REPUBLIC OF KENYA

NATIONAL AGRICULTURAL RESEARCH SYSTEM POLICY 2021

THIRD DRAFT
May, 2021

REPUBLIC OF KENYA

NATIONAL AGRICULTURAL RESEARCH SYSTEM POLICY 2021

Ministry of Agriculture, Livestock, Fisheries and Cooperatives
State Department for Crop Development and Agricultural Research
Kilimo House,
Cathedral Road,
P. O. Box 30028 – 00100,
Nairobi, Kenya.

Tel. +254-20-718870
Email : psagric@kilimo.go.ke
Website: www.kilimo.go.ke

Contents

Abbreviations

AFA	Agriculture and Food Authority
AG	Attorney General
AgGDP	Agricultural Gross Domestic Product
AIRC	Agricultural Information Resource Centre
AREE	Agricultural Research, Extension and Education
ARF	Agricultural Research Fund
ARR	Annual Review Report
ASTGS	Agricultural Sector Transformation and Growth Strategy
AU	African Union
CAADP	Comprehensive African Agriculture Development Programme
Cap	Chapter, Laws of Kenya
CARSF	County Agricultural Research System Forum
CECM	County Executive Committee Member
CEO	Chief Executive Officer
CGIAR	Consortium of International Agricultural Research Centres
CGS	Competitive Grant System
CoG	Council of Governors
CoK	Constitution of Kenya
CRAC	Centre Research Advisory Committee
CRF	Coffee Research Foundation
CS	Cabinet Secretary
EAAFRO	East African Agriculture & Forestry Research Organization
ERSWEC	Economic Recovery Strategy for Wealth and Employment Creation
FARA	Forum for Agricultural Research in Africa
FSA	Farming Systems Approach
FSA-RET	Farming Systems Approach to Research, Extension & Training
IAR4D	Integrated Agricultural Research for Development
ICT	Information Communication Technology
IFPRI	International Food Policy Research Institute
IM&ES	Integrated Monitoring and Evaluation System
IPR	Intellectual Property Rights
KALR	Kenya Agricultural and Livestock Research
KALRO	Kenya Agricultural and Livestock Research Organization
KARI	Kenya Agricultural Research Institute
KARO	Kenya Agricultural Research Organization
KEFRI	Kenya Forestry Research Institute
KEMRI	Kenya Medical Research Institute
KENAFF	Kenya National Farmers Federation
KENET	Kenya Education Network
KENIA	Kenya National Innovation Agency
KESREF	Kenya Sugar Research Foundation
KETRI	Kenya Trypanosomiasis Research Institute
KIAMIS	Kenya Integrated Agricultural Management Information System
KIPI	Kenya Industrial Property Institute

KIRDI	Kenya Industrial Research Development Institute
KMFRI	Kenya Marine Fisheries Research Institute
KNBS	Kenya National Bureau of Statistics
KSC	Kenya Seed Company
M&E	Monitoring and Evaluation
MoALFC	Ministry of Agriculture, Livestock, Fisheries and Cooperatives
MoU	Memorandum of Understanding
MSc	Master of Science
SMEs	Small and Medium Enterprises
NACOSTI	National Commission for Science, Technology and Innovation
NARI	National Agricultural Research Institute
NARIF	National Agricultural Research and Innovation Fund
NARS	National Agricultural Research System
NARSF	National Agricultural Research System Forum
NCST	National Council for Science and Technology
NG	National Government
NGO	Non-Governmental Organizations
NIA	National Irrigation Authority
NIB	National Irrigation Board
NIMES	National Integrated Monitoring and Evaluation System
NRF	National Research Fund
PhD	Doctor of Philosophy
PPPs	Public-Private-Partnerships
R&D	Research and Development
SDGs	Sustainable Development Goals
SRA	Strategy for Revitalizing Agriculture
ST&I	Science, Technology and Innovation
TIMPS	Technologies Innovations and Management Practices
TWG	Thematic Working Groups
TRFK	Tea Research Foundation of Kenya
UNIs	Universities

Glossary

Agriculture	Cultivation of land and use of land (whether or not covered by water) for any purpose of husbandry and includes crop and livestock production, seed growing; bee keeping and breeding; conserving and keeping game animals, game birds and other protected animals and all aquatic animals; the use of land for grazing, meadow, market garden or nursery ground; and the use of land for woodland and other forms of agroforestry, when that use of land is ancillary to the use of land for other agricultural purposes.
Agricultural Knowledge and Information System	The sources and parts of technical and other knowledge and information that clients in the agricultural product value chain access and use. It includes indigenous knowledge and practices, technical knowledge and information generated through formal research work, knowledge and information accessed through education institutions and extension systems or otherwise available through publications and the electronic media and related technologies or infrastructure.
Agricultural Product Value Chain	The full range of activities that are required to transform an agricultural product or service from conception through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to consumers, and final disposal after use.
Agricultural Research	The means for advancing, accumulating and improving knowledge and technologies of agriculture and related sciences. This is achieved through original and other scientific investigations and methods into the production, treatment or handling of an agricultural product, including research required to better understand the process or the environment necessary for producing an agricultural product with the objective of advancing agriculture.
Client	In the context of this policy, a client is any person / organization involved in agricultural production, research, extension, education, processing and agribusiness enterprise.
Farming System Approach	A multi-(inter and intra)-disciplinary approach to generating and diffusing knowledge and technologies for specific target groups of clients with their participation focusing on identified priority problems, constraints and opportunities of the production system under consideration under different biophysical and socio-economic conditions, with emphasis on improving the productivity of the existing system.

Innovation	A new idea, technology or process for increased responsiveness and competitiveness of the agricultural sector.
National Agricultural Research System	A system that brings together public and private sector research institutions, universities and other tertiary institutions, non-profit organizations, producer groups, civil society organizations and groups, individuals and private companies engaging in integrated agricultural research for development.
Stakeholder	In the national agricultural research system, a stakeholder is any person or organization with a direct or indirect interest in agricultural research, innovation, extension and education.

Foreword

Agriculture remains a key sector in the Kenyan economy. The sector continues to play a pivotal role in the realization of economic growth and poverty reduction through contribution in food and nutrition security; raw materials for agro-industry; employment creation; and foreign exchange earnings. It remains a major economic pillar that addresses the Vision 2030 agenda.

The Government of Kenya recognizes the important role agricultural technology development and application can play in transforming and modernizing agriculture. The Agricultural Sector Transformation and Growth Strategy 2019 -2029 (ASTGS) addresses the challenges in the agricultural sector and recognizes that this sector can deliver the 10 percent annual economic growth that is envisaged under the economic pillar of *Vision 2030*. The Constitution of Kenya also acknowledges the importance of proper coordination and synergies in agricultural research and therefore placed it under the responsibility of the National Government while it placed services to farmers through agricultural extension under the county governments.

In view of this, National Agricultural Research System Policy 2012 was formulated for the sector and has been implemented since 2013. This has proven inadequate with the result being that agricultural research in Kenya is still poorly coordinated and exposed to risks of inefficiency, duplication of effort and misallocation of resources.

The poor coordination emanates from the fact that presently, agricultural research is guided by numerous Memoranda of Understanding, Treaties, Host Country Agreements, and legislations such as the Science, Technology and innovation Act 2013; the Kenya Agricultural and Livestock Research (KALR) Act 2013; as well as the Universities Act of 2012.

This National Agricultural Research System Policy 2021 seeks to streamline, rationalize and put in place a system that is consultative, efficient and effective and one that takes into account economies of scale to not only use the current scientific, human and physical capacities but also position Kenya as a hub for agricultural research, innovations and knowledge base in the region. The policy will thus create an enabling environment for a vibrant agricultural research industry that contributes to the overarching national policies of economic growth and wealth creation, poverty reduction and gender equity. It seeks to focus policy towards a problem-solving, client-driven and impact-driven research agenda; and to restructure the National Agricultural Research System to be better coordinated and efficient.

It is expected that the reform process prompted by the policy will be harmonized and mainstreamed into the transformational processes that are taking place in the fields of agricultural education, training and extension, as well as in other scientific fields for the realization of the Government's Big Four agenda on 100% food and nutrition security, and the Agricultural Sector Transformation and Growth Strategy (ASTGS).

Hon. Peter Munya M.G.H., E.G.H.
Cabinet Secretary
Ministry of Agriculture, Livestock, Fisheries and Cooperatives

Preface

Realization of food and nutrition security as envisaged in the Government key policies calls for increased agricultural production.

Presently, agricultural production is negatively affected by constraints and changing factors that include: increasing population pressure; unsustainable land and environment management practices; dependency on unreliable rainfed agriculture; inaccessible and high input costs; climate change resulting in severe, erratic weather patterns, and emerging pests and diseases; and, decreasing access to production resources such as, credit and technology amidst increasing poverty levels.

The adoption of agricultural technologies and innovations can lead to increased productivity and quality along agricultural value chains. However, agricultural research is constrained by: weak research-extension-farmer linkages; weak interdisciplinary collaborations and partnerships in agricultural research; inadequate capacity for research; slow adoption of new and emerging technologies; and, gender and socio-economic aspects of agriculture.

A logical, well-founded, solution-oriented and impactful agricultural research system is pivotal to addressing these challenges. In order to address the above constantly changing factors effectively and efficiently, agricultural research has to be dynamic too, well-coordinated and a never-ending process.

Implementation of the National Agricultural Research System (NARS) Policy 2012 did not succeed as intended by the Policy, due to the fact that it became impossible along the way to bring together all institutions and stakeholders in agricultural research to form the Kenya Agricultural Research Organization (KARO) that was envisaged in the Policy.

It is in the light of this shortcoming that the review of the NARS Policy 2012 became necessary so that it would create mechanisms for better regulation, coordination, research and development of the Agricultural Research System which is acceptable to all stakeholders.

