minimal ongoing research work on coco-yams and yams to develop superior varieties and optimum agronomic practices to address production constraints. Past work

on the two crops involved germplasm collections for their accessions. Some work has also been done on multiplication of yam planting materials using the mini-sett technology.

Root and tuber crops production, however, is still affected by access to adequate improved and disease free planting materials. This is because of the frequently experienced prolonged droughts that lead to loss of planting materials by farmers especially in the dry regions. A well developed seed system for the root and tuber crops will be key in ensuring constant and adequate supply of planting material leading to a reliable supply of produce for commercialization.

2.3.9 Limited incentives for investment in root and tuber crops value chain

Access to financial services in root and tuber crops value chains has been hampered by lack of quality agribusiness records on inputs and outputs. Additionally, the majority of the value chain actors work individually while financial institutions prefer financing large scale producers with collateral or organized groups in well developed crops value chains. Furthermore, most of the existing financial products have been developed without involvement of the root and tuber crops value chain actors. These issues have resulted in low access to financial services by roots and tuber crops value chain actors.

Most crop enterprises produced in Kenya do not have comprehensive agro insurance cover. International Livestock Research Institute (ILRI) has developed agri index based insurance assessment guidelines while some insurance providers such UAP, AON Minet, ICEA, APA and CIC have developed agro insurance products.

Access to productive resources such as land, infrastructure and utilities for investment is limited due to long procedures and multiple taxation and licensing from various regulators.

2.3.10 Poor enforcement of produce and product Standards

Standards ffor Irish potatoes and cassava; and partially for sweet potatoes have been developed and published. A code of practice on fresh produce was developed by Kenya Bureau of standards (KEBS) and its closest equivalent is the Kenya Good Agricultural Practice (Kenya-GAP) or the Global Good Agricultural Practice (Global–GAP) being implemented in the vegetables and fruits exports. Additionally, product specifications for Irish potatoes and cassava value added products have been developed. However, observance and enforcement of these standards remains weak due to lack of appropriate tracking mechanisms at marketing points.

Measures to realize traceability have also not been put in place in the root and tuber crops. Poor conformity to and harmonization of regional existing produce and product standards has failed to attract formal trade. Lack of compliance to Sanitary and Phytosanitary (SPS) requirements has greatly limited access to external markets even during times of glut.

2.3.11 Climate change and environmental degradation

Climate change affects plants, animals and natural systems in many ways. Food insecurity and climate change are, more than ever, the two major global challenges humanity is facing,

and climate change is increasingly perceived as one of the greatest challenges for food security.

With many of the resources needed for sustainable food security already stretched, the food security challenges are huge. Climate change will make it even harder to overcome them, as it reduces the productivity of the majority of existing food systems

Climate change has led to declining production of crops, including root and tuber crops due to fluctuation in rainfall, reduced soil fertility, erosion and nutrient mining. These factors have led to land degradation hence reduced the land area suitable for crop production. Other climate change-related phenomena include more frequent extreme weather conditions exemplified by severe and prolonged droughts, floods and emergence of new pests and diseases. Pollution from industrial wastes, misuse of mineral fertilizers and pesticides, poor crop husbandry practices etc. have also led to decline in productivity and overall production of these crops.

Since climate change has a greater impact on cereals which are the conventional industrial starch crops; root crops such as potato, sweet potato and cassava, which also produce high quality starch, but less severely impacted by climate change, could bridge the gap for industrial starch demand. This characteristic of the root and tuber crops could be exploited to further develop the value chains.

2.3.12 Low access to and control over agricultural production resources and processes for women, youth and people living with disabilities

Issues on gender and disability have not been mainstreamed in most agricultural activities. This is either due to the affected persons inability to own properties that could be used as collateral or due to their physical incapacity to operate the current technologies used for crop production and processing.

Root and tuber crops farming is labour intensive making it unattractive to the youth. Planting, harvesting and transportation to the market activities for these crops is laborious with both the planting materials and the harvested produce being too heavy. This discourages the youth, women and people living with disabilities. Labour saving technologies such as planters and harvesters would alleviate this gender disparity in the root and tuber crops subsector.

In most communities, women and the youth do not own properties hence are not considered during groups' leadership positions. People living with disabilities are shunned by communities and are regarded as dependent and only considered during charity discussions. With the ageing farming community, it is strategic to get the youth and the women involved in agriculture for the future welfare of the county's agricultural sector.

2.4 Justification for the Intervention

The Root and tuber crops are high yielding crops that can grow in diverse environments including the arid and semi-arid lands (ASALs), thus providing a great potential for ensuring food security for the majority of Kenyans. In spite of the potential for these crops to address food security, there have been no strategic initiatives to exploit their potential hence a significant proportion of rural communities in Kenya are constantly faced with food deficits.

The production and productivity of root and tuber crops have however been declining due to the emergence of new pests and diseases, poor quality planting materials, low levels of mechanization and poor crop husbandry practices. Compared to the potential yields, majority of the roots and tuber crops have very low production. Limited access to quality business development services has also had a negative effect on production. This is compounded by the negative consumer perception.

After Kenya's independence, the agricultural strategy as contained in the Sessional Paper No. 10 of 1964[2] focused on the attainment of food self-sufficiency with maize as the main staple food crop. In essence, this ignored root and tuber crops and many other crops though grown and consumed by a large proportion of the Kenyan population. This bias impacted negatively on efforts to promote the roots and tuber crops as viable and commercially marketable foods. This bias has however changed and there is a paradigm shift towards the inclusion of root and tuber crops in the national agenda of ensuring food security and income generation.

The livestock subsector has largely relied on animal feeds mainly derived from cereals and their by-products. However, the scarcity of cereals and consumption of whole maize grain among rural communities denies the animal feed industry raw materials thus increasing the cost of feeds. Root and tuber crop products can effectively substitute cereal products used in animal feed formulations.

The National Root and Tuber Crops Strategy will therefore offer an opportunity for the development of the value chains that would ensure the constant and sustainable supply of root and tuber crops produce for households and raw materials for industrial use thereby contribute to the implementation of the ASTGS anchor three of "reducing the number of food insecure Kenyans in the ASAL regions from 2.7 million on average to zero, while reducing the cost of food and improving nutrition" at the same time the achievement of the two pillars of the Big Four Agenda namely 100% food and nutrition security and manufacturing.

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[2]Sessional Paper No. 10 of 1964 on `African Socialism and Its Application to Planning in Kenya'. Government of Kenya.

3.0 STRATEGIC DIRECTION

3.1 Strategic Approach

This strategy will give priority to establishment of strong R&TCs VC actors' institutions and stakeholder forums in each county for organized agribusiness support and efficient coordination of the subsector. Improved coordination and targeted support will address majority of weakness by providing suitable entry points to all interested service providers along the entire R&TCs value chains. In addition, the approach will be to identify the strengths and build on them while at the same time convert any threats to opportunities that will be exploited to enhance the sub sector competitiveness. The institutions created will be R&TCs value chain actors owned and led but with defined functions supported by consistent relevant capacity building, deliberate facilitation and regulation by the state agencies. The intergovernmental coordination mechanism will be key to the success of this strategic approach.

3.2 Vision

A commercialized and competitive industry that contributes towards improved livelihoods in the root and tuber crops subsector.

3.3 Mission

To establish robust self regulating institutions, develop, and disseminate sustainable demand-driven gender responsive technologies, market information and value addition.

3.4 Strategic objectives

The overall objective of this strategy is to provide a roadmap for the development of the root and tuber crops subsector in Kenya. This strategy provides a stimulus for private sector investment in the root and tuber crop subsector. It aims at transforming the subsector into a commercial and vibrant industry that contributes to the country's food and feed security needs, the development of agro-industries, employment creation and improved livelihoods.

The specific objectives of this strategy are:

i) To establish robust self regulating institutions with diverse linkages to provide agribusiness information and financial services

ii) To increase sustainable production by developing, packaging and disseminating demand-driven and climate smart, technologies

iii) Increase market access for roots and tuber crops produce and products

iv) To mainstream gender, youth, PLWD and environmental concerns at all levels of root and tuber crops value chain development

3.5 Expected Outputs

The expected outputs include:

i) Robust and self regulating institution with diverse linkages to provide agribusiness information and financial services established

ii) Increased and sustainable production and supply of quality root and tubers produce and products

iii) Market access for root and tuber crops produce and products increased

iv) Gender, youth and PLWD sensitive stakeholder institutions, technologies, financial products and data developed and environmental concerns addressed along the value chain

4.0 IMPLEMENTATION OF THE STRATEGY

4.1 Introduction

This strategy is intended to enhance efficient production, facilitation, processing and marketing and utilization of R&TCs. The focus will be to establish institutions and linkages for stakeholders, clean seed production and input supply system, undertake marketing analysis, market infrastructure improvements and development of Management Information System. The Ministry will identify gaps in the existing projects in roots and tuber crops and address them guided by this strategy. All stakeholder forums formed at county and national level will provide an entry point for service providers and development partners. The strategy will form a framework to guide the implementation and participation of R &TCs VC actors.

The strategy underscores the importance of sharing responsibilities with stakeholders and between national and County Governments, donors, investors/private sector. This will be done through formal Memorandum of Understanding (MoUs) and contractual agreements between relevant parties. The National Government shall take the lead in areas of policy formulation, capacity building, development and dissemination of national, regional standards, and market development in close consultation with donor agencies/private sector. Technical assistance, formation of stakeholder institutions, research and technology development will be done in collaboration with private sector and donor agencies and other stakeholders. On the other hand the County Governments will mainly be involved in actual implementation of activities, data collection and enforcement of all quality standards.

4.2 Consultation and Co-Operation Mechanism for the Agricultural Sector in Kenya

The highest level of the sector Mechanism is the Intergovernmental Forum on Agriculture (IGF). The legal mandate of the IGF is rooted in Intergovernmental Relations Act, 2012; article 13. 1&2 which empowers the Intergovernmental Relations Secretariat to establish sectoral working groups or committees while at the same time underlining that; it is in the mandate of the Cabinet Secretary to convene consultative fora on sectoral issues of common interest to the National and County Governments.