This NARS Policy seeks: to streamline, rationalize and put in a system that is consultative, efficient and effective and takes into account economies of scale to not only use the current scientific, human and physical capacities but also position Kenya as a hub for agricultural research and development in the region; and, to create an enabling environment for a vibrant agricultural research industry that contributes to the overarching national policies of economic growth and wealth creation, poverty reduction, gender equity, increased productivity, improved livelihoods, environmental sustainability, and eventually sustainable development.

In addition, the NARS Policy seeks: to promote an innovative, commercially-oriented, and modern agricultural sector; and, to facilitate the development of hybrids for crops, livestock and fish in line with the aspirations of the BIG4 Agenda, Vision 2030, the ASTGS, the CAADP/MALABO declaration, and the Agenda 2063 of AU and the SDGs.

The development of this policy was highly consultative and interactive with views of key stakeholders informing the process. In developing this National Agricultural Research System Policy, the Ministry of Agriculture, Livestock, Fisheries and Cooperatives has benefited immensely from the expertise of individuals, groups and organizations who I wish to thank for their invaluable input.

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

Executive Summary

Kenya's agriculture is central to meeting the challenges of feeding a growing population, creating wealth, reducing poverty and managing the degradation of natural resources. Agriculture will contribute effectively to these national goals if continued emphasis is put on the positive factors that underpinned the remarkable agricultural growth realized since 2003. Further, concerted efforts must be made to address the country's vulnerability to climate change and other external shocks, as well as a need to initiate policy and institutional reforms to address globalisation, constitutional and other changes in the sector. It is worth noting that these are achievable through effective agricultural research system.

Over the past decade technological, political and socio-economic factors affecting agricultural research institutions have changed significantly. While the information and communication technology revolution has broadened access to knowledge and information, the private sector has become an essential player. At the same time, agricultural development is increasingly concerned with diversifying, adding value, improving product quality, emphasis on food safety, equity in economic growth, capturing and creating markets, and addressing gender parity.

In Kenya, agricultural research is carried out by public and private sector institutions but without a common vision and a legal and strategic framework. This situation has led to a lack of cohesion, inefficient use of resources and limited impact. The establishment of a national institutional framework that captures the complementarities of the diverse actors engaged in agricultural research and development aims at addressing these shortcomings. The Science, Technology and Innovation Act No. 28 and the KALR Act of 2013 attempted to establish the key building blocks of the National Agricultural Research System (NARS), namely: National Commission for Science, Technology and Innovation (NACOSTI), National Research Fund (NRF), Kenya National Innovation Agency (KENIA), and the Kenya Agricultural and Livestock Research Organization (KALRO). However, this attempt to strengthen and organize the NARS did not lead to systematic rationalization, integration and alignment of the various programs with national goals. Many other key players such as producers, the private sector, universities, International agricultural research centres (IARCs), NARIs, NGOs and the civil society were not adequately integrated.

Further, the current shift in global agricultural research towards integrated agricultural research for development and emphasis on demand-driven research call for major adjustments in the way research is organized and managed. To adapt to change processes, the Kenyan agricultural research system must be dynamic, innovative, responsive and well-coordinated, guided by a common vision, mission and goal, and have a programmatic framework. The reform agenda must also be synchronized with transformations taking place in agricultural education, training, extension and other scientific and development fields.

It is against this background that the Government of Kenya has reviewed the National Agricultural Research System (NARS) Policy 2012. The overall objective of the NARS Policy 2021 is to develop a vibrant, coordinated, innovative and modern agricultural research system framework that will contribute to food and nutrition security and social-economic development.

More specifically, the policy will:

(a) facilitate coherency, consistency and effectiveness of the national agricultural research policy, legal, regulatory and institutional framework that enables efficient coordination of the National Agricultural Research System;
(b) orientate agricultural research planning and priority setting systems to respond to National and County agricultural development goals
(c) coordinate planning, development and management of knowledge, information and communication technology;
(d) promote adoption, upscaling and commercialization of agricultural research innovations and technologies; and to link research and industry to promote innovation and technology transfer and uptake
(e) coordinate planning, development and sharing of human resources and physical assets;
(f) strengthen investment and funding for agricultural research; and
(g) increase focus towards outreach, technology dissemination and targeted partnership.

To achieve these objectives, the policy establishes a mechanism to coordinate and facilitate all aspects of agricultural research development. The envisaged national and county coordination mechanism shall operate as an interactive and interdependent network of autonomous bodies committed to a common vision, mission and goal. The coordination mechanism shall be under the Ministry of Agriculture, Livestock and Fisheries. An Agricultural Research Fund will be established to operate as the major funding arm for institutions implementing a prioritized agricultural research agenda.

The goal of this new legal, institutional and regulatory framework is to improve the synergies and complementarities among the various players operating along the research–development continuum for agricultural research that addresses the needs of the sector.

CHAPTER ONE: INTRODUCTION

1.1 Background

Agriculture is core to Kenya's national economic growth and development. The sector contributes to food and nutrition security for the country's growing population with over 80 percent of the 47.6 million Kenyans deriving their livelihoods directly or indirectly from agriculture. The sector accounts for 65 percent of total exports and contributes 33 percent of total GDP directly and 27 percent indirectly. It provides more than 60 percent of informal employment and 18 percent of formal employment. The development of agriculture is important for wealth creation and poverty reduction for pastoralists, fisher folk and farmers.

The Constitution of Kenya 2010 recognizes that every person has a right to be free from hunger and to have adequate food of acceptable quality. Kenya's Vision 2030 envisions the achievement of a food-secure and prosperous nation, raising incomes through a modern, innovative, and commercially-oriented agricultural sector that will contribute towards developing Kenya to a newly-industrialized, middle income country, providing a high quality of life to all its citizens. The agricultural sector is one among the six productive sectors targeted at contributing to the delivery of the10 percent annual economic growth envisaged under the economic pillar of the Vision. The Government has made efforts to improve productivity through the development and implementation of various policies, strategies and programmes at National and County levels

However, this is being curtailed by among other things, inadequate progress in agricultural science, technology and innovation that should facilitate enterprise diversification, reduction of production costs, improving productivity and product quality.

The government's public expenditure in agricultural research as a proportion of the Agricultural Gross Domestic Product (AgGDP) has averaged 2.6 percent, or about 0.7 percent of GDP, which falls far short of that of newly industrialized countries like South Korea at 2.6 percent AgGDP.

Agricultural research faces challenges brought about by underdeveloped, uncoordinated and segmented agricultural research systems; the evolving roles of the public and private sectors; globalization; market liberalization; decentralization and climate change. This has led to inability to keep up with advances in science and technology.

To address these challenges, restructuring of the current agricultural research system is imperative.

1.1.1Overarching Policies

(1) Evolution of Science and Technology Policies and Institutions

The vital role of science and technology was recognized in Sessional Paper No. 10 of 1965 on 'African Socialism and its Application to Planning in Kenya' which emphasized the application of scientific methods in managing Kenya's natural and human resources. The Science and Technology Act, Cap 250 of 1977, provided the legal framework for managing research, science and technology. It was amended in 1979 to provide for creation of semi-autonomous research institutions.

The Science, Technology and Innovation Act No. 28 of 2013 was enacted to facilitate the promotion, co-ordination and regulation of the advancement of science, technology and innovation (ST&I) in the country; develop research priorities; and entrench ST&I into the national production system. This Act also established the National Commission for Science, Technology and Innovation (NACOSTI), the National Research Fund (NRF), and the Kenya National Innovation Agency (KENIA). Several research institutions such as Coffee Research Foundation, Tea Research Foundation of Kenya, Kenya Sugar Research Foundation were established under the Companies Act.

(2) Strategies for Economic Development

The government enacted policies and strategies to address aspects of globalization, economic liberalization and the role of agricultural research to improve agricultural production and poverty alleviation in the country.

The Economic Recovery Strategy for Employment and Wealth Creation 2003–2007, the Strategy for Revitalizing Agriculture (SRA) for economic growth 2004–2014, Agricultural Sector Development Strategy (ASDS) 2010-2020 and National Climate Change Action Plan 2018-2022 focused on increasing productivity and income growth; enhanced food security and equity; promotion of irrigation to stabilize agricultural output; commercialization and intensification of production especially among small scale farmers; and, environmental sustainability. The Agricultural Sector Transformation and Growth Strategy 2019-2029 (ASTGS)aspires to sustainably transform and modernize the agricultural sector to achieve 100 percent food and nutrition security and growth of agro-industries.

1.1.2 Development of Agricultural Research in Kenya

Formal agricultural research in Kenya dates back to 1900, with the establishment of the National Wheat Breeding Centre in Njoro, the agricultural testing station at Kabete, and livestock testing station in Naivasha. The regional research institutes under the East African Community were established in 1950. After the breakup of the East African Community in 1977, the research institutions were spilt up and each Country established their own research system.

By the 1980s, the government had started to reorganize and rationalize the public agricultural research system, in order to respond to national developmental goals and objectives. Various national agricultural research units and services were integrated rationalizing the research infrastructure, and design of programmes. The agricultural research system has developed and now comprises public and private research institutes and universities, regional and international research institutes, private sector companies and institutions which are established under different legal and institutional frameworks. These institutions are involved in research, training, regulation and outreach.

Over this period, notable achievements included development of research products to, among others, improve varieties and breeds so as to increase yields; resistance and tolerance to diseases and pests; and adaptability to various climatic conditions.

1.1.3Agricultural Research Approaches

The traditional approach to agricultural research was mainly supply driven. Researchers set the research agenda without consulting clients and other stakeholders. The participatory nature of the Farming Systems Approach (FSA), focused at the farm level addressing production-oriented issues with little feedback directed to research on the agricultural product value chain.

The Integrated Agricultural Research for Development (IAR4D), is a generic approach that includes other paradigms such as farmer participatory research, integrated natural resource management and sustainable livelihoods and involved a broad range of stakeholders and multiple knowledge sources.

In the Agricultural Product Value Chain approach, the full range of research activities and actors that are required to transform an agricultural product or service from conception through the different phases of production, delivery to consumers, and final disposal after use are considered.

1.2 Rationale

Agricultural research and technology development play a critical role in transforming and modernizing the agricultural sector. Currently, the agricultural research system comprises public research institutions, universities with relevant faculties and departments, research units within public corporations and authorities, and private sector institutions that undertake agricultural research independently. This situation does not provide for optimal exploitation of synergies among Agricultural Research, Extension and Education (AREE) institutions. Consequently, this has led to inadequate research, extension and education service delivery to clients, including farmers.

In an effective National Agricultural Research System (NARS) all the entities responsible for organization, coordination and execution of research need to be coordinated and managed in order to efficiently execute research that addresses national priorities and contributes to national development. This has not been adequately addressed in the current policy under review.

This Policy seeks to streamline, rationalize and establish an efficient and effective inclusive research system which is able to harness and utilize existing scientific, human and physical capacities for enhanced agricultural research and development in Kenya. A policy establishing a framework for the development and implementation of agricultural research management in Kenya will ensure a common and shared vision designed to meet agricultural research objectives and priorities.

1.3 Policy Focus

1.3.1 Vision

A world class innovative, dynamic, holistic and responsive agricultural research system.

1.3.2 Mission

To provide an enabling environment that promotes, supports and coordinates an integrated agricultural research system for increased agricultural innovation and sustainable development.

1.3.3 National Agricultural Research System Policy Objectives

(1) Overall Policy Objective

This policy seeks to develop a vibrant, coordinated, innovative and modern agricultural research system framework that will contribute to food and nutrition security and social-economic development.

This will be achieved through:

(2) Specific Policy Objectives

1. To facilitate coherency, consistency and effectiveness in the legal framework codifying agricultural research in Kenya
2. To establish appropriate, and strengthen existing, institutional arrangements and mechanisms that foster coordination, collaboration, partnership and synergy in the conduct of Agricultural Research
3. To orientate agricultural research planning and priority setting systems to respond to National and County agricultural development goals.
4. To ensure an efficient and effective agricultural knowledge management system.
5. To promote effective mechanisms for adoption, upscaling and commercialization of agricultural research innovations and technologies.
6. To develop an effective system-wide framework for planning, developing and managing human and physical resources to facilitate efficient capacity utilization in agricultural research.
7. To establish innovative mechanisms aimed at achieving sustainable funding for agricultural research.

CHAPTER TWO: STATUS AND CHALLENGES IN KENYA'S AGRICULTURAL RESEARCH

2.1 National Agricultural Research Policy, Legal, Regulatory and Institutional Framework

Current Situation

2.1.1 Policy Framework

The National Agricultural Research System Policy of 2012 aimed at achieving the following policy objectives: improving agricultural research policy framework; harmonizing and providing direction to national research for sustainable development; strengthening the legal, institutional and regulatory framework; coordinated planning, development and sharing of human resources and physical assets; coordinated planning, development and management of knowledge, information and communication technology; increased focus on outreach and technology dissemination and targeted partnership development framework.

The policy proposed the establishment of a body corporate called the Kenya Agricultural Research Organization (KARO) to co-ordinate and facilitate all aspects of agricultural research development.

However, in implementing the policy, KARO was never established. Instead, through an Act of Parliament (KALR Act 2013), KARI was merged with several research institutes to establish KALRO whose mandate was research policy, coordination and regulation.

The original policy intention to establish KARO as a coordination platform for interactive and interdependent network of autonomous bodies committed to a common agricultural research vision, mission and goal was therefore not realized. The attempt to strengthen and organize the NARS did not lead to systematic rationalization, integration and alignment of the various research programs with national goals.

2.1.2 Legal and Regulatory Framework

Research, science and technology in Kenya is governed by several legal instruments. Over the past four decades the Science and Technology Act, Cap 250 of 1977 was the main statute for managing science and technology in the country. The Act established a mechanism for advising the

Government on Research, science, technology and innovation. Section 12 of Cap 250 established research institutions such as the KARI, KIRDI, KEMFRI, KEMRI, KETRI and KEFRI and outlined their mandates. Other statutes that provided a framework for agricultural research included the Irrigation Act, Cap 347 of 1966, the Crops Act 2013 and the Universities Act Cap 210B. The Irrigation Act established the National Irrigation Board (NIB), with a research division to undertake research on irrigation technologies and practices. The Crops Act 2013 provides for the establishment of linkages between AFA and research institutions to facilitate the conduct of research for crops scheduled under the Act including technical support in research and extension services. The Universities Act provided the framework for the establishment of universities some of which have faculties of agriculture and allied sciences. These universities undertake agricultural research independently or in collaboration with other agricultural research institutions.

Currently, the main laws governing agricultural research include the Constitution of Kenya (CoK 2010), the Kenya Agriculture and Livestock Research Act (KALR) No, 17 of 2013, the Science, Technology and Innovation (ST&I) Act, No. 28 of 2013 and the Universities Act of 2012. These laws promote and underscore the central role of research in the country's development agenda.

The Constitution of Kenya, 2010, in the Fourth Schedule, confers the function of research to the National Government, making relevant Government ministries and agencies at the national level the central driving institutions in the management of research in the country. The KALR Act is the overarching statute that defines and provides direction for the conduct of agricultural research. The Act provides for the establishment and functions of the Kenya Agricultural and Livestock Research Organization (KALRO) and the coordination of agricultural research activities in Kenya. The KALR Act merged the former KARI, CRF, TRFK and KESREF to form KALRO. KALRO is one of the key public research organizations accountable for government led agricultural research. It has a network of national research Institutes and Centers responsible for generating technologies, innovations and management practices along the agricultural research continuum. Section 51 of the KALR Act, amended Cap 250 by removing agricultural research institutions (KARI, KEFRI, KMFRI and KETRI) from the Fourth Schedule of the ST&I Act, thereby transferring agricultural research from Cap 250 to KALR Act. Through review of the KALR Act by Amendment Act No. 7 of 2016, KEFRI and KMFRI were removed from the KALR Act. The original intention to have the two as part of the KALRO mandate was therefore never realized as the two

research institutes remained independent. Although KARI and KETRI were brought into KALRO by the KALR Act of 2013, the ST&I Act 2013 which repealed Cap 250 still retained them

The ST&I Act was enacted to facilitate the promotion, coordination and regulation of the progress of science, technology and innovation in the country; assign priority to the development of science, technology and innovation; and, entrench science technology and innovation into the national production system. The ST&I Act establishes a number of institutions. These are the National Commission for Science, Technology and Innovation (NACOSTI) whose mandate is to assure quality in the science technology and innovation sector and to advice the Government on research matters. The Act also established the National Research Fund (NRF) and the Kenya National Innovation Agency (KENIA). Section 47 of the ST&I Act repealed the old Science and Technology Act, Cap 250 of 1977 but went ahead and re-introduced sections of the repealed Act maintaining the agricultural research and its institutions as institutes as part of ST&I and hence created a conflict between KALR Act and the ST&I Act.

The Irrigation Act under Sections 8 and 18 respectively provide for the Irrigation Authority to collaborate with county Governments and other stakeholders to carry out periodic research to determine and make recommendation on fair prices for crops, animals and fish products grown or produced on national and other irrigation schemes; and to appropriately coordinate irrigation research, innovation and training.

Universities, as part of the agricultural research system were established under various Acts of Parliament and Charters. The University's Act No 42 of 2012 identifies the promotion of quality research and innovation as a core function of universities.

Other legal instruments governing agricultural research include international treaties, conventions and multilateral arrangements that Kenya is party to and under which regional and international research and supporting organizations are established. Most of these institutions such as CGIAR institutions have been granted privileges to carry out research and innovation in the country under country bilateral MOUs and host agreements. Several NGOs involved in technology development and deployment are registered under the NGO Co-ordination Boards Act No. 19 of 1990, while other private entities are registered under various Acts of Parliament.

2.1.3 Institutional Framework for Agricultural Research

The current institutional framework for agricultural research in the country comprises policy organs, regulators, funding agencies, implementors, enablers and beneficiaries. This section reviews current institutional framework under the above categories.

2.1.3.1 Policy Institutions

National and County Governments

The National Government is responsible for providing policy guidelines, oversight, technical and financial support for agricultural research. The County Governments are key stakeholders and also coordinate the county-based stakeholders in setting agricultural research agenda priorities. The County Governments also play a central role in information dissemination and technology, research support, evaluation, transfer and uptake

2.1.3.2 Regulators

(a) National Commission for Science, Technology and Innovation

The National Commission for Science, Technology and Innovation (NACOSTI), has the mandate of regulating and assuring quality in the science, technology and innovation sector. NACOSTI is responsible for coordinating sectoral research agenda setting; publishing of research agenda priorities and regulating research activities. It also provides advice to the Government on related matters.

(b) Kenya Plant Health Inspectorate Service

The Kenya Plant Health Inspectorate Service is established under the Kenya Plant Health Inspectorate Service (KEPHIS) Act of 2012 to implement the Seeds and Plant Varieties Act and the Plant Protection Act. The mandate of KEPHIS include; facilitation of safe movement of plant materials including those meant for research, setting tolerance limits and standards for compliance to quality and safety, national performance trials, pest surveillance and pest risk analysis; provision of diagnostic, virus cleaning and indexing services. KEPHIS is the custodian of plant breeders' rights which ensures that breeders are rewarded for their breeding effort. The institution further facilitates production of early generation seed by breeders.