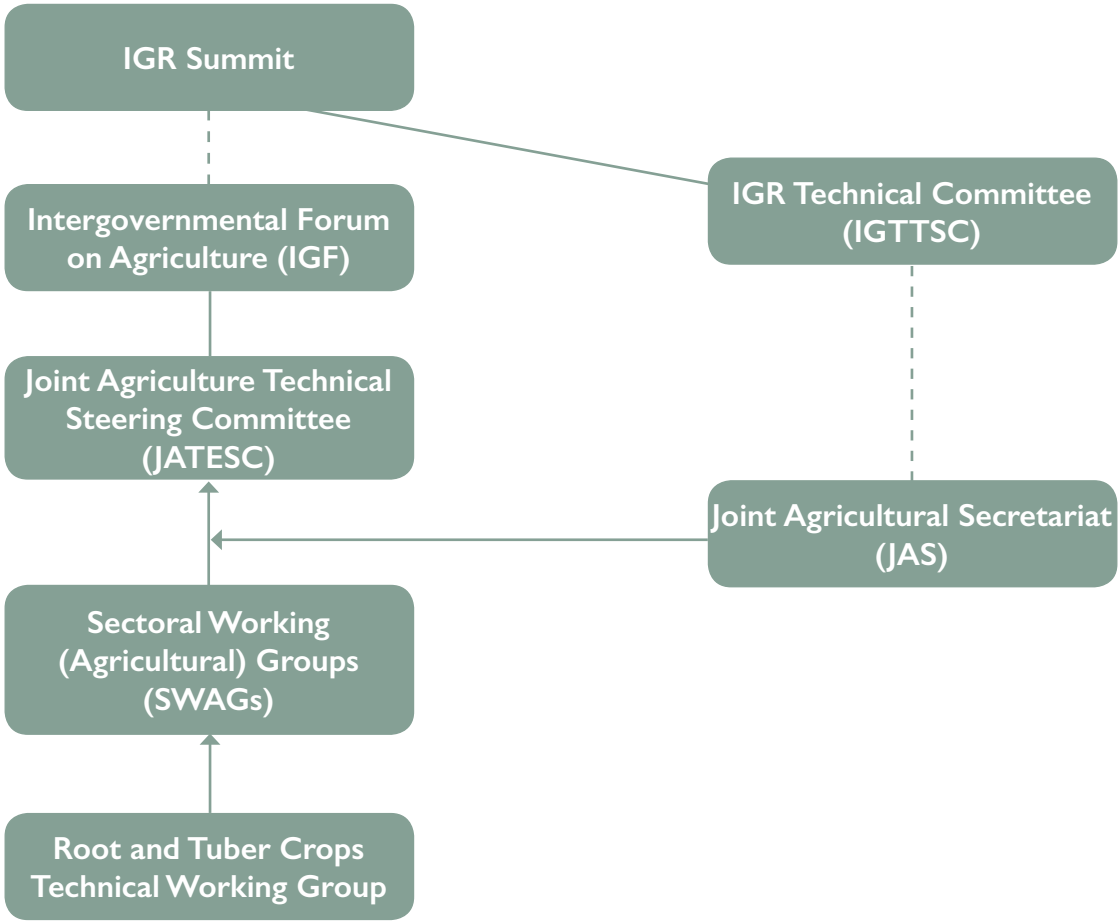


Figure 1: Agriculture Sector Consultation & Cooperation Mechanism

The Root and Tuber Crops Technical Working Group shall be among the Sectoral Working Groups formed (SWAGs) under the Agriculture Sector Consultation and Cooperation mechanism above. The TWG will be responsible for overall coordination and implementation of the root and tuber crops subsector initiatives in the 47 counties in the country. It will report directly to the Joint Agriculture Technical Steering Committee (JATESC) under the leadership of Intergovernmental Forum (IGF) on Agriculture which is under the IGR summit. The working group will draw its members from relevant government Ministries, Departments and Authorities (MDAs) selected stakeholders and its main role will be to mobilize resources and information sharing on root and Tuber Crops value chains

4.3 Root and Tuber Crops Log Frame

Details of planned interventions, indicators and means of verification together with the assumptions are shown in the following logical framework.

Roots and tuber crops subsector Log frame

Intervention logic	Key Performance indicators	Means of verification	Important assumptions
Project Goal: Improved livelihood of Kenyans through promotion of R &TCs	• Increased per capita income by 20% • Increased acreage under R&TCs by 20% by 2022 • Increased per capita yields of R& TC by 20% • Increased per capita consumption of R & TC by 5%	• KNBS assessment reports and economic surveys • Progress reports	• Government policies will continue to be favorable for the development of the R&TCs sub-sector • There will be sufficient mitigation measures against climate change and other risks
Sub Sector purpose: To establish strong institutions, linkages and regulation for improved coordination, facilitation and promotion of R &TC subsector	• No. of institutions established and strengthened • Increased Institutional linkages by 20% • No. of regulations reviewed	• Reports in the Kenya Gazette • Reports of meetings and forums • MOUs and business contracts established	• Enabling policy and business environment • Funding will be availed • There will be commercialization and competitiveness of R&TCs
Outcomes:			
Objective 1: To establish a robust and self regulating institutions with diverse linkages to provide agribusiness information and financial services	• Approved framework implemented • No. of functional agribusiness institutions and platforms • No. of active contracts • No. of functional R&TCs Technical committees at county and national levels • No. of financial institutions offering financial products for R&TCs value chain actors • No. of firms providing R&TCs subsector insurance • No. of groups and individuals accessing R&TCs tailor made financial products	• Framework document • Reports, copies of contracts • Business turnovers • Active membership to TC • Minutes of meetings held • Financial reports and records • Gazette notice on standards • Signed Protocols	• Conducive environment for operations • Member's willingness to associate • There will be Economic, Social and political stability • Confidence of Financial sector and Investors in Agriculture sector increased • Access to certified/ accredited labs

Intervention logic	Key Performance indicators	Means of verification	Important assumptions
	• Amount of money disbursed to R&TCs value chain actors • No. of standards adopted, reviewed, and developed • No of standards deployed and enforced • No of regional and international standards harmonized • Comprehensive data capture forms • Functional accessible MIS	• Reports • No. of data entries • Login reports • No of MIS administrators trained	• Active participation of relevant stakeholders • The regional and international treaties and agreements will continue being favorable • Appropriate software will be available for use, there will be up take of MIS
Objective 2: To increase sustainable production by developing, packaging and disseminating demand-driven and climate smart, technologies	• No. of cultivars and varieties of seed developed • Acreage of R&TCs under seed multiplication • No. of seed systems functioning • Technology development guidelines developed and adopted • No. of technologies packaged and disseminated • No. of advisory personnel trained and deployed in R&TCs • No of agribusiness service providers along the value chains trained • No of germplasm of R&TCs conserved • No. of research institutions undertaking research in R&TCs • No. of technologies on R&TCs evaluated • No. of technologies developed or adopted • No. of constraints identified and addressed	• Seed production and sales reports • Variety release Reports • No. of registered seed merchants • Institutions established offering training in R&TCs • Training curricula • Technology development and Training Reports • Technical Reports • Research publications and conference presentations • No. of Patents registered	• Regulatory environment will be favorable • Seed enterprises will be economically viable • Viable technologies developed • There will be uptake of technologies • Retention of trained personnel in the R &TCs sub sector • Funds available for these activities • Funds for research will be available • There will be continuous demand for technological improvements

Intervention logic	Key Performance indicators	Means of verification	Important assumptions
Objective 3: Increase market access for roots and tuber crops produce and products	• No. of market structures (Retail, wholesale, storage, collection centres) functioning • Declared local and export volumes for R&TCs traded • No. of products developed • No. of processing units established • Increase per capita consumption of R&TCs by 5% • Potential market data for R&T products - local and export markets	• Market survey reports • Report on local and export information • No. of products of R&TCs available in market shelves, • Survey reports on consumption trends • No. of R&TCS processing units functioning	• Funds will be availed to renovate existing markets and construct new market structures • Sites for market structures will be available • Produce will be competitive in the local & international markets • Steady supply of raw materials will be maintained • Positive uptake by populace, industry and other processors • Appropriate Investment Incentives package available • Export market identified
Objective 4: To mainstream gender, PLWD and environmental concerns at all levels of Roots and Tuber Crops Value chain development	• No of complementary enterprises adopted • No of climate smart technologies introduced along the R&TCs VC • Amount of biomass marketed • No of Waste management programmes initiated/implemented • No. of gender based technologies promoted • No. of gender based institutions established along the R & TCs value chains	• Reports • Surveys	• Supportive legal frameworks and incentive schemes • Adequate resources will be availed

4.4 Planned Interventions

The following activities are designed to increase productivity at household level, increase production, improve market access, household food security and incomes, create employment opportunities for all gender and ensure food safety and nutrition for all. In order to realize the objectives outlined above, the stakeholders will collectively implement activities listed below in order of priority. The same activities are summarized in the implementation matrix **Annex I**.

4.4.1 Robust and self regulating institutions with diverse linkages established

4.4.1.1 Credible stakeholder based institutions at ward, sub county, county and National level formed

The most limiting factor in agribusiness development across enterprises remains weak institutions. The priority is to form strong stakeholder managed and owned institutions with defined linkages to all value chain players and relevant service providers. These institutions will be in form of Ward Root & Tuber Crops Cluster Management Committees (WRTCCMCs) that will be based at each ward. They will have coordination institutions at the county and national level. At the national level represented by an apex body the National Root and Tuber Crops Stakeholders Forum. The support of government in availing seed resources is a critical prerequisite for the success of these SH institutions.

i. Establishment of R&TC s coordination structure

The R&TCs coordination structure will be established to improve information flow between all value chain players including producers, buyers and traders and service providers. The lowest level will be the Ward Market Development and Management Teams that will link to the ward, sub county and the county committees and finally to the National Roots and Tuber Crops Technical Working Group.

The WMDMTs will be based at one market centre in each ward in all the Root and Tuber Crops growing counties. The criteria for selection of the suitable market will be production volumes, accessibility, and availability of services, public land and location within the ward. The market teams will be composed of elected officials supported by a technical team and support staff hired competitively based on qualifications and their direct involvement in agribusiness activities. Elected officials, the technical team and Support staff will be remunerated to ensure commitment to their roles and to ensure that resources belonging to the communities are safeguarded.

A typical cluster will have an average of 3,000 primary producers (households) being managed by the WMDMT whose main functions includes; coordination, implementation and provision of quality business development services to all stakeholders across the ward. These services include inputs supply, financial services, technical services, marketing, enforcement of standards and specifications and processing of surplus produce, provide appropriate storage facilities for households and institutions. They will also participate in identification of technology gaps forums. Finally, the teams shall enforce collection and remittance of cess, levies commissions and membership fees. The WMDMTs will

undergo capacity building in the relevant fields to provide them with the necessary skills and knowledge for allocated tasks. They will also be expected to register themselves as formal business entities so as to engage in legal business transactions on behalf of the members. The detailed process of formation of the stakeholder organizations, and election of leaders and their minimum qualifications and requirements including duties and specific roles and duties are given in Annex II. Key activities involved in the formation of WMDMTs are as follows:

a) Awareness and sensitization of root and tuber crops VC players

The main aim is to be as inclusive as possible to bring all interested value chain players on board. Unlike in the past where mobilization usually target only selected stakeholders such as group members alone, this time the process will target to reach all producers whether individual or group member and other value chain player including the buyers, processors, transporters, input suppliers and other market players. This will be done through the use of mass media such as popular FM stations, posters located in strategic places and bearing photos of familiar community members and word of mouth. In addition, appropriate messages will be prepared and delivered to the public by the county leadership. The message will include minimum qualifications and requirements for those wishing to contest for various positions, their roles and responsibilities.

b) Mobilization and registration of roots and tuber crops VC players

Mobilization and registration will involve collecting data for all households in each ward and data for other value chain players. The data to be recorded by the enumerators will include names and ID no. of the head of the household, total land area and enterprises currently practiced. Similarly, data for other players will be collected using formats agreed upon by the service providers. In addition, details of those individuals who may be interested in various leadership positions for the root and tubers crops coordination structures in each ward will be compiled and handed over to the county for further scrutiny and preparation for elections.

c) Capacity building, Market Development and Management Teams

Team members will be trained in relevant business modules to prepare them to effectively manage the production and marketing functions. Some of these modules include entrepreneurship, business skills, marketing, market arrangement and hygiene, market records and record keeping, costing and pricing, Good Agricultural Practices (GAPs) and preparation of business plans. In addition, the capacity building will include training on business registration, access to government procurement, negotiation skills and preparation of contractual documents with large buyers.

ii. Establishment of Roots & Tuber crops Agribusiness revolving fund

Each registered market development and management team shall open and operate a revolving fund account that will be used for remittances of all funds received, to finance agribusiness activities and remuneration of the leaders and support staff. Initial funds shall be in form of grant from the government or other donors, and later commissions and levies collected. The fund account is expected to increase further over time through increase in business turnover, membership fees and shares. The funds generated will also be used to support research and technology development for addressing technology gaps

identified by the stakeholders, environment conservation activities, bursary schemes etc. An aggregated surplus of about 1% of each Wards SH net earnings will used to build a sub-county fund for supporting priority development.

iii. Facilitate establishment of Business Development Services providers

Quality business development service providers are generally lacking. This provides an opportunity to mobilize youth, capacity build them and facilitate them to start offering services at a fee to clients. Business development Services include; training and technical assistance, advisory services, policy and advocacy support, marketing assistance, market access services, infrastructure services, promoting business linkages and, Support for technology and product development for the roots and tuber crops value chains. The centers will advertise the services to value chain actors and also provide a linkage between service providers and clients.

4.4.1.2 Linkages and partnerships for promotion and regulation of both national and county R&TCs partner institutions formalized

The National Government shall initiate and support formation of forums for partner institutions at both national and county levels. Membership to these forums shall include national and County Governments, development partners, value chain players, financial institutions, development partners, NGOs, International NGOs, Research Institutions, technology development, manufacturing and machinery distribution companies' regulatory institutions, policy institutions, learning institutions etc

i. Formation of fora for partner institutions

Their main role shall include joint planning, implementation and monitoring of R&TCs activities at all levels of government. All the R&TCs technical working groups shall provide regular reports to the forum during their biannual meetings. The technical working groups are; Agricultural Produce Market and Information Management, Capacity Building and Information dissemination, Research, technology development and innovation, Food & nutrition security and food safety and cross cutting issues. The cross cutting TWG shall handle issues of financial services, standards, climate change, gender and others. The responsibilities of the technical working groups shall include: institutional strengthening, review work-plans, capacity development, supervision of enforcement of quality standards, mobilization of resources, preparation for call for proposals to address technology gaps, review the research and technology proposals, undertake regular TNA for review of training curricula, carry out specialized skills trainings for roots and tuber crops for R&TCs value chain players.

ii. Monitor and evaluate the stakeholder institution model

Continuous monitoring will be part and parcel of implementation of this strategy. The SH leaders will be sensitized on the indicators to monitor and also carry out self-assessment on quarterly basis through preparation of progress reports.

4.4.1.3 Access to productive resources for stakeholders and value chain players in the roots and tuber crops improved

Access to affordable credit facilities to key actors in roots and tuber crops value chain is critical for development of the subsector. Efficient financial services will enable the stakeholders access credit to support the development of the value chain at the same time provide insurance that is critical in cushioning the R&TCs value chain actors from unplanned losses. To facilitate development of financial products that are attractive and accessible to the R&TCs sub-sector the following activities will be undertaken:

i. Identify opportunities for funding along the value chain:

Conduct a study to identify opportunities and needs along the R & TCs value chain for financing. Compile a report and share with stakeholders.

ii. Develop and Review financial products

Convene a forum with the financial services regulators (IRA, Central Bank), VC actors, SH leaders to discuss, develop and review financing products to make them accessible to stakeholders.

iii. Develop and review financial policy guidelines

Consultative meetings shall be organized between financial institutions, stakeholder leaders and government to review the existing policies and associated legal framework to facilitate access to credit by R & TCs value chain actors. Policy guidelines for each financial product will be developed to meet the needs and requirements of the value chain actors.

iv. Disseminate financial policy guidelines to beneficiaries

Consultative stakeholder fora shall be organized to share financial products and policy guidelines developed. The awareness materials developed shall include lending guidelines and other financial information. Awareness campaigns shall target all stakeholders.

v. Develop business plans for financing R&TCs value chain actors

To create sustainability and enhance agribusiness development, the R & TCs VC actors and SH leaders at different levels will be facilitated to access additional resources for investment. This will be done by partner institutions through capacity building and mentorship in business plans development.

vi. Increase access to productive resources

The National and County Governments to avail public land for investment through Public Private Partnership, develop business parks and incubation centers with utilities. In addition, the Government should harmonize the taxes and licences, and create a one stop shop for ease of access, and tax rebates be applied for investments in root and tuber crops.

4.4.1.4 Produce and product standards for R&TC developed and enforced

The expansion of the market for root and tuber crops will largely depend on the degree of enforcement of produce and product quality standards and specifications. Availability and accessibility of standards is critical in that they will facilitate trade, safeguard stakeholder's interests and ensure consumer safety. Various produce and product standards have been developed at national and harmonized at regional levels. The same are annexed at the end of the strategy document. The main activities include:

i. Sensitization of actors on specifications/requirements

The product development team selected by the State Department for Crop Development and Agricultural Research will visit the counties, market centres and individual processors to give guidelines on the requirements and specifications that are acceptable for commercialization.

ii. Identification of market specifications

The standards of R & TCs were developed in 2010 with the support of ASARECA. Given that the standards are supposed to be revised every five years to align them with the market preference and current circumstances in terms of variety, grading, fresh ware produce (like in potato and cassava), value added products derived from these crops, packaging and packaging materials and other specifications such as quality, disposal of material, labeling and post-harvest handling/storage. The existing standards were due for review in 2015 and hence there is need for their review. Individual processed and non-processed products will be standardized on demand. This will be done in collaboration with relevant institutions such as Public Health, Universities, Kenya Bureau of Standards and other stakeholders.

iii. Development of the standards and product certification

The procedure for developing new /review of standards of R &TCs entails holding SH fora which comprise representatives from industry, regulatory bodies, professional societies, Universities, research institutions, farmer organizations and consumer protection bodies. Technical meetings are held to develop and review the draft standards and the output then send out to the public for review (PR). PR connects with at least 60 different institutions both local and international. The PR takes place normally for a period of two months but can be accelerated depending on the urgency of the standard. The results of the PR are subjected to a Technical Committee (TC) for consideration and comments for preparation of the final draft which is then put to the ballot for approval by the TC members. The approved document is then submitted to the Standards Advisory Council for recommendation to the responsible Minister for gazettement as Kenya Standards (KS).

iv. Harmonizing standards regionally and internationally

For seamless trading regionally and internationally the standards will have to be harmonized. This will entail the sector management team participating in the regional and international forums to enhance constructive partnerships and to improve market access.

v. Dissemination and enforcement of standards

The gazetted standards will be disseminated to the public through print and electronic media to enhance compliance. The standards will be enforced by the authorized regulatory agencies.

4.4.2 Increased and sustainable production and supply of quality root and tubers produce and products

4.4.2.1 An efficient seed system for seed and planting materials for roots and tuber crops developed and implemented

Seed is a key determinant of agricultural productivity as it determines both quantity and quality of the output. There are three categories of seed systems in Kenya, the informal, semi-formal and formal. The formal seed system is regulated by the government and to some extent the industry. This is where new and improved varieties of certified seeds of consistent quality and high purity are provided. The informal or traditional category mainly operates at individual or community level. This is especially so for indigenous vegetables, pulses, some cereals and vegetative propagated materials. These seeds are generally more easily accessible and cheaper, but of inconsistent quality.

The semi –formal category is a blend of the formal and informal systems where selected farmers and community based organizations multiply and sell small quantities of quality declared seed of improved varieties to other farmers. The seeds are inspected and approved by the official certification body, Kenya Plant Health Inspectorate Services (KEPHIS). Most of the root and tuber crops fall under the semi-formal seed system where the seed developer, KALRO, supplies the seeds to licensed multipliers who after the certification process by KEPHIS are allowed to sell the seeds to the farmers.

Production of high quality root and tuber crops depends on access to sufficient, improved seed and clean planting materials as well as timely provision of other farm inputs. Currently, none of the roots crops has a functioning seed system. Most producers have challenges finding clean quality seeds/planting materials during the planting season. This has resulted in spread of diseases through the planting/seed materials and hence continuous decline in yield. The aim is to establish an efficient seed production and distribution system involving the farmers, seed merchants, public institutions such as NYS, KALRO, and KEPHIS. Seed/ planting materials requirements shall be informed by the market demand. An ideal seed system should be a hybrid between formal and informal seed systems, the semi-formal system. With the exception of Irish potato which is under mandatory certification category, all the other R &TCs are under voluntary certification. Hence a formal seed system is difficult to institutionalize. As a result, commercial seed merchants have not invested in seed production of R & TCs other than those trading in Irish potato. The following sub activities are proposed for establishment of a sustainable R&TCs seed system. The system will involve both the public and private sectors:

i. To establish an efficient certified seed production system

The ward market development and management teams will compile the requirements for R&TCs seeds/planting materials and disseminate information to Ward Root & Tuber Crops Cluster Management Committee (WRTCCMCs) who share with seed companies, institutions with large farms and abundant labour such as prisons, NYS for multiplication of certified seeds/planting materials and distribution to farmers. Commercial seed companies will be encouraged to participate in this programme to make it sustainable once volumes pick up to commercially viable levels.

The government, through the National Root & Tuber Technical Working Groups (NRTCTWGs) will support the establishment of the tissue culture and green houses for rapid multiplication of roots and tuber crops clean seed/planting materials in the Universities and regional KALRO centres of Mtwapa, Embu, Tigoni, Molo, Oljororok, Kakamega and Kisii. Lead farmers will be recruited, trained and facilitated to acquire infrastructure for clean seed production to undertake bulking of seeds/planting materials for sale to other farmers. The production subcommittee of the ward cluster management committee will oversee the acquisition of planting materials to the 3,000 households within the cluster.