(c) Directorate of Veterinary Services

The Directorate of Veterinary Services (DVS) is mandated by the Animal Diseases Act Cap 364. The Directorate is responsible for provision of animal

health services, regulatory oversight and facilitation of safe movement of animal materials including those meant for research.

(d) The National Biosafety Authority (NBA)

Established by the National Biosafety Act, NBA supports research by reviewing the safety of genetically modified organisms, some of which are products of agricultural research and provides the necessary guidelines and approvals.

2.1.3.3 Implementors of Agricultural Research

Implementing agricultural research institutions are categorized as follows:

1. Public agricultural research institutions
2. Private Sector agricultural research institutions; and
3. Regional and International agricultural research institutions

2.1.3.3.1 Public Agricultural Research Institutions

(a) National Agricultural Research Institutes

The role of the National Agricultural Research Institutes (NARIs) is to develop technologies innovations and management practices along the agricultural research continuum. The NARIs include the following;

(i) Kenya Agricultural and Livestock Research Organization

The Kenya Agricultural and Livestock Research Organization (KALRO) was formed following the merger of former KARI, CRF, TRFK and KESREF to form KALRO, in 2014. KALRO consists of; Coffee Research Institute, Food Crops Research Institute, Horticulture Research Institute, Industrial Crops Institute, Sugar Research Institute, Tea Research Institute, Beef Research Institute, Apiculture Research Institute, Dairy Research Institute, Non Ruminant Research Institute, Sheep, Goat and Camel Research Institute, Veterinary Research Institute, Arid and Rangeland Research Institute, Biotechnology Research Institute, Genetic resource Research Institute and Agricultural Mechanization research Institute. Each research institute has at least one centre located in various parts of the country and have specialized research mandates

(ii) The Kenya Animal Genetic Resources Centre

The Kenya Animal Genetic Resources Centre (KAGRC) was established vide Legal Notice number 110 of 2011 and is the successor of Central Artificial Insemination Station (CAIS). The mandate of KAGRC is to produce, preserve, and conserve, animal genetic material (semen embryo, tissues and live animals) and rear breeding bulls for provision of high-quality disease-free

germplasm to meet the national demand and for export. In order to meet its mandate, KAGRC works in close collaboration with other breeding organizations such as the Kenya Stud Book, the Dairy Recording Services of Kenya and the Livestock Recording Center. Together, these organizations implement the Contract Mating and Progeny Testing Programmes. The organization also works closely with the breed societies as well as individual and institutional farms which provide herds for the breeding program

(iii) Kenya Marine and Fisheries Research Institute

Kenya Marine and Fisheries Research Institute (KMFRI) is a State Corporation established in 1979 by the Science and Technology Act, Cap 250 of 1977. KMFRI's mandate is to undertake research in "marine and freshwater fisheries, aquaculture, environmental and ecological studies, and marine research including chemical and physical oceanography", in order to provide scientific data and information for sustainable development of the Blue Economy

(iv) Kenya Medical Research Institute

The Kenya Medical Research Institute (KEMRI) is the medical research arm of the Government established through the Science and Technology Act Cap 250 of 1977, as the national body responsible for carrying out health research in Kenya. The institute undertakes basic and biotechnology-related research on human and zoonotic diseases, with the overall goal to contribute in the improvement of human health. KEMRI collaborates closely with NARS institutes especially in matters of nutrition and food safety. KEMRI has devolved its research activities and services, through seven regional institutions located in Nairobi, Kilifi, Kisumu and Busia that serve the forty-seven counties under the strategic pillar of health research in the context of devolution

(v) The Kenya Forestry Research Institute

The Kenya Forestry Research Institute (KEFRI) was established as a State Corporation in 1986 under the Science and Technology Act, Cap 250 of the Laws of Kenya to focus on forestry research. KEFRI is also mandated under the Forest Conservation and Management Act, 2016 to undertake forestry research. The mandate of KEFRI is to conduct research in forestry and allied natural resources, research in agroforestry, soil fertility and development of tree provenances relevant to agriculture; disseminate research findings to stakeholders; build capacity of stakeholders; and establish partnerships and cooperate with other research organizations and institutions of higher learning in joint research and training.

(vi) Kenya Industrial Research and Development Institute

Kenya Industrial Research and Development Institute (KIRDI) is a national research institution established in 1979 under the Science and Technology Act Cap. 250 of 1977. It is mandated to undertake multidisciplinary research and development in industrial and allied technologies including: mechanical, electrical and electronics, chemical, ceramics and building materials, food technology, leather and textile, ICT, environment and energy. The technologies developed are transferred to both Micro, Small and Medium Enterprises (SMEs) and large industries to enhance their competitiveness and productivity

(vii) Kenya Institute of Public Policy Research Analysis

The Kenya Institute for Public Policy Research and Analysis (KIPPRA) is an autonomous public institution, established in May 1997 through a Legal Notice. In January 2007, the KIPPRA Bill was signed into law and the KIPPRA Act No. 15 of 2006 commenced on 1st February 2007. The Institute is thus an autonomous think tank established under an Act of Parliament. It is mandated to improve public policy making for realization of national development goals, through economic forecasting, policy analysis and research, and formulation of medium and long-term strategic perspectives for economic and social development. It has established links with local and international organizations forming resourceful network of researchers, who have been useful in facilitating joint projects as sources of data and information, and in providing capacity building opportunities for KIPPRA researchers

(viii) TEGEMEO Institute of Agricultural Policy and Development

Tegemeo Institute of Agricultural Policy and Development is a policy research institute in the Division of Research and Extension of Egerton University which was established under the Universities Act, 2012 (No. 42 of 2012). The Institute conducts research and analysis on policy in the domain of agriculture, rural development, natural resources and environment. It aims at addressing micro and macroeconomic policy issues bearing on farming, transportation, processing, marketing, and trade of agricultural products and inputs; sustainability of agricultural systems and natural resources as well as the environment; and commercialization, income growth and food security.

(ix) Kenya Veterinary Vaccines Production Institute

The Kenya Veterinary Vaccines Production Institute (KEVEVAPI) was established as a parastatal under, Cap 446 of the laws of Kenya in 1990

through legal Notice No. 223 of 4th June, 1990. The Institute is mandated to co-ordinate and take charge of all veterinary vaccines production in the country. Its functions include; conducting research either alone or in collaboration with other research institutions into new innovations of veterinary vaccines production, developing and producing chemicals, media and laboratory products for use in the production of vaccines and other veterinary products and marketing and distribution of veterinary vaccines locally and abroad.

(b) Public Universities

Universities essentially foster the development of agriculture through cooperation to produce efficient training and research outputs. These functions emphasize on environmental impact and the development of production potential. Cooperation with other institutions encourages specialization of individual establishments to develop focused generation of knowledge. Universities design agricultural curricula to equip students with skills and attitudes in order to actively participate in research and outreach programs.

(c) Institutions that carry out research to support their mandates

i) The Kenya Seed Company

The Kenya Seed Company (KSC), a State Corporation registered under the Company's Act (Cap 486) as a seed company, is involved in agricultural research relating to seed production.

ii) The National Irrigation Authority

The National Irrigation Authority (NIA), established under the Irrigation Act, No. 14 of 2019 and successor of the National Irrigation Board established under the repealed Irrigation Act (Chapter 347), has a research division that undertakes research on irrigation technologies and practices.

iii) Agriculture Food Authority

The Agriculture and Food Authority (AFA) is responsible for the promotion, development and regulation of the crops subsector. AFA implements the Crops Act of 2013 through its Directorates for various crops. AFA supports research through participation in research agenda setting, dissemination of new technologies promotion and promotion of adoption.

2.1.3.3.2 Private Sector Institutions That Undertake Agricultural Research

The other component of the agricultural research system comprises private sector companies, NGOs and institutions with research components in their organizations. These entities conduct research geared towards enhancing

productivity, product quality, safety and competitiveness in domestic and global markets.

Some Agricultural Research, Innovation, Extension and Education (AREE) is undertaken by private institutions. National and locally based international agribusiness institutions (with agricultural research wings) are incorporated under the Companies Act.

2.1.3.3.3 Regional and International Research and Supporting Organizations

There are also regional and international research institutions undertaking agricultural research, extension or education in the country. These institutions have regional and international mandates and offer opportunities for enhancing and complementing national AREE initiatives. These institutions have their own corporate and legal frameworks and operate independently. Kenyan-based regional and international agricultural research and allied science institutions also carry out activities consistent with the NARS and generally relevant to the nation's goals.

2.1.3.4 Funding Agencies

National Research Fund and the Agricultural Research Fund

The National Research Fund (NRF) and the Agricultural Research Fund (ARF) are Funds established under the Science Technology and Innovation Act of 2012 and the Kenya Agriculture and Livestock Act, 2013 with the aim of financing national research and agricultural research activities respectively. The NRF is fund operational. However, ARF was not operationalized;

2.1.3.5 Agricultural Research Enablers

Enablers are agricultural research supporting institutions that undertake activities that directly support research or complement agricultural research such as technology uptake, data management, extension or education.

(i) Kenya Bureau of Standards

The Kenya Bureau of Standards (KEBS) is the premier government agency for the provision of Standards, Metrology and Conformity Assessment (SMCA) services, established by the Standards Act, Chapter 496 of 1974. The Institutions activities have grown from the development of standards and quality control for a limited number of locally made products in the 1970s to the provision of more comprehensive Standards Development, Metrology, Conformity Assessment, Training and Certification services. With the re-establishment of the East African Community (EAC) and Common Market for

Eastern and Southern Africa (COMESA), KEBS activities now include participation in the development and implementation of SMCA activities at the regional level where it participates in the harmonization of standards, measurements and conformity assessment regimes for regional integration. KEBS operates the National Enquiry Point in support of the WTO Agreement on Technical Barriers to Trade (TBT).