Starting with tissue culture material (laboratory cleaned plantlets), they are hardened in a screen house and transplanted to the field in identified disease free areas to produce Breeder seed. This should be done by the variety breeder, either from a research institution, University, or seed companies with breeders' rights over the varieties (Technology developers). Certified breeder seed/planting material from this stage moves to basic seed production done by NGOs, public institutions such as Prisons, NYS, seed companies, CBOs and private seed producers under MOUs with the breeder in close supervision with the variety breeder and KEPHIS. From this stage, the materials are given to recognized registered and trained farmers, farmer groups or seed companies (Multipliers) who at the end get certification by KEPHIS before selling to farmers in the designated catchment areas (Production). This is as depicted in the diagram below:

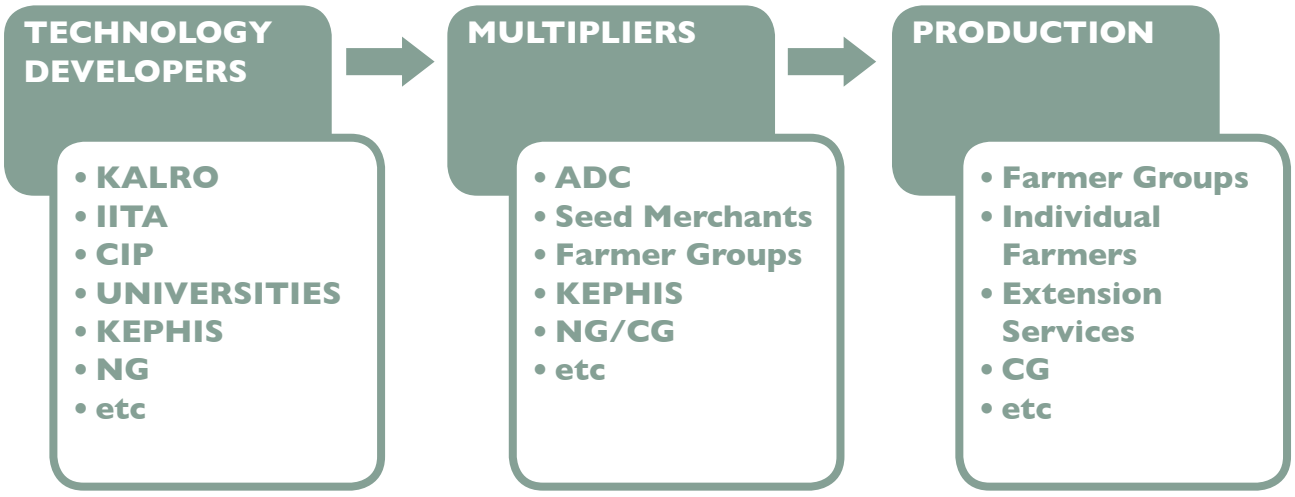


Fig 5: The Seed System

Both the National and County Governments will be involved in ensuring that good seed quality is available for production. The National Government would coordinate technology development (research) while the County Governments would coordinate the acquisition by farmers and farmers groups through extension services.

4.4.2.2 An efficient roots and tuber crops Management Information System with inbuilt data collection, accessible at both County and National levels developed and implemented

Quality data and efficient flow of agricultural information is critical for planning interventions that will lead to sustainable development of root and tuber crops.

i. Develop management information system for Root and Tuber Crops

A comprehensive management information system will be developed and deployed in all counties producing the roots and tuber crops. The roots and tuber crops MIS shall be hosted on the existing Agricultural websites for ease of consolidating the data and sharing relevant information with all stakeholders. The system will have provision for access of the information at ward, sub county, county as well at national levels. The system should be able to analyze the data and display the information in various graphical forms in customized dashboards for each of these levels.

ii. Purchase and equip the data collection and processing points

For ease of information exchange and flow, each market shall be equipped with appropriate data collection tools and entry equipment's. The data equipment shall be linked through the MIS system to the sub county, county and national levels for ease of data and information sharing.

iii. Development of baseline data collection tools

There is no data on number of stakeholders in roots and tuber crops. Data on current acreage on quantities and qualities required is not available. Data collection tools that will capture all appropriate and relevant data will be prepared and all the data captured will be input in the management information system. At the post-farm level, tools for collection of information on source, volumes traded, unit prices and types of buyers, and the destination of produce will be prepared and availed for use.

iv. Recruitment and training of data enumerators

During collection of data for the baseline, enumerators will be recruited from among the stakeholders, service providers and trained to undertake data collection. The exercise shall be supervised to ensure the credible, reliable and valid data is captured.

v. Data entry and cleaning

Another set of clerks will be recruited and trained on data entry. The supervisors will clean the data before uploading into the system. Later on the households and other VC players will be trained on data entry which will be subjected to validation before uploading into the system.

vi. Data Processing, analysis and sharing

The data processing and analysis will be carried out to test the quality of the data collected. The information system will be able to provide accurate information on the roots and tuber crops which will be accessible to all users.

4.4.2.3 Appropriate technologies, skills, and technical information on root and tuber crops developed, packaged and disseminated to all stakeholders

There government will collaborate with public institutions to develop a curriculum for short courses covering the entire value chain. The same institutions will be encouraged to offer advanced courses and undertake research to develop recommendations on husbandry practices for dissemination. KALRO will be involved in technology inventory, development, testing, validation and packaging. Specific activities to enhance dissemination of Root &Tuber Crops skills include:

i. Take inventory of existing technology and identify technological gaps

Surveys will be conducted to identify the existing R&TCs equipments, machineries, technology gaps and institutional capacities of technology developers and fabricators.

ii. Source/develop required technologies

There exist many technologies on different enterprises within and outside country. The first steps will be to identify the sources of the required technologies. This will be done through advertisement of the technology gaps and soliciting for submission of catalogues from interested firms.

iii. Demonstrate and stage exhibitions on appropriate technologies

Forums will be arranged between the relevant institutions and SHs verify the various technologies and select, source samples and evaluate performance. The technologies that will have satisfactory performance will be disseminated to the relevant counties and entrepreneurs.

iv. Sensitization on availability of skills on R&TCs

Demonstrations centers for roots and tuber crops will be established by the elite farmers at ward agribusiness centers. To create awareness on the available skills on roots and tuber crops and training opportunities, the local media will be used to inform the public on the locations where to access skills and knowledge and other agribusiness services.

v. Conduct training needs assessment (TNA)

The sensitization will also spell out the skills lacking among the service providers and the farmers. TNA tools will be developed, enumerators recruited and trained. The enumerators will then collect information on the training needs of different groups in the value chain. Data analysis will be done and TNA reports prepared.

vi. Develop curriculum for R&TCs training

The TNA report will be used to develop simplified curriculum on R&TCs for different clients. The institution will advertise for these training so that the County Governments can sponsor their staff or beneficiaries to pay for themselves for Training of Trainers

(TOT) trainings as need arise. Other service providers and institutions dealing in roots and tuber crops will also be encouraged to sponsor their staff for these specialized courses.

vii. Establish R&TCs centre of excellence

Where an institution is excelling in R&D, a centre of excellence will be developed and equipped to continuously produce trainers and transfer skill to farmers. This will start by identifying the centres, take inventory of existing facilities and human resources qualify its performance and capacity development of the centre. These centres of excellence will promote roots and Tuber crops technologies through a value chain approach.

viii. Capacity building for R&TCs service providers and lead farmers

The training will be done in two (levels). TOTs will be conducted at the centre of excellence while farmer training will be done at the location level. The lead farmers will be trained at the centre of excellence on training methodologies and supported to upgrade the farms to provide adequate learning resources for other farmers. The lead farmers will be identified through a competitive process established. They will charge for the service to ensure sustainability and continuous improvement of the services provided. The staff will have the mandate to ensure the content being delivered is of acceptable standards. Other covered topics will include entrepreneurship and business management training to enable them learn about data collection, record keeping, costing and business planning.

ix. Benchmark on appropriate skills and capacities

From past experience and observations, skills development can never be complete without farmers and stake holders getting exposed to best practices. Tours and visits will be organized for stakeholders to successful R&TCs initiatives in their locality or outside their region.

x. Compile appropriate technical information

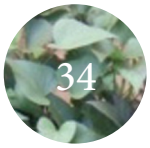
All relevant information on R&TCs skills and technologies will be collected from various sources and compiled in reports. This will be done through meeting with staff from relevant public, private and international institutions. Additional information shall be compiled from literature reviews of publications and journals. Exchange forums shall also be held with R&TCs stakeholders to gather practical and current information on production, processing and marketing.

xi. Package appropriate technical information for different end users

Information collected will be designed in various simplified formats. This will be done in workshops for information packaging experts. This will include experts in training modules, ICT and print.

xii. Disseminate appropriate technical information through different media

There is no deliberate effort currently to disseminate relevant R&TCs information to stakeholders. The aim is to identify the target groups and disseminate information using the appropriate media for effective accessibility.



4.4.2.4 Demand driven research and technology development for root and tuber crops strengthened

Research organizations to develop new varieties and improve the local cultivars and explore the possibilities of introducing superior germplasm that are higher yielding, resistant to pests and diseases, are suitable for industrial use (production of Starch & Beverage) for various ecological zones in Kenya. In order to develop the subsector the following 3 challenges will be addressed: lack of knowledge on appropriate production technology; poor quality germplasm that is highly susceptible to diseases and limited use of machinery and technology (planting, harvesting and storage) in R&TCs in Kenya.

i. Expand and Conserve R&TCs genetic resources

The aim is to provide grants to KALRO and other relevant institutions for continuous collection of roots and tuber crops germplasm to expand and preserve the genetic resources for the Potato, Sweet potato, cassava, cocoyams, yams and other roots and tuber crops. The materials sourced will be used for breeding of improved varieties. The main source of funding will be from the research fund established at national and county levels.

ii. Constitute County Research, Technology development and Innovation TWG (CRTD&I)

County research technology development & Innovation TWG will be constituted within the County Root & Tuber Technical Working Groups (CRTCTWGs) with a wider representation from specialized institutions from both public and private sectors. The representatives shall include; research and technology development institutions, machinery manufacturers, individual innovators etc. Their main function shall be identification of research and technology gaps and mobilization of resources to address the gaps in the sector and supervision of research, technology development activities. Mechanization of farm operations will be key for this TWG as these crops are bulky and heavy. The TWGs will also manage the research fund.

iii. Develop Research proposals, Resource mobilization and conduct research

The technology gaps will be identified and research/technology proposals with inputs from other stakeholders developed for the subsector. The main source of funds to finance the proposals will be from the research fund established at national and county levels.

4.4.2.5 Use of climate smart technologies in production, processing and marketing of root and tuber crops enhanced

Adaptation of the food systems will require complex social, economic and biophysical adjustments to food production, processing and consumption. Strategies to combat effects of climate change will include adopting practices to conserving soil moisture, organic matter and nutrients, using short-cycle varieties.

In the past no adequate incentives have been provided for the households to engage in environmental conservation initiatives. Since benefits for such initiatives are long term there

has been reluctance on the part of the community to invest in these initiatives. Initiatives such as carbon credit are not accessible to individual households due to the lengthy procedures in processing of the same for sale. Therefore, under this strategy, climate smart agricultural activities shall be promoted such as rotation with fertility enhancing crops (e.g soybeans and sunflower), promotion of beekeeping, growing of passion fruits, fish farming, and dairy to encourage investment in water efficiency and environmental conservation such as production of fodder crops activities. Specific activities will be as follows:

i. Planting of fodder trees and fodder crops

Fodder trees, fruit trees and pastures such *Calliandra sp*. and *Sesbania sesban*, napier grass will be grown for fodder and firewood on terraces and sloppy areas. *Calliandra sp*. and lucerne will also be planted for fodder and honey production. These will prevent soil erosion especially on sloppy areas and degraded lands. This way will increase land under economic production.

ii. Promotion of complementary enterprises

Beekeeping, Passion fruits and Dairy farming will be introduced to utilize the fodder trees and crops established. In addition, beekeeping will boost passion fruits production through improved pollination. The passion fruits will be planted in the fodder (Desmodium sp.) and on the steep slopes. All these are high value enterprises that will increase earnings thereby encourage the households to diversify in complementary enterprises in effect contributing to the conserving the natural resources such as water and soil.

iii. Improve Water shed Management

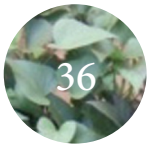
Cocoyams grow in swampy areas. These are quickly declining due deforestation and reclaiming of swampy areas for crop production. Sensitization campaigns will be carried out as well as planting of watershed trees in these areas to conserve the water which will be used to expand the area under cocoyams as well as construction of fish ponds.

iv. Introduction of environmental conservation incentive schemes

Bursary fund for advanced studies in environmental programmes will be established at each designated market to be awarded to those households that have contributed most to conserving the environment. Other incentives will include trophies, inputs for the complementary enterprises and tours and visits to areas excelling in environmental conservation etc. Competitions will be organized between different administrative units, schools both primary and secondary including tertiary institutions to encourage wider participation in environmental conservation activities.

v. Introduction of alternative energy sources and use energy saving devices

To reduce the consumption of trees, devices such as clean cook stoves and energy saving jikos, use of briquettes, improved chicken brooder systems and use of alternative energy sources such as wind and solar will be introduced and promoted in all households growing roots and tuber crops. This will reduce use of firewood reduce the destruction of trees and thereby increase earnings from sale of carbon.



4.4.3 Market access for root and tuber crops produce and products increased

Marketing seeks to develop the market for root and tuber crops by creating competitive advantages through strategies such as Product Differentiation, Market segmentation, Promotion and Development of specific.

4.4.3.1 Market analysis undertaken and local and foreign market supply chains for root and tuber crops developed

Marketing Development of market supply chain involve establishment of market development and management teams, rehabilitation of existing markets to provide for appropriate space and facilities for roots and tuber crops and deployment of market information system at each level to facilitate efficient market information flow.

i. Undertake R&TCs market analysis

This will involve preparation of market data collection tools; sensitize stake holders to cooperate during data collection, recruitment and training enumerators on market data collection. The data will then be analyzed to establish the demand-supply gaps of R&TCs. This information can then be shared with the stakeholders and value chain players to inform the preparation of production and marketing plans. Analysis will also generate list of local buyers and demand for various produce and products as well as product and produce specifications. This information will be used to prepare production plans to supply the markets identified.

ii Rehabilitation of existing markets

There are many existing markets in the counties which can serve as produce collection centre for roots and tuber crops. Unfortunately, these markets lack appropriate facilities for handling, storage and display of the roots and tuber crops. This greatly compromises the quality and the shelf life for these crops. The aim is to improve their basic market infrastructure. The renovation will involve construction of receiving, sorting, grading, storage and appropriate sanitation facilities. The rehabilitation works will be designed to increase the shelve life of root crops and reduce post-harvest loses. The markets will have utilities such as water, electricity, telephone and improved toilets, plant health diagnostic laboratory, furniture and ICT equipment's for data capture and processing. The markets shall also provide office space for market development and management teams.

Other services that will be offered at the markets include trainings and business incubation rooms for processors training and demonstrations of technologies and rooms to facilitate community meetings, stakeholder meetings and banking i.e. payments for goods and services.

iii. Collection and dissemination of market information

In order to ensure competitiveness and sufficient demand for produce there will be need to carry out continuous promotion campaigns. The following methods will be used to access selected target markets; organize media advertisement, prepare introduction letters, catalogues, Posters, bill boards; visit potential buyers and utilization promotion campaigns.

iv. Identification of export markets

The local market will feed into the export market. Prospecting for the external markets will be done with the assistance of Export Promotion Council (EPC). The WRTCMCs will also be trained on export requirements by EPC and University of Nairobi. They will also be assisted in product development to improve on branding and packaging. The team will also be trained on preparation of marketing material suitable to export markets. The export product specifications and quantities will be established and this information shared with the field representatives to initiate production.

4.4.3.2 Improved utilization of root and tuber crops through processing, development of appropriate recipes, composite blending ratios and animal feed rations

To promote utilization of R&TC by the households, especially the youth and persons with special nutritional needs, there is need for extensive awareness campaigns to improve the attitude towards R &TCs by the consumers. There will be need to develop innovative products and recipes that resonate with the youth to make R & TCs attractive and improve consumption. These include flours for Porridge and Ugali, doughnuts, beverages and snacks like biscuits, chips and crisps, coffee derived from roots and tuber crops. The following activities will be implemented to improve shelf life and product diversification for improved returns.

i. Undertake inventory of processing capacities

Conduct a study on different types of products and existing processing capacities including both technical and processing tools and machinery for the roots and tuber crops. Commercialization of the root and tuber crops value chains will greatly be influenced by the ability to process into diversified value added products

ii. Registration and capacity build of business owners/processors of food and feeds

Convene investment forums with processors and machinery manufacturers to disseminate the market study report. The interested business owners and youth will be recruited and trained and facilitated by the relevant Government and private institutions on blending, packaging, branding and commercialization of the products through a process of business incubation (to acquire relevant practical business skills. The process will be as follows: Provision of space for training of new business owners, installation of simple processing machineries & equipment and development of a practical session sharing programs.

iii. Publicity and awareness creation of economic and nutritional benefits

Conduct awareness campaigns to educate the public on the economic and nutritional benefits of production and consumption of root and tuber crops.

iv. Product development and recipes/ration formulation

Product development will result in market expansion for the existing produce. It will involve: introducing branded packaging for fresh produce, creating new demand by training consumers on new recipes of the known produce and non-conventional produce and

finally product diversification and segmentation (e.g. juice, flour, dried chips, puree etc.). New products will be developed by food scientist and nutritionists.

v. Demonstrate preparation and formulation

Training workshops shall be organized on the new recipes at the sub-county level. The target stakeholders shall include catering service providers, hotels and restaurants and public institutions. We shall also use the media for wider public reach.

4.4.4. Gender, youth and PLWD sensitive sStakeholder institutions, technologies, gender disaggregated data and financial products developed along the value chain

Limited access to resources and inadequate nutrition affects billions of women, men, girls, and boys but inequalities in resources, power, and roles in food and agriculture systems tend to affect women and the youth more greatly. Although women comprise a higher percentage of the agricultural labor force in developing countries, on average, they have disproportionately less access to resources (such as land and financing), markets, technologies and information, positions of influence, and means to manage risk. Lack of access to credit, limited group membership, and high workloads are among the most pressing constraints for both women and men in agriculture, although the burden of disempowerment in these constraints is almost twice as much for women.

Social norms about women's and men's roles and responsibilities compound gendered barriers to resources and institutions, often limiting women's ability to earn income, manage risk, or influence how earnings are spent or what foods are available to feed young children. Where women do not have sufficient resources or power to act for their own and their children's health, nutritional outcomes suffer

i. Affirmative action for involvement of all gender categories during establishment of stakeholder institutions

Deliberate effort will be made and special slots set aside for all gender categories during the establishment of the root and tuber crops coordination and management institutions. This will be in the Cluster management committees, county and sub county value chain platforms, technical working groups (TWGs) and other structures. Recruitment to positions of leadership will therefore be done in manner that ensures the leadership is representative of all gender categories.

ii. Gender responsive farm mechanization & Processing equipments

The strategy envisions the participation of all people at all stages along the root and tuber crop value chains. The youth will be engaged through being involved in documentation work/ record keeping, business Development Services (BDS) and transportation of produce using motorcycles or handcarts and other affordable conveyances. Labour saving technologies such as planters and harvesters would alleviate this gender disparity in the root and tuber crops subsector.

Small scale mechanization machinery would lessen the burden for women farmers during planting and harvesting. Apart from power or fuel driven machinery, ox-drawn equipments can also be utilized.

iii. Access to financial support

For agricultural production to thrive, investment in terms of farm inputs including mechanization dictates that funds must be expended. Financial institutions have not been forthcoming towards funding agricultural activities. For the few that have, the conditions set for their release of these funds are not suited for the youth and the women. The requirement for collaterals such as land Title Deeds, car log books and equity shares are way beyond the reach of the majority of the women and youth. Financial institutions will therefore be encouraged to develop gender responsive financial products that will ensure that these gender categories will be fully engaged at all levels of value chains development. The envisaged agribusiness revolving fund will also pay special interest in the promotion of gender by targeting these groups for funding.

5. INSTITUTIONAL AND LEGAL FRAMEWORK

5.1 Institutional Framework

The root and tuber crops coordination structure will be at four levels of National, County, Sub County and ward. At each ward, the Ward Root & Tuber Cluster Management committee (WRTCMCs) shall be constituted from among the elected leaders representing Agricultural producers, market traders, transporters, processors, service providers, Youth, PLWD, and ex officio members from the following government departments trade, Agriculture, ward administrator, revenue and public Health. Their main role is to supervise and link all markets within the county and with other counties.

The Ward Root & Tuber Crops Cluster Management committee (WRTCCMCs), three subcommittees shall be formed including Production subcommittee, Marketing Subcommittee and Finance subcommittee. The membership of the subcommittees shall be drawn from among the members of the ward committee (WRTCCMC) the Other MDAs shall be co-opted on need basis from time to time to address unique market constraints. The chair will be elected in the first sitting but will be from the private sector. The secretary for the Ward committee will be an employee of the County Government. Their main roles will be to oversee the market activities and mobilize resources. The market players shall be elected through a transparent, democratic process and candidature shall be through self-interest. Membership will be voluntary and all market players in the county are eligible to participate in the election of the members.

The fifth Root and Tubers Crops development institution to be formed will be known as Market Management Development Team. The teams will be based at the market and undertake the day to day activities of the market. The Team will consist of a Manager assisted by 3 assistant managers each in charge of production, marketing and finance. The committee will be assisted by a technical team composed of 2 staff one in charge of production and marketing and 3 support staff in charge of data, revenue & accounts all hired competitively. The market development teams shall be independent autonomous but with defined linkages with relevant County Government departments through the ward cluster management committees. The teams will be remunerated to ensure commitment to their responsibilities. Their main responsibility is to coordinate all production and marketing activities and ensure compliance to produce, Food safety and standards. Other key role will be to implement an efficient data collection and dissemination system that will feed directly into an integrated MIS accessible at both county and national levels.

The root and tuber crops stakeholder institutions will be established from the ward, sub county, County and national levels. These will be composed of both technical and non technical representatives from the various agencies in the root and tuber crops value chains including both National and County Governments, NGOs, Donor agencies, farmer organizations (CBOs, Self help groups, Cooperatives), Traders and processors.