(ii) Kenya National Innovation Agency

The Kenya National Innovation Agency (KENIA) is established under the ST&I Act 2013 and its mandate is to develop and manage the Kenya national innovation system. KENIA strengthens interrelationships between actors in order to promote innovation and enterprise development out of research and ideas. The agency also works with partners to ensure appropriate prioritization, relevant capacity development, innovation recognition and publication of the same

(iii) Kenya Industrial Property Institute

Kenya Industrial Property Institute (KIPI) is established under section 3 of the Industrial Property Act with a mandate of administering Industrial Property Rights, providing Technological Information, promoting Inventiveness and providing Training on Industrial Property.

(iv) Kenya National Bureau of Statistics

Kenya National Bureau of Statistics (KNBS) was established by the Statistics Act of 2006 to replace the Central Bureau of Statistics. KNBS is a Semi-Autonomous Government Agency incorporated under the Ministry of State for Planning, National Development and Vision 2030. Its core mandate is collection, compilation, analysis, publication and dissemination of statistical information for public use, with an additional role of coordinating, monitoring and supervising the National Statistical System (NSS).

2.1.3.6 Beneficiaries

Beneficiaries of agricultural research outputs include but not limited to; Input suppliers, producers, traders, transporters, processors, CBOs, Cooperatives, FBOs and other commodity value chain actors.

2.1.4 Challenges in Agricultural Research Legal and Institutional Framework

1. **Conflict and overlaps in institutional mandates**

There are various research institutions that deal with agricultural research. Some of these institutions have conflicting and overlapping mandates. For instance, KALR Act conferred KALRO with the mandate of formulating policy, national coordination and regulation of agricultural research. This presents a conflict as the Constitution 2010 confers the role of policy, coordination and regulation to the national government through line Ministries. In addition, overlaps between KALR Act and the ST&I Act presents problems in research priority setting and funding.

Further, individual legal instruments establishing agricultural research and research supporting institutions have areas constraining institutional performance.

2. **Poor coordination of agricultural research**

There are many institutions involved in agricultural research but there is weak coordination of various research institutions due to lack of an effective coordination mechanism for both public and private institutions to initiate research, undertake and evaluate research findings in order to meet national research aspirations. In addition, the framework for regulation of the industry is lacking leaving various research institutions to set their own research agenda some of which may not address priority needs of the recipients of the research products. More often, the research agenda are determined by development partner funding and priorities, which are not necessarily in tune with sector priorities.

3. **Inadequate and ineffective collaboration and partnership among institutions undertaking and supporting agricultural research**

The various public, private and international research institutions including universities carry out research independently with little or limited collaboration and partnership. Many local research institutions collaborate with foreign and international institutions compared amongst or between themselves. Weak mechanism exists hindering the harnessing of individual strengths of research and supporting institutions at national and county level or even a designated process to link them in a structured manner. For example, there exists weak

framework for linking universities which undertake a lot of research with the public or private research initiatives and industry.

2.2 Agricultural Research Planning and Priority Setting Systems

Current Situation

Agricultural research activities are undertaken without adequate planning and priority setting systems for interaction and linkage to industry. This has partly been caused by poorly coordinated agricultural research planning which often leads to duplication of effort.

Before the enactment of the Constitution of Kenya 2010 that gave rise to devolved system of government, the Centre Research Advisory Committee (CRAC) meetings brought together researchers, extensionists and private sectors for planning and research agenda priority setting. Currently such fora are no longer held. However, with devolution and adoption of Agricultural Product Value Chain (APVC) approach, CRACs were replaced by APVC actors and innovation platforms for priority setting and planning of research for the target value chains. The APVC platforms have however not been fully operationalized for various reasons that include inadequate funding.

In the past, agricultural research in Kenya focused on increased production without considering agro-processing, food safety, nutritional security, emerging technologies, market opportunities and challenges. Currently, the research has diversified into addressing agricultural product value chain issues that include: post-harvest management; product development; marketing and value adding processing; and, analyzing constraints and opportunities in order to develop appropriate technologies and innovations. However, the approaches to agricultural research priority and agenda setting systems are by individual institutions.

Most of the planning processes show a dysfunctional link between priority setting and the research programmes and projects initiated or implemented at the National and County levels. Currently, NACOSTI plays the role of national research agenda setting but because its focus is very broad and intended to address all national research issues it has not given due attention to agricultural research.

Challenges

(1) Uncoordinated agricultural research priority setting

Although agricultural research institutions have continued to undertake research programs, some of these programs have not been in tandem with the expectations and needs of the agriculture sector. This has been due to

low levels of interaction between the farmers, extensionists, private sector and the researchers resulting in uncoordinated research priority setting by the agricultural research institutions. Further, because the Constitution identified research as a national function, the Counties no longer feel obligated to incorporate research in their planning.

(2) Weak linkage between research priority setting; and research program planning

NACOSTI, which sets the national research agenda, has a broad mandate covering all aspects of research in the country. This has led to low attention being given to agricultural research in spite of the contribution the sector makes to the national economy. The agricultural research agenda rarely finds its way into the national research agenda. As well, in the rare occasions its reflected in the national agenda, there is limited participation of relevant agricultural research stakeholders and beneficiaries in priority setting and planning. This leads to poor targeting of the limited available research funding to priority research areas.

Further, agricultural research institutions operate independent of each other on planning of research programs leading to allocation of limited resources to non-priority areas of research thereby causing wastage and duplication of efforts. The weak link between priority setting and planning of research programs also leads to, among others, inadequate generation of data and agricultural statistics required by national planners.

2.3 Agricultural Knowledge Management, Information and Communication Systems

Current Situation

In agricultural knowledge management systems, stakeholders and institutions are linked to promote and allow mutual learning and to generate and share agriculture-related technology, innovation, indigenous knowledge, skills and information. The demand for new knowledge and technologies in the agricultural sector is dynamic. There are several research institutions and private entities in the country that undertake agricultural research and generate enormous amounts of technologies and innovations. Some of these technologies and innovations have neither been disseminated nor shared with the relevant stakeholders because research results are limited to scientific forums such as journals and conferences. The NARS Policy 2012 envisaged the setting up of an integrated information and communication technology system and knowledge management strategy. In addition, a

functional technology development and delivery system that facilitates prompt and effective application of agricultural research results was to be instituted. These two are yet to be actualized. Individually the NARS institutions have information communications technology systems but not integrated as envisaged.

There is lack of a system for information communication to communities to recognize, document and protect agrobiodiversity resources and associated indigenous technical knowledge. Such knowledge is therefore underutilized and exploited without commensurate benefits accruing to the initial owners and managers. This has limited the extent to which stakeholders' harness and preserve knowledge, information and practices. Monitoring and Evaluation (M&E) is an important tool for assessing the effectiveness and efficiency of agricultural research programs. It generates data and information for evidence-based decision making by stakeholders. A Systemwide monitoring, evaluation, quality control and impact assessment mechanisms are necessary for improved performance and accountability as well as the culture of learning. Currently, there is no national integrated monitoring and evaluation system that captures all agricultural research in the country thereby resulting in data quality control issues and weak data systems.

Challenges

(1) **Poor and Inadequate sharing and dissemination of agricultural knowledge**

Individual agricultural research institutions hold research information in their separate entities making such research information not easily accessible to stakeholders. In some instances, the information is not packaged in a form suitable for use by stakeholders from different agricultural value chains. This makes it difficult to access and acquire knowledge generated from agricultural research programs.

(2) **Inadequate knowledge management system for agrobiodiversity resources and indigenous technical knowledge**

Communities are in possession of numerous *in situ* agrobiodiversity resources and indigenous technical knowledge that could be accessed and used for their benefit but due to lack of awareness, such opportunities remain untapped. In addition, a number of these opportunities have been taken up by unscrupulous persons and protected under various Intellectual Property Rights (IPR) regimes to the disadvantage of the communities.

(3) **Inadequate tracking of performance in agricultural research programs;**

Research institutions carry out own monitoring and evaluation of programs with minimal sharing of research data and results leading to duplication of

efforts and inefficiencies in resource utilization. The M&E systems in research institutions are not integrated. Institutions are therefore not able to capitalize on each other's competitive advantage through tracking and sharing of M&E generated information.

2.4 Adoption, Upscaling and Commercialization of Agricultural Research, Innovations and Technologies

Current Situation

Research institutions, universities and private entities undertake agricultural research that generates technologies and innovations. The mechanisms to support and promote the transfer of these research outputs have been inadequate leading to their partial adoption, up-scaling and commercialization.

There is weak engagement and partnership between the research institutions and the industry. This has resulted in research programs not translating to demand driven technologies that can be upscaled by the industry for commercialization. Where research institutions have generated demand driven technologies, their commercialization has been limited due to weak linkages.

There is no national framework for benefit sharing between researchers, industry and sponsoring entities. This has resulted in low up-scaling and commercialization of agricultural research technologies and innovations.

Challenges

(1) Low adoption of agricultural technologies and innovations.

Agricultural technologies and innovations have not been fully adopted by the stakeholders due to; high cost of acquisition, the need for specialized skills for operation, limited capacity building and information on their utilization and their availability among others.

(2) Low upscaling of agricultural technologies and innovations

There are inadequate incentives to promote public and private sector investments in commercialization of agricultural research technologies and innovations. There is also no national platform to encourage partnerships and linkages between research and industry towards enhanced upscaling and commercialization of these technologies and innovations.