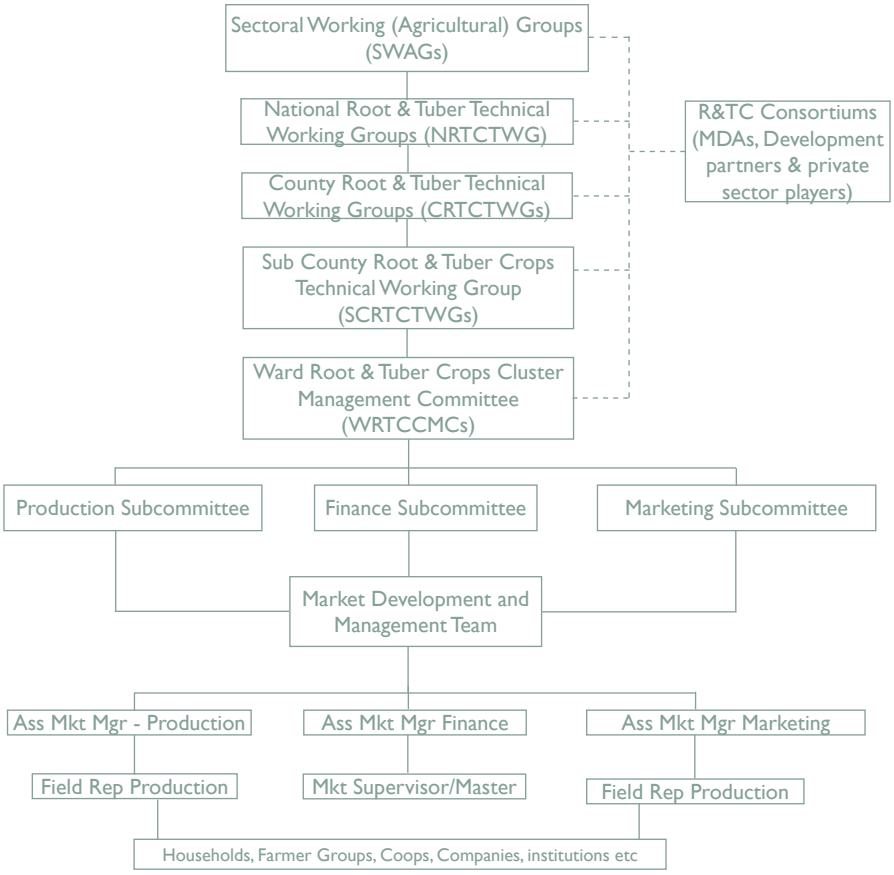


Fig 6: The National R&TCs Coordination Structure

5.2 The Legal framework

The Constitution of Kenya 2010: Article 43 (1) (c), Article 53 (l) (c), Article 21 and Article 27 guarantees the right to food and adequate nutrition and the universal right to food and nutritional health, and protection from discrimination. Fundamental duty for Ministry of Agriculture is to take legislative, policy and other measures, including the setting of standards, capacity building and policy dialogue to achieve progressive realization of the rights set under Article 43(1) c

Schedule 4 of the constitution assigns both the NG & CG functions of delivering essential agricultural services. This will be achieved through the implementation of the sustainable development goals of ending poverty (Goal 1), ending hunger (Goal 2), Ensuring healthy lives (Goal 3), Employment creation (Goal 8) and sustainable consumption and production (Goal 12). Both the national and County Governments will be expected strategically intervene through review/Enactment of legislation for efficient and effective implementation of the National Root and Tuber Crops development strategy at both national and county levels.

The other instruments to drive the attainment of the objectives of the National Root and Tuber Crops development strategy will include the Vision 2030 economic pillar, the Food and Nutrition Security Policy, Agricultural Sector Transformation and Growth Strategy -2018-2028, Gender Mainstreaming Strategy and the Youth and Agribusiness Strategy

Both levels of government will be expected to introduce specific budget lines for sustainable implementation of National Root and Tuber Crops development strategy including the establishment of resource mobilization desks for the inclusion of all stakeholders in financing the National Root and Tuber Crops development programs/projects.

6. SUSTAINABILITY OF ROOTS & TUBER CROPS SUBSECTOR

The established root and tuber crops coordination and management institutions from the Ward to the National level, the distribution of functions between the National and the County Governments and the involvement of both local and international agricultural development agencies will ensure the sustainability of the initiatives towards the development of the root and tuber crops value chains.

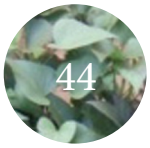
Commissions, levies and membership fees collected will be used to pay for provision of costs of offering agribusiness services. These include purchase of seeds and planting materials. The ward and market management leaders will be trained on business skills to improve delivery of agribusiness services to stakeholders. They will also undergo training and mentorship on business plan development to get access to financial services i.e credit and insurance facilities from the financial institutions. In addition, the National and County Government will introduce competition among the wards to motivate the SH leaders to improve performance. Lastly, ISO 9001-2015 QMS will be introduced to improve efficiency and effectiveness of the services offered by the market teams to all clients.

7.0 MONITORING LEARNING & EVALUATION

Monitoring and evaluation is a key element for the success of the strategy. In general, this strategy shall adopt participatory Monitoring, Learning and Evaluation (MLE) approach. Baseline data will be collected during the registration of stakeholders and clear indicators established for all activities identified for monitoring of progress. Further media will be part of the implementation team to assist in sensitization and continuous reporting on the progress of the strategy. At county level, regular field visits shall be organized with key collaborators such as government extension officials from Ministry of Agriculture, Livestock and Fisheries, development partners, stakeholder management team leaders and project beneficiaries. This will ensure that partners have a common understanding of emerging issues, challenges and forge common approaches for solving them.

Reports will be used to monitor progress in implementation. Standard reporting formats will be developed to capture all the baseline information and other significant events and outcomes within the target groups. The beneficiaries will be expected to provide quarterly information on the progress in the implementation of the planned activities and any achievements.

Learning will be part and parcel of the strategy activities where regular exchange visits will be organized for project beneficiaries. Evaluation will be a key feature of the project. Relevant Institutes will be supported to undertake evaluation of the strategy. In this regard the Ministry will develop impact indicators with the relevant evaluation experts to assist in effective evaluation. During any evaluation, beneficiaries shall be involved and their views given highest priority. Results of any evaluation shall be made public and the governments at both county and national encouraged implementing recommendations and replicating them in other counties.



8.0 CONCLUSIONS

Kenya's endeavor to attain sustainable food security and reduction in poverty is pegged on increasing productivity, diversification of crop and livestock enterprises and commercialization of the agricultural sector. The National Root and Tuber Crops Strategy is formulated in the context of the primary contemporary national and sectorial policies and strategies: Kenya Vision 2030, The Third Kenya Vision 2030 Medium Term Plan (MTP 2018-2022), the Agricultural Sector Transformation and Growth Strategy (ASTGS, 2018 - 2028) especially on the aspects of value addition of agricultural products and expanding existing and creating new markets, and the National Food Security and Nutrition Strategy (NFSNP).

Full exploitation of the potential of the roots and tuber crops, as a source of food, feed and other agro-raw materials is constrained by an array of challenges ranging from institutional deficiencies, asymmetric market and technological information and sub-optimal basic crop husbandry practices. Of particular importance is in-availability of adequate quality clean seed and planting materials.

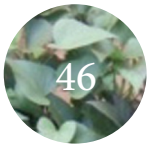
Developing roots and tuber crops into commercially viable enterprises requires profound institutional organization of production and marketing agents along the value chain. At the primary level, farmers will come together and form production groups for coordinated support and to upscale agribusiness concerns to reap economies of scale. In addition, procurement of services and inputs (e.g. planting materials and disposal of produce) will be under the same groups. Thereafter, the same farmer organizations will strive to look for and acquire technology for value addition.

An additional dimension to long-term declining production of root and tuber crops is adverse Climate Change. These changes attributed to global warming are manifested in amplified wide fluctuations in the rainfall regime (commencement dates, amounts, distribution and cessation) and temperature swings which precipitate structural distortions in crop adaptability and productivity in certain agro-ecological zones hitherto suitable for such crops. Pollution from industrial wastes, overuse of mineral fertilizers and pesticides, unsustainable farming practices (such mono-cropping) have also led to decline in productivity and overall production of crops. Poor land use practices and low adoption of conservation initiatives by farmers have led to soil erosion and land degradation especially in fragile ASALs and hence overall reduction of land area suitable for crop production. Contemporary research shows that root and tuber crops have higher tolerance thresholds to a variety of stresses that could result from climate change.

Full implementation of this Strategy will cost approximately KShs.2.7 billion, over the next 4 years, partially financed by the National Government, County Governments, development partners and other stakeholders, as detailed in Annex I (Implementation Matrix). Seed money will be in form of advances from both levels of Government, other donors, and thereafter commissions collected and grants shall form the main source. Funds raised

from donations and other sources will be paid into a revolving fund account established and managed by the SH leadership institutions and will be used to finance agribusiness activities and remuneration of the leaders and staff. This fund will also finance research and technology development for addressing gaps identified by the stakeholder organization (such as provision of quality planting materials and farm inputs, appropriate technology for value addition etc.).

Finally, a secure economy is anchored on an innovative, commercially oriented and competitive agricultural sector. A modern and thriving agriculture can ensure food and nutrition security and improve the incomes of Kenyans through creation of an enabling environment and sustainable natural resource management. The outputs outlined in this strategy once implemented collectively by all stakeholders will deliver the vision stated herein.



APPENDICES

Annex I: Roots and Tuber Crops Sub Sector Implementation Matrix

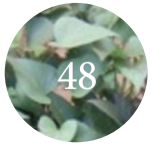
Annex II: Process of Formation of Stakeholder Based Institutions, Requirements and Responsibilities

Annex III: Existing Roots and Tuber Crops Standards

Annex IV: Reporting Formats for Roots and Tuber crops

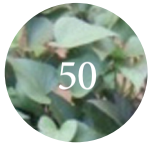
Annex I: Roots and Tuber Crops Sub Sector Implementation Matrix

Results: Areas of intervention and respective outputs, Intervention strategies and activities	Expected outputs	Responsible/ Collaborators	Performance indicator	Time Frame	2019-22 Est 000' Kshs
Output 1: Robust and self regulating institution with diverse linkages to provide agribusiness information and financial services established					
Credible stakeholder based institutions at ward, sub county, county and National level formed	Improved information flow and coordination of roots and tuber crops along the value chains	National and County Governments	No. of functional institutions	2019-2020	4,130
Linkages and partnerships for promotion and regulation of both national and county R&TCs partner institutions formalized	Improved information flow and coordination of roots and tuber crops along the value chains	County Government	No. of partnerships formed	2019-2020	1,050
Incentives for investment in root and tuber crops value chain increased	Increased investments in the value chain	National and County Governments	No. of investors (SMEs) No. of financial and BDS services accessed	2019-2022	31,500
Produce and product standards for R&TC developed and enforced	Enhanced Production and Trade	National and County Governments, KEPSA and KEBS	No. of protocols, standards developed and adhered to	2019-2022	4,568
Sub- Total: Output 1					**41,248**



Results: Areas of intervention and respective outputs, Intervention strategies and activities	Expected outputs	Responsible/ Collaborators	Performance indicator	Time Frame	2019-22 Est 000' Kshs
Output 2: Increased and sustainable production and supply of quality roots and tubers produce and product					
An efficient clean, quality seed system for seed and planting materials for roots and tuber crops developed and implemented	Improved access to clean, quality seeds/ planting materials for roots & tuber crops	National & County Governments, KEPHIS, KALRO, CIP	Quantities of seed/ planting materials acquired by farmers	2019-2022	608,000
Appropriate technologies, skills, and technical information on root and tuber crops developed, packaged and disseminated to all stakeholders	Improved skills and technology uptake in R&TCs value chains	National and County Governments (Extension, Training & Research Institutions)	No of packages disseminated	2019-2022	630,000
Demand driven research and technology development for root and tuber crops strengthened	Enhanced performance of R & T Cs value chains	National and County Governments, research institutions	No of technologies developed	2019-2022	750,000
Use of climate smart technologies in production, processing and marketing of roots and tuber crops	Climate smart technologies enhanced	National and County Governments (Extension, Training & Research Institutions)	No of climate smart technologies promoted	2019-2022	2,804
Sub- Total Output 2					**1,990,804**

Results: Areas of intervention and respective outputs, Intervention strategies and activities	Expected outputs	Responsible/ Collaborators	Performance indicator	Time Frame	2019-22 Est 000' Kshs
Output 3: Market access for roots and tuber crops produce and products Increased					
An efficient roots and tuber crops Management Information System with inbuilt data collection, accessible at both County and National levels developed and implemented	Improved data based planning and decision making	National and County Governments, service providers	An operational IMS	2019-2022	630,000
Market analysis undertaken and local and foreign market supply chains for root and tuber crops developed	Market driven production and trade linkages and networks established	National Government, County Government, development partners, NGOs, INGOs	No. of trade linkages and networks established No. of products & tonnage exported	2019-2022	5,000
Promotion of Utilization of root and tuber crops through processing, development of appropriate recipes, composite blending ratios and animal feed rations	Increased per capita consumption & productivity of R&TCs	NG, CG, Universities, KIRDI, TWGs, KIBT	No. of recipes, food and feed products developed	2019-2022	19,200
Sub-Total Output 3					**654,200**



Results: Areas of intervention and respective outputs, Intervention strategies and activities	Expected outputs	Responsible/ Collaborators	Performance indicator	Time Frame	2019-22 Est 000' Kshs
Output 4: Gender , youth and PLWD sensitive Stakeholder institutions, technologies, financial products and data developed and environmental concerns addressed along the value chain					
Affirmative action for involvement of all gender categories during establishment of stakeholder institutions	Gender participation in value chain planning improved	National Government, County Government, development partners, NGOs, INGOs	No. of gender responsive institutions established	2019-2022	2,804
Gender responsive Farm mechanization & Processing equipments	Increased participation of all gender in all farm and processing operations established	NG, CG, Universities, KIRDI, TWGs, KIBT	No. of gender responsive equipments promoted established	2019-2022	6,344
Gender responsive farm mechanization & processing equipments	Increased investment in the value chain by all gender categories	National Government, County Government, development partners, NGOs, INGOs	No. of gender responsive financial products developed	2019-2022	7,644
Sub-Total Output 4					**16,792**
Estimated Total Budget					**2,703,044**

Annex II: Process of formation of Stakeholder Based Institutions, requirements and responsibilities

A. The Structure

The market management structure in the strategy will be at four levels of government; National, County, sub county and ward. The market management committees shall be constituted from among the elected leaders representing Agricultural producers, market traders, transporters, processors, service providers, Youth, PLWD, and ex officio members from the following government departments trade, Agriculture, ward administrator, revenue and public Health. Their main role is to supervise and link all markets within the county and with other counties.

At the market the current Market committees shall be converted into Market boards with a maximum of 9 members to ensure a smooth transition in market management. The board membership shall consist property owners, agricultural producers, market players and ex-officio members from among the relevant Government ministry's, departments. Other MDAs shall be co-opted on need basis from time to time to address unique market constraints. The chair will be elected in the first sitting but will be from the private sector. The secretary for the board will be an employee of the County Government. Their main role will be to oversee the market activities and mobilize resources. There remuneration will be inform of allowances paid during the meetings.

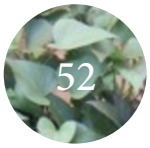
The market players shall be elected through a transparent, democratic process and candidature shall be through self-interest. Membership will be voluntary and all market players in the county are eligible to participate in the election of the board members.

The third market institution will be formed will be known as Market Management Development Team. The teams will be based at the market. The Team will consist of a Manager assisted by 3 assistant managers each in charge of production, marketing and finance. The committee will be assisted by a technical team composed of 2 staff one in charge of production and marketing and 3 support staff in charge of data, revenue & accounts all hired competitively. The market teams shall be independent autonomous but with defined linkages with relevant County Government departments through the market bards. The teams will be remunerated to ensure commitment to their responsibilities. Their main responsibility is to coordinate all production and marketing activities and ensure compliance to produce, Food safety and standards. Other key role will be to implement an efficient data collection and dissemination system that will feed directly into an integrated MIS accessible at both county and national levels.

B. Process of Formation

The main aim is to reach out to all households in each county so that all interested stakeholders can register to participate in agribusiness activities. The mobilization will be done through local vernacular and national radio stations, posters, word of mouth to ensure that all clients receive accurate information. Formation will involve the following steps:

a) Sensitization, and awareness on the strategy and the minimum qualification, roles and responsibilities for market teams,



b) Mobilization, registration of all VC actors,

c) Preparation of lists for candidates for various elective positions,

d) vetting of candidates for integrity before elections,

e) Holding elections of market team's wards, Sub county, County and National levels,

f) Capacity Building of the teams in marketing and business skills,

g) Ward Market Management committee will be the lowest management level,

h) Establishment of a revolving fund account to finance operations and for deposits of all funds collected.

C. Requirements' for election to market teams

i. Market Manager

Requirements for election and subsequent appointment to this position:

a) Post-secondary level education

b) Must be resident of the ward/market

c) Must be involved in agribusiness activities – production, input supply, buying and selling, transportation, processing or consumption etc,

d) Computer literate

e) Ready to offer self for the position

f) Elected democratically by the SHs in the ward

g) Demonstrated leadership abilities

ii. Assistant Manager Finance

Requirements for election and subsequent appointment to this position:

a) Post primary level education

b) Minimum certificate or diploma in accounts related profession

c) 3 years' experience in related service

d) Must be involved in agribusiness activities – production, input supply, buying and selling, transportation, processing or consumption etc, added advantage

e) Computer literate

f) Ready to offer self for the position

g) Elected democratically by the SHs in the ward

The Assistant manager will be assisted by two clerks one in charge of revenue and the one in charge of accounts

iii. Assistant Manager - Production

Requirement for election and subsequent appointment

a) Post primary level education

b) Minimum certificate or diploma in agribusiness related profession

c) Minimum 1-year experience in related field

d) Must be involved in agribusiness activities – production, input supply, buying and selling, transportation, processing or consumption etc,

e) Computer literate

f) Ready to offer self for the position

g) Elected democratically by the SHs in the ward

He or she will be assisted by the field officer(s) in charge of production.

iv. Assistant Manager Marketing

Requirement for election and subsequent appointment

a) Post primary level education

b) Minimum certificate or diploma in agribusiness related profession

c) Minimum 1-year experience in related field

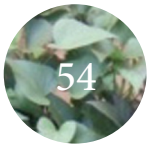
d) Must be involved in agribusiness activities – production, input supply, buying and selling, transportation, processing or consumption etc,

e) Computer literate

f) Ready to offer self for the position

g) Elected democratically by the SHs in the ward

He or she will be assisted by the field officer(s) in charge of production.



v. Field Representatives

There will be two sections at the Ward one to deal with production and the other marketing. the no of reps will depend on spread and intensity production and marketing activities.

1) Production representative

Requirement for election and subsequent appointment

a) Primary or post primary education

b) Actively engaged in agribusiness

c) Willing to offer self for election to the position

2) Marketing representative

Requirement for election and subsequent appointment

a) Primary or post primary education,

a) Actively engaged in agribusiness activities,

b) Willing to offer self for election to the position,

D. Process of Formation

The main aim is to reach out to all households in each county so that all interested stakeholders can register to participate in agribusiness activities. The mobilization will be done through local vernacular and national radio stations, posters, word of mouth to ensure that all clients receive accurate information. Formation will involve the following steps:

i). Sensitization, and awareness on the strategy and the minimum qualification, roles and responsibilities for market teams

ii). Mobilization, registration of all VC actors

iii). Preparation of lists for candidates for various elective positions

iv). Vetting of candidates for integrity before elections,

v). Holding elections of market team's wards, Sub county, County and National levels

vi). Capacity Building of the teams in marketing and business skills

vii). Ward Market Management committee will be the lowest management level

viii). Establishment of a revolving fund account to finance operations and for deposits of all funds collected

E. RESPONSIBILITIES FOR MARKET INSTITUTIONS

i. National Root & Tuber Crops Technical Working Group (NRTCTWG)

The NRTCCTWG will provide the critical link among all markets within the country as well as international markets. In addition, it will be responsible for consolidating national and exports demands and sharing with relevant markets for translation into production statistics. Other responsibilities include:

a) Establishment and administration of roots and tuber crops fund,

b) Coordinate counties production and marketing activities,

c) Prospecting for external markets in collaboration EPCs,

d) Negotiating and preparation of contractual agreements with national regional and international markets,

e) Compile and share with government industry's production and marketing data,

f) Participate in development of quality standards and standardization,

g) Disseminate external market specifications and standards,

ii. County and Sub County Root and Tuber Crops Committees

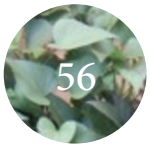
Reporting to the NRTCCTWG, the County Root and Tuber Crops committees will be responsible for the following:

a) Interpret the volumes of produce/products demanded into production statistics,

b) Disseminate production statistics, market requirements and standards,

c) Coordinate production and marketing activities at various markets,

d) Compile county production and marketing data,



e) Participate in development of quality standards and specifications for county specific value chains.

f) Compile an inventory of idle agribusiness equipment and machineries in county,

g) Initiate the process of rehabilitation and management of the idle assets,

h) Organize meetings between markets teams in county,

i) Dissemination of market information, produce and product standards to the wards.