(3) Inequitable sharing of royalties among researchers, institutions, communities and industry

There are inadequate modalities to determine reward mechanisms and benefit sharing of intellectual property rights royalties between researchers, institutions, communities and industry. This has resulted in conflicts between stakeholders with claims to ownership of agricultural innovations and technologies thereby delaying or hampering their adoption, upscaling and commercialization.

2.5 Institutional Capacity for Research

2.5.1 Human Resource Capacity

Current Situation

There is a critical mass of scientists in public and private research institutions including universities engaged in agricultural research. The numbers of agricultural research scientists is low and inadequate to serve the needs of the country. Generally, capacity in public NARS institutions is developed and managed in a fragmented manner resulting in professional and gender imbalance and inconsistencies between staff capacity and actual implementable research. This situation makes it difficult to quantify and document human resource capacities per discipline in the entire system to facilitate efficiency and effectiveness in management of these resources.

Research institutions and universities have declining number of research scientists and research assistants in specialized areas. Critical human resource is often misallocated and under-utilized (brain-in-the-drain). This is aggravated by poor and widely varying remuneration packages and high researcher to population ratio.

The youth are not attracted to study agricultural sciences in universities and tertiary institutions leading to low talent pool for recruitment of agricultural scientists. In addition, there is shortage of mentors in agricultural research to motivate young scientists.

Challenges in Human Resource Capacity

(1) Low and declining number of agricultural research Scientists

This has been occasioned by the freezing of recruitment of staff coupled with natural attrition and brain drain. The curriculum for training at university and technical institutes in agriculture is not aligned to industry demands and emerging issues limiting the required skills and expertise at all levels.

(2) Lack of a suitable framework to allow agricultural research scientists to work across institutions

There is no framework for sharing staff and infrastructure among the NARS institutions for purposes of research and training. There is no framework for collaboration amongst scientists in the NARS Institutions. There is no central data base of staff and infrastructure available in institutions.

(3) Inadequate Incentives to attract and retain experts in the field of agricultural research:

Inadequate funding to agriculture sector has led to low remuneration, limited training and development, old and unserviceable infrastructure and poor staff retention.

(4) Inadequate human resource in public research institutions to manage research:

NARS institutions are not supported with adequate staff numbers, appropriate expertise, mentorship and motivation. In addition, most NARS Institutions do not cater for adequate succession planning.

2.5.2 Physical Resource Capacity

Current Situation

There are inadequate physical resources in the public research institutes and universities. The government land set aside for agricultural research is vulnerable to alienation and encroachments. Designated centers of excellence have ageing and inadequate field and laboratory equipment that are poorly maintained and are rarely upgraded. The cost of some essential and specialized equipment demanded is very high making it very expensive to install and maintain. Where specialized equipment is available, other NARS institutions may not be aware of their existence and modalities for sharing are not available.

Challenges

(1) Poorly equipped research infrastructure.

Continuous technological changes render equipment obsolete very fast leading to a need for frequent replacement. Limited funding of agricultural research institutes makes it difficult for routine maintenance and replacement of old and damaged equipment. This has affected the quality and quantity of agricultural research output.

(2) Inadequate research infrastructure:
Agricultural research institutions and public institutions have inadequate infrastructure such as land, offices, laboratories, equipment, machineries and vehicles affecting generation and uptake of technologies

2.5.3 Funding Agricultural Research

Current Situation

The Government of Kenya recognizes the key role of agricultural research in national development. According to the Science, Technology and Innovation Act, 2013 the country is expected to commit two percent of GDP to the National Research Fund for research and Innovation. Levies for major agricultural commodities such as coffee, tea and sugarcane were abolished following concern that they were reducing farmer incomes thereby negatively affecting funds available for research. In addition, the funds released for Agricultural Research Programmes and Projects are a very low percentage of the funds disbursed to NRF thus impacting negatively on research. Areas considered non-priority are majorly funded by development partners.

There is no clear legislation or mechanisms for cost and benefit sharing which constrains the development of Public Private Partnerships and limit their contribution and participation in agricultural research programmes.

The KALR Act established the Agricultural Research Fund mandated to provide resources to the NARS players. However, the fund has not been operationalized.

Challenges

Inadequate and inconsistent/uncertain funding for agricultural research institutions. Despite the fact that research is of public good, the subsector funding levels are not adequate. In addition, there is lack of participation by the county governments and private sector in funding agricultural research. This is due to lack of a mechanism that allows participation of private sector and county governments to fund agricultural research

CHAPTER THREE: POLICY INTERVENTIONS

3.1 Enabling Legal, Regulatory and Institutional Framework

Specific Policy Objectives

i) To facilitate coherency, consistency and effectiveness in the legal framework codifying agricultural research in Kenya
ii) To establish appropriate, and strengthen existing, institutional arrangements and mechanisms that foster coordination, collaboration, partnership and synergy in the conduct of Agricultural Research

Policy Statement:

The National Government will review the legal, regulatory and institutional framework governing agricultural research to ensure it provides the enabling environment to improve the contribution of agricultural research to the development of agriculture.

Policy Interventions

(i) Review current legal frameworks to remove inadequacies, conflicts and overlaps in agricultural research mandates

The legal frameworks governing agricultural research coordination will be reviewed with a view to harmonizing /removing overlaps. Secondly, legal and other instruments establishing and giving mandates and responsibilities to individual research and supporting institutions that have areas constraining their performance will be reviewed. In addition, the legal framework will be reviewed to provide for an Agricultural Research and Innovation Fund.

(ii) Establish a framework for coordination of the Agricultural Research System

To enable better coordination and regulation of the NARS, and efficient linkages that allow increased harmony in the implementation of the country's agricultural research agenda, the Government will establish a coordination mechanism. This mechanism will bring on board National and County Governments, NARIs, Universities, agricultural research supporting organizations, private sector institutions, regional and international research and farmers. In order to ensure effective coordination of agricultural research the Government will develop guidelines and mobilize resources to operationalize the established coordination mechanism.

(iii) Promote collaboration and partnership between and among research institutions, beneficiaries of research and other stakeholders.

The Government will establish guidelines that will promote engagement and implementation of collaboration and partnership agreements. Further, the relevant Ministry will initiate and implement collaboration and partnerships MoUs and between local and international partners and countries.

3.2 Agricultural Research Planning and Priority Setting Systems

Specific Policy Objective

To orientate agricultural research planning and priority setting systems to respond to National and County agricultural development goals.

Policy Statements

(i) The National government in collaboration with County governments will establish mechanisms to ensure consultative and inclusive agricultural research planning and priority setting at various levels.

(ii) The National government in collaboration with County governments will establish mechanisms to ensure linkage between set priorities and agricultural research programs

Policy Interventions

(i) Establish a mechanism for enhancing coordination of agricultural research priority setting

Stakeholder fora will be established at various levels for consultative and inclusive agricultural research priority setting bringing together farmers, researchers, extentionists and private sector. A framework for inclusion of research priority setting, and participation of counties will also be developed. In addition, research priority and agenda setting will be aligned to county agricultural research policy goals. During priority setting emerging issues and challenges such as guiding policies, new research approaches and techniques, pests and diseases, among others, will also be considered.

(ii) Strengthen linkage between set priorities and research program planning

A mechanism linking set priorities with both joint research program planning will be established amongst agricultural research institutions. In addition, the mechanism will ensure that agricultural research agenda receives more attention at the national level. Further, it will ensure that national agricultural research priorities fit into the national agenda and receive adequate funding directly from the exchequer that matches the set priorities. The strengthening of the link between priority setting and planning of research programs will ensure that, among others, adequate data and agricultural statistics are generated for use by national planners.

3.3 Agricultural Knowledge Management, Information and Communication Systems

Specific Policy Objective

To ensure an efficient and effective agricultural knowledge management system.

Policy Statements

(1) The National Government in consultation with the County Governments and stakeholders will develop appropriate strategies and systems for managing access, process, storage and sharing of agricultural knowledge and information for enhanced utilization.

(2) The National government will establish and strengthen information communication systems responsive to various beneficiary groups

Policy Interventions

(i) Establish mechanisms for enhancing sharing and dissemination of agricultural knowledge.

A mechanism for integration of all information, technological and communication platforms from the agricultural research ecosystem will be developed. A Kenya Integrated Agricultural Management Information System (KIAMIS) will be developed. This will ensure a one-stop shop for all information and knowledge related to agricultural research. Agricultural knowledge management resource centres in NARS institutions will be strengthened to provide all agricultural research related content to stakeholders. This will

ensure improved access, processing, storage, sharing and dissemination of agricultural knowledge and information

(ii) Establish mechanisms for sensitization of communities on the protection of agro-biodiversity and associated indigenous knowledge.

A communication strategy that will ensure communities are adequately sensitized on the appropriate measure to protect and benefit from genetic resources and indigenous technical knowledge will be formulated.

(iii) Improve performance monitoring and evaluation of agricultural research programs

An integrated monitoring and evaluation system that captures all aspects of agricultural research programs will be developed and rolled out in consultation with stakeholders for improved performance and accountability as well as the culture of learning.

3.4 Adoption, Upscaling and Commercialization of Agricultural Research Innovations and technologies

Specific Policy Objective

To promote effective mechanisms for adoption, upscaling and commercialization of agricultural research innovations and technologies.

Policy Statements

(1) The National and County Government will establish appropriate systems to promote adoption, upscaling and *commercialization of agricultural research innovations and technologies.*

(2) *The National and County Governments will establish appropriate systems for linking research and industry to promote innovation and technology transfer and uptake.*

Policy Interventions

(i) Facilitate adoption of agricultural technologies and innovations.

A mechanism will be established to empower agricultural research institutions and beneficiaries to increase the uptake and adoption of innovations and technologies. An all-inclusive multi-stakeholder system will be developed to support ownership and adoption of research outputs.