iii. Ward Market Development and Management Teams

The market management & Development teams will be based at established markets. Mainly responsible for day to day running of these outlets. Specific functions will include:

a) Processing and dissemination of market information received from the county and buyers,

b) Safe custody of produce,

c) Preparation and signing of contractual agreements,

d) Market hygiene and arrangement,

e) Submit surplus produce to processing plans,

f) Compiling data on production and marketing,

g) Compile, process and distribution of inputs,

h) Collection of levies, commissions and cess for produce received directly from farmers,

i) Management of market waste,

j) Plan and initiate market development initiatives.

iv. Partner Institutions

Composition will include Government Ministry's departments and Agencies. Their roles will include:

a) Undertake policy formulation, implementation and regulation,

b) Supervise collection, cleaning, validation and entry of baseline information for households and market players,

c) Undertake market surveys – analysis and market intelligence gathering

d) Validation of data collected on regular basis,

e) Skill development of SHs on technical and business skills.

f) Supervise implementation of production plans and schedules,

g) Compile and analyse weekly, monthly, production and sales record for various commodities at the market centres,

h) Promotion of new technologies,

i) Ensure adherence to quality standards, market hygiene and sanitation

j) Facilitate establishment of quality support services e.g pest control, harvest, transportation, and post harvest handling, processing, etc,

k) Supervise and enforce collection of taxes, levies and other charges,

l) Preparation of project financing proposals and business plans,

m) Identify idle public structures or space,

n) Resolve market land dispute/allocations issues,

o) Prepare and seek approval for market designs,

p) Undertake EIA studies,

q) Supervise repair/construction and rehabilitation of markets,

r) Undertake Monitoring and Evaluation of the marketing activities.

v. Responsibilities for Market Manager

He/She will be the overall person in charge of the marketing activities in the market. Duties entail coordinating the production and marketing activities as well as ensuring that all financial transaction for business activities at the market are executed in timely manner.

vi. Responsibilities of Assistant Manager finance

Reporting to the Market manager, the assistant manager finance will be mainly responsible for ensuring processing of all payments, statutory collections and remittances for goods and services offered at the market. In addition, he or she will:

a) Maintain accurate records on all transactions made,

b) Ensure timely recovery and remittance of all credit advanced to the value chain players,

c) All statutory deductions and levies are collected and remitted promptly,

vii. Responsibilities Assistant Manager Production

Reporting to the ward manager he or she will ensure efficient coordination of production activities in the ward. In addition he or she will:-

a) Participate in the development of production plans by the ward agricultural officer,

b) Compile input requirements from the locational production representatives,

c) Timely processing and delivery of inputs required,

d) Timely harvesting and delivery of produce to the trade centres,

e) Compilation of weekly production reports as per the agreed formats.

viii. Responsibilities Assistant Manager Marketing

Reporting to the ward manager, the ward assistant marketing manager will be responsible for efficient coordination of marketing activities and timely input supply. In addition, he or she will be responsible for:

a) Processing of orders from the sub county marketing executive,

b) Timely delivery of produce by owners to the trade centres,

c) Timely payment for the produce delivered at the trade centres by owners,

d) Supervision of the sub location marketing representatives

ix. Responsibilities Market Field Production representative

Reporting to the ward production member, the representative will coordinate production at the farm level. In addition, he or she will:

a) Collect baseline data for all VC players at sub location,

b) Implement production plans,

c) coordinate farmers access to support services i.e land preparation, weed & pest control etc,

d) Coordinate delivery of produce to the trade centres.

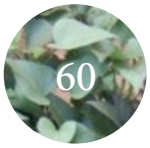
x. Responsibilities Market Field marketing representative

Reporting to the ward marketing member the representative will coordinate farm level produce marketing and input supply. In addition, they will:

a) Compile and submit to ward marketing leaders input requirements by farmers,

b) Disseminate market information and market specifications,

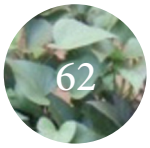
c) Supervise harvesting, sorting of produce and delivery to market centres.



Annex III: Existing roots and tuber crops standards

Standard	Product	Classification
KS 2063:2009;	Cassava chips	Specification
KS EAS 743:2010	Cassava crisps	Specification
KS EAS 782:2012	Composite flour	Specification
KS EAS 745:2010	Potato Crisp Part 1: Potato crisps (Second Edition). Part 2: Cassava crisps	Specification
KS EAS 739:2010	Dried cassava chips	Specification
KS 433:2007	Edible cassava starch	Specification
KS EAS 742:2010	Food grade cassava starch	Specification.
KS EAS 778:2012	Fresh bitter cassava	Specification
KS EAS 780:2012	Fresh cassavas leaves	Specification
KS EAS 748:2010	Fresh potato tuber (ware potato tuber)	Specification
KS EAS 771:2012	Fresh sweet potatoes	Specification
KS EAS 747:2010	Fried potato chips	Specification
KS EAS 746:2010	Frozen potato chips	Specification
KS 2090:2007	Handling of ware potatoes	Code of practice
KS EAS 745:2010	Potato crisps	Specification
KS EAS 776:2012	Production and handling of fresh cassava	Code of practice
KS EAS 775:2012	Production and handling of fresh ware potatoes	Code of practice
KS COD STAN 114:1981	Quick frozen French fried potatoes. Roots and tuber products	Guide to storage
KS EAS 777:2012	Reduction of acrylamide in potato products	Code of practice

KS 2077:2007	Seed potato	Specification
KS 1094-3:1997	Specification for Crisps - Part 3: Banana Crisps	Specification
KS ISO 2165:1974	Ware potatoes	Guide to storage
KS 2091:2007	Ware potatoes	Specification



Annex IV: Reporting Formats for Roots and Tuber crops

Section I: Introduction

Reporting period

General information e.g household Food security situation, weather, business environment, significant market changes, new developments in e.g leadership infrastructure status etc

Section II: Summary Staff Performance Report

Name of Service Providers	No of Staff	Target Areas	Areas Covered	Target No of Clients
Targets No of Clients	No of Clients Reached	Skills courses attended	Comments by staff	Comments by the supervisor

Notes:

Section III: Market Demand analysis summary Report

Commodity (specify)	Category of Buyers	Quantity Demanded (Kgs)	Produce/ Product standards & Specification	Frequency of demand (Monthly, Quarterly, etc)	Qty Bought Kgs	Price/ Unit
Losses in Kgs	Total Value Kshs	Total Cess collected Kshs	Total Taxes	Total Levies/ Commission	Net Earnings	Remaks

Notes:

- Total quantity demanded will in-form the production targets for enterprises commodities. "Principal ***of Sale first before u produce"***
- Category of buyers: Include Local Traders, Institutions (Schools, Colleges, Universities, Hospitals, Other Institutions Please specify) Exporters, processors

Section IVa: Input Requirements report

Volume of Commodity demanded specify (Kgs)	Estimated production Area	Type of inputs (seed, vines, cuttings, assorted, fertilizers, pesticides, others specify)	Quantities of each Kgs
Price per unit	Total Cost Kshs	Commissions %	Interest Rate %

Note: This table should be generated automatically except for the field on prices due to fluctuations.

Section IVb: Elite Seed demand projections report

Variety	Output per Acre	Certified Seed/Planting materials Required per Acre	Qty of Basic seed/ planting materials	Qty of breeders seed required
No of multipliers		Total Area Acres	Unit	Qty Produced
Qty Certified	Qty rejected	Reasons for rejection	No of recipient farmers	Remarks

Note: The figures in column 3 above will be derived from column 4 row one in table IVa above

Section V: Physical Market Infrastructure Report

Name of county	Name of sub county	Name of ward	Name of market	Types of produce handled	Quantities of produce handled Kgs
Storage capacity Kgs	Produce/ products stored	Quantity in store	Storage losses	Storage costs/unit kshs	Total value of produce handled
Market Fees Collected		Total Cess Collected		Commissions collected	

Notes:

Section VIa: Farmers Crop Production report format

Market Code	Enterprise Name	No of farmers to grow the crop	Mean Target Incomes Kshs	Total acres grown	Total Input costs*
Total production Kgs	Qty harvested	Qty consumed at household	Qty utilized as feed for livestock	Post-harvest losses kgs	Qty sold
Total Annual income Kgs	On-Farm Value addition activities	No of Products	Constraints in farming	Suggested solutions	Remarks

***Note:** These include certified seed, farm saved seed, planting fertilizer, top dressing fertilizer, field pesticides, storage pesticides

Form 3: Farmer Farm tools, equipment and machinery data (feed into machinery report format)

Separate report for each commodity commercial & Household food security

Section VII: Ward Market Management Committees

Name of market	Ward	Mobile	Emails	Current market infrastructure
No of service providers registered	No of Services offered	Total Amt paid for services kshs	Quantity of Produce handled	Quantity sold
Quantity of produce stored	Qty Produce processed	Quantity of products sold	Total raised kshs	Qty of products stored
Total Expenditures	Total Levies Collected	Taxes Collected	Other collection	Total funds raised from other source
Bank Account status	No of meetings held	Meeting resolutions	Actions	Remarks

Note: Gender representation ratios, total number of market players (producers, buyers, processors, service providers & others).

Section VIII: Service Providers Report format

Name of tools, equipment's, Machinery and transportation modes	No of units	Total No units	Total acres/km covered	Total Number of clients served	Quantity of produce/ products moved
No of clients served	Total capacity	Capacity utilized	Produce/ product losses kgs	Estimated monthly earnings	Remarks

Note: Categories Hand Tools, Animal Draught power tools, Small motorized machinery, Medium 40-60Hp machinery, Large 80-120 machinery

Section IX: Processed products, standards and enforcement report

No of commodities	Total no of products	No of products standardized	No of standards developed
No of standards reviewed	No of actors sensitized	No of inspection certificates issued	No of standards adopted
No of new recipes and rations developed	No of demonstrations done	Quantities sold	Remarks

Note:

Section X: Conservation & Expansion of Germplasm report

Name of Crop	No of accessions/ Varieties	Period of preservation	No of conservation methods	Total Amount for regeneration	Conservation Method	Remarks

Notes

Section XI: Technology Development Innovation & packaging report

Gaps not filled by existing technologies	Name of value chain	No of calls made for innovators	Time of call	No of innovators responding	No selected for incubation

Period of incubation	Est Cost of incubation	No released	No packaged & disseminated	Adoption rate	Remarks
Name of technology	Number of users	Duration of use	No of modes of technology packaging	Feedback (Online physical, call, sms etc)	Remarks

Notes

PART XII: Sustainable farming - Climate smart agriculture

Climate mart Initiative	No of households/ individual practicing	Cumulative carbon credit values	Total amount paid per ward Kshs	Effects on climate change	Remarks

Note: Effects on climate change- Reduced soil erosion, use of mineral fertilizer, siltation in rivers, water table etc

Section XIII: Training and technology dissemination

No of TNA conducted	No of gaps identified	No of training Method used****	No of trainings	No of SHs trained	Remarks

****Notes:**

- Includes demonstrations, technology dissemination forums/seminars/ workshops, open days'/field days and media
- All information, technologies skills and knowledge for the commodity value chain will be carefully packaged and disseminated though training organized, demonstrations and through the media, posters, barazas and other public gatherings to ensure maximum reach

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