(ii) Improve upscaling and commercialization of agricultural technologies and innovations

Research institutions will be given suitable incentives and facilitated to develop appropriate technologies and innovations that are demanded by industry. Public-private partnerships will be promoted to support commercialization of technologies and innovations through platforms for engagement and incubation among other initiatives. Research institutions that have developed technologies and innovations will be given suitable incentives to encourage upscaling.

(iii) Equitable sharing of royalties among researchers, institutions, communities and industry

An enforceable incentive framework will be developed to facilitate equitable sharing of intellectual property rights benefits amongst researchers, institutions, communities and industry. This will spur interest in research which will in turn increase the number of adoptable, up-scalable innovations and technologies for commercialization.

3.5 Improving Research Capacity

Specific Policy Objective

To develop an effective system-wide framework for planning, developing and managing human and physical resources to facilitate efficient capacity utilization in agricultural research.

Policy Statements

1. *The National Government will develop a coordinated and system-wide framework for planning, attracting, recruiting, deploying, retaining, sharing and developing human resource capacity*
2. *The National Government will develop and manage a coordinated and system-wide framework for planning, development, management and sharing of the physical infrastructure in agricultural research institutions.*
3. *The National Government will strengthen the mechanism for acquiring and securing land for agricultural research.*
4. *The National Government will establish a versatile and sustainable funding system to effectively harness resources from Internal and external sources.*

3.5.1 Human Resource Capacity

Policy interventions

(i) **Improve the human resource capacity in public research institutions**

A vibrant and competitive system that allows for attracting, training, retooling, retaining and enhancing performance of human resource will be developed. The schemes of service for agricultural researchers will be continuously reviewed to make them competitive and improve work environment. Suitable incentive programmes will be established to attract and retain staff. In addition, a reward and recognition system to incentivize researchers, technologists and young scientists will be developed including payment of intellectual property royalties where applicable. The government will encourage and support registration of agricultural professional bodies. The curriculum for agriculture training at university and technical institutes will be continuously reviewed to align them to industry demands and emerging issues. A framework for absorbing agriculture trained graduates to increase the pool of scientist will be developed. The government will continue to recognize agriculture as a key subject in sustainable development. A central data base of staff and infrastructure available in institutions will be established. NARS Institutions will be encouraged to establish and implement succession plans.

(ii) Enhance inter-institutional collaboration in research staff management

A central data base for technical staff and research scientists in the NARS will be established. A suitable mechanism to allow/encourage mobility of scientists across institutes will be developed. This may be undertaken through exchange programmes and sabbaticals among other initiatives.

(iii) Enhance capacity of national institutions that manage and support research.

The government will strengthen capacities of institutions which regulate and manage agricultural research. This will include supporting adherence and compliance to national, regional and international standards, treaties, regulations and conventions.

(iv) Promote collaboration between the research agencies, universities, tertiary institutions and other stakeholders.

A framework for sharing human resource and infrastructure among the NARS institutions, universities and other stakeholders for purposes of research and capacity building with be developed. Joint PhD, MSc and multi-level

programs in agricultural research capable of attracting youth in agriculture will be supported. Research linkages amongst the academia, research institutions and the industry will be strengthened.

3.5.2 Physical Infrastructure

Policy interventions

(i) Modernize research infrastructure

The research institutions and universities will be supported to procure required infrastructure and facilities for agricultural research. Investors in agricultural research infrastructure will be given incentives such as tax waivers for equipment, infrastructure, offices and machinery.

(ii) Promote sharing and use of agricultural research infrastructure

Sharing of facilities such as land and laboratories for agricultural research will be promoted. Centers of Excellence will be supported so that their equipment and other research facilities are regularly maintained, calibrated and upgraded.

3.5.3 Agricultural Research Funding

Policy Objective

To establish innovative mechanisms aimed at achieving sustainable funding for agricultural research.

Policy Interventions

(i) **Establish a secure and sustainable fund**

In order to secure the NARS system self-sufficiency and reduce dependency on external funding, a National Agricultural Research and Innovation Fund (NARIF) will be established. The Fund will assure sustained funding which will be supported by the Government, development partners in the sector and stakeholders. This will offer competitive grants to support the development of agricultural technologies to include research innovations, technology delivery and uptake processes. The Fund will also be utilized to support the National agricultural research and innovation agenda as well as the establishment and modernization of agricultural research infrastructures.

(ii) Enhance private sector participation in agricultural research funding

To increase investment and participation in agricultural research, the government will develop a framework providing incentives for private sector investment in agricultural research

(iii) **Enhance County Governments participation in agricultural research funding**

To increase investment and participation in agricultural research, the National government will develop a framework for providing incentives to County governments to support agricultural research through provision of physical and financial resources including mobilization of stakeholders to participate in agricultural research.

(iv) Improve funding for special commodities revenues (industry levies)

To secure ongoing research and development in priority commodities the government will reintroduce commodity–tax. In addition, the government will expand this tax to other industrial and horticultural crops, livestock and fish products. The government will explore additional funding sources for research.

(v) Diversification of internally generated sources of funds for agricultural research

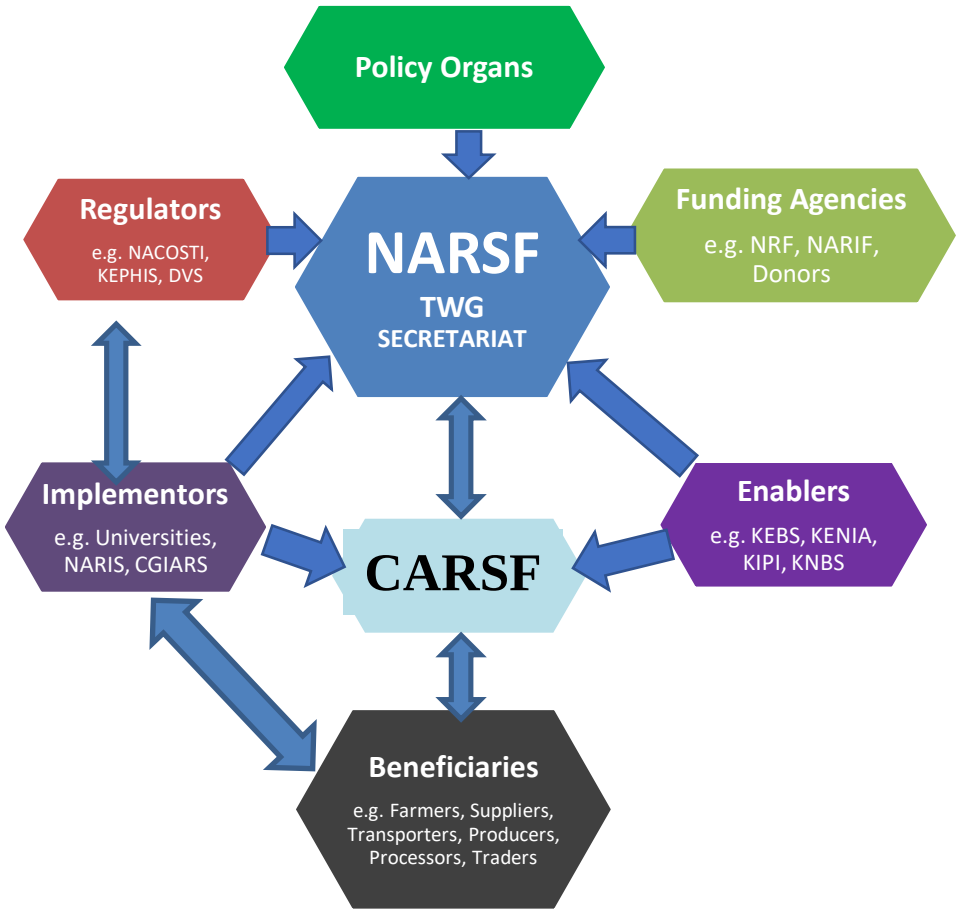
Research institutions will be encouraged to enhance their own internally generated resources through activities such as consultancies, soil analysis services and seed units.

CHAPTER FOUR: POLICY IMPLEMENTATION

4.1 Policy Implementation and Coordination

In order to ensure effective implementation of the National Agricultural Research System Policy, an implementation framework will be put in place. The implementation framework for the NARS policy will incorporate an integrated approach, joint planning and regular joint reviews of progress. A National Agricultural Research System Forum (NARSF) consisting of agricultural research stakeholders from policy agents, research institutions, universities, regulators, enablers, funding agencies and beneficiaries both in public and private sector will be put in place to coordinate implementation of the policy. A five-year strategy will be developed to implement the policy spearheaded by the NARS Forum. Annex 1 provides a detailed implementation framework matrix for NARS.

4.1.1 National Agricultural Research System Coordination Structure



4.1.2 Roles, Responsibilities and Membership under the Coordinating Framework

(1) Ministry responsible for Agricultural Research

a) Shall provide oversight for all matters of agricultural research.

b) Shall provide the overall direction on policy, coordination and regulation of agricultural research in Kenya.

c) Development and Implementation of the agricultural research strategy.

(2) National Agricultural Research System Forum (NARSF)

The Forum will be responsible for advisory, oversight, resource mobilization and allocation; adoption and approval of the recommendations from the Thematic Working Groups and ensuring policy implementation.

The PS responsible for Agricultural Research will be the convenor of the first meeting of the Forum that will elect its chair. The secretary shall be the head of the Secretariat.

The composition of the forum shall be; PSs responsible for Agriculture, lands, irrigation, water, livestock, environment, treasury, Chair of Agriculture Committee of CoG, NACOSTI, KIRDI, KIPI, KEPSA, NRF, KENIA, KIPPRA, Chair of the CGIARs, Agriculture Sector Donor Working Group, Chairs of Agriculture Parliamentary Agriculture committees, farmer representatives, a representative of the Deans of Faculties or Schools of Agriculture and a representative of National Agricultural Research Institutions.

(3) National Agricultural Research and Innovation Fund (NARIF)

This will be the main source of funding for agricultural research, which will be awarded for research activities based on set national priorities. The Fund managers will be responsible for resource mobilization and its administration. The resources shall be sourced from among others, the exchequer, National Research Fund, development partners and the private sector.

(4) National Research Institutions, Universities with Agricultural faculties, Regulators, Private sector, Regional/International Institutions, and NGOs involved in agricultural research

These are the actors responsible for undertaking research and generation of Technologies Innovations and Management Practices (TIMPs). It is expected that each contributes to the development of Kenya's agricultural sector and

forge multi-institutional collaboration among them. In order to increase efficiency and effectiveness, their activities shall be coordinated and regulated through the National Agricultural Research Forum. NARIs and Universities shall be the link between the regional/international institutions and counties/farmers.

(5) County Agricultural Research System Forum

The County Agricultural Research Forum (CARSF) shall be responsible for coordination, advisory, oversight and resource mobilization and allocation for county-specific agricultural research needs. It shall provide a platform for identifying and prioritizing county-specific agricultural research needs and forward those requiring national support to NARSF. The CECM responsible for agriculture will be the chair of the CARSF.

The composition of the forum shall be; CECM responsible for agriculture, Chief Officers responsible for agriculture, lands, irrigation, water, livestock, environment, chair of Agriculture Committee of County Assembly, county-based research institutes, funding agencies, universities, private sector, local based agricultural research regulators and farmer representative.

(6) Thematic Working Group (TWG) Apex Committee

This committee shall distill recommendations from the 5 TWG and prepare agenda for presentation to the NARSF. It shall comprise heads of the Thematic Working Groups.

It shall consolidate recommendations from the Thematic Working Groups for presentation to the Forum and provide feedback from the Forum to the Thematic Working Groups. The work of the Apex TWG shall be supported by the Secretariat.

(7) Thematic Working Groups for NARSF

Thematic Working Groups will generate issues regarding their thematic areas for consideration and adoption by the NARSF. In addition, the TWGs will deliberate on matters referred to them by the NARSF through the Apex TWG.

There will be five standing Thematic Working Groups which will be established as per the following policy themes:

1. Enabling Legal, Regulatory and Institutional Framework
2. Research Planning and Priority Setting Systems

3. Agricultural Knowledge management, Information and Communication Systems
4. Adoption and Upscaling of Agricultural Research Innovations
5. Capacity for Research

Each Thematic Working Group will have representatives from the following Institutions:

1. Policy Institutions
2. Regulators
3. Implementors
4. Funding Agencies
5. Enablers
6. Beneficiaries
7. Two experts relevant to the policy thematic area.

Counties Thematic Working Groups will be aligned to the national TWG format based on county-specific needs and using county determined institutions.

(8) National Agricultural Research System Forum Secretariat

The Secretariat will be the executing unit of the NARSF and its role will include facilitating the working of, and communicating to, other organs at all levels. In order to support the consolidation of the agenda that will be brought before NARS-F, the secretariat will support the TWG Apex Committee.

The Head of the Secretariat shall be the secretary to the NARSF.

4.2 Resource Mobilization for Policy Implementation

Research institutions under the NARS will continue to use traditional sources of funding for undertaking agricultural research in areas where priorities have been set.

In addition, collaborative and partnership research programs between and among agricultural research institutions will also draw upon the institutions' joint resources as shall be mutually agreed.

The administrative and coordination expenses for Policy implementation shall not exceed 10% of funds from the proposed NARIF.

4.3 Monitoring and communication for Policy Implementation

An effective policy implementation tracking framework will be developed to monitor implementation of the policy and asses timely delivery of policy objectives to ensure that they are achieved in a cost effective, coordinated and harmonized manner at all levels. The NARS Forum will lead the development and roll out of the policy implementation tracking framework and bring on board all actors. The policy implementation tracking framework will employ participatory approaches including mutual accountability systems to determine progress towards implementation of agreed and prioritized policy interventions and the realization of policy objectives based on the policy implementation matrix provided in Annex 1 of the policy. The policy implementation matrix will be unbundled to develop annual rolling workplans and intervention tracking matrices for the various thematic areas targeted for implementation.

The data and information emanating from the policy implementation tracking matrix and the yearly workplans will constitute evidence for policy review and decision making. Based on implementation progress, the policy will be reviewed periodically to address emerging issues and policy implementation challenges. The policy implementation tracking framework is expected to have clear terms of reference for relevant stakeholders in data collection and reporting at all levels.

There will be an Annual Review Report (ARR) on implementation of the policy that will be presented to peers for review and recommendations during periodic NARSF sessions with the participation of all the necessary stakeholders and to the Cabinet Secretary responsible for agricultural research for dissemination to the public and relevant stakeholders.

Annexes

Annex I: Policy Implementation Framework

1. Thematic Area: Enabling Legal, Regulatory and Institutional Framework			
Specific Policy Objectives (i) To facilitate coherency, consistency and effectiveness in the legal framework codifying agricultural research in Kenya (ii) To establish appropriate, and strengthen existing, institutional arrangements and mechanisms that foster coordination, collaboration, partnership and synergy in the conduct of Agricultural Research			
Policy Intervention	**Lead/Key Responsible Institutions**	**Expected Outputs/Outcomes**	**Timeline** Short-term (≤3 years) Medium-term(3-7 years) Long-term (7-10 years) Continuous
(1) Review current legal frameworks to remove inadequacies, conflicts and overlaps in agricultural research mandates: a) Review legal frameworks governing agricultural research coordination to harmonize/removing overlaps.	CS Ministry responsible for Agricultural Research, AG, and Parliament	KALR Act Reviewed	Short term (≤3 years)
b) Review legal and other instruments establishing and giving mandates and responsibilities to individual research and supporting institutions that have areas constraining performance	CS Education, Science and Technology	STI Act 2012 amended to be in harmony with KALRO Act	Short term (≤3 years)
c) Review legal framework to provide for a National Agricultural Research and Innovation Fund.	CS Ministry responsible for Agricultural Research, AG, and Parliament	KALRO Act Amended/ repealed	Short term (≤3 years)
(2) Establish a framework for coordination of the Agricultural Research System: a) Establish a mechanism to enable better coordination and regulation of the NARS, and efficient linkages that allow increased harmony in the implementation of the country's agricultural research agenda.	CS Ministry responsible for Agricultural Research, CoG, AG, and Parliament	National and County Agricultural Research forums established and operational	Short term (≤3 years)

Policy Intervention	Lead/Key Responsible Institutions	Expected Outputs/Outcomes	Timeline Short-term (≤3 years) Medium-term(3-7 years) Long-term (7-10 years) Continuous
b) Develop guidelines and mobilize resources to operationalize the established coordination mechanism for effective coordination of agricultural research.	CS Ministry responsible for Agricultural Research and CoG	Coordination mechanism established by CS through administrative or regulatory measures	Short term (≤3 years)
		Guidelines for effective coordination and functioning of the National and County forums developed and operationalized	Short term (≤3 years)
(3) Promote collaboration and partnership between and among research institutions, beneficiaries of research and other stakeholders. Establish guidelines of engagement and implementation of collaboration and partnership agreements. Further, the Ministry will initiate and implement collaboration and partnerships MoUs between local and international partners and countries.	CS Ministry responsible for Agricultural Research, CoG, NARIs, CGIAR institutions and research support institutions.	Guidelines for collaboration and partnership developed and rolled out	Short term (≤3 years)

2. Thematic Area: Agricultural Research Planning and Priority Setting Systems

Specific Policy Objective

To orientate agricultural research planning and priority setting systems to respond to National and County agricultural development goals.

Policy Intervention	Lead/Key Responsible Institutions	Expected Outputs/Outcomes	Timeline Short-term (≤3 years) Medium-term(3-7 years) Long-term (7-10 years) Continuous
(1) Establish a mechanism for enhancing coordination of agricultural research priority setting a. Establish fora for consultative and inclusive agricultural research priority setting at various levels that bring together public and private research institutions, enablers of research, policy agencies, regulators, beneficiaries including farmers, funding agencies and extentionists.	NARSF and CARSF	Research Priority setting better coordinated; national / county research agenda set	Short term (≤3 years)
b. Develop a framework for inclusion of research priority setting and participation of Counties.	NARSF and CARSF	Research planning and Priority setting better coordinated between National and County Governments;	Short term (≤3 years)
c. Align research priority and agenda setting to County agricultural research policy goals.	NARSF and CARSF	Research planning and Priority setting mainstreamed in County plans	Continuous
(2) Strengthen linkage between set priorities and research program planning a) Establish a mechanism for joint research planning among agricultural research institutions for the set research priorities.	NARSF	Joint research planning held; approaches to joint research planning improved	Short term (≤3 years)

Policy Intervention	Lead/Key Responsible Institutions	Expected Outputs/Outcomes	Timeline Short-term (≤3 years) Medium-term(3-7 years) Long-term (7-10 years) Continuous
b) Establish a mechanism to ensure that agricultural research programs are aligned to the set National Research Agenda.	National Government and research institutions	Improved linkage between set priorities and research programs	Short term (≤3 years)
c) Establish a mechanism to ensure that agricultural research priorities fit into the national research agenda and receive adequate resources from the exchequer that match the set priorities.	National Government and research institutions - specify	Agricultural research priorities aligned to National Research agenda and adequately resourced.	Short term (≤3 years)

3. Thematic Area: Agricultural Knowledge Management, Information and Communication Systems

Specific Policy Objective
To ensure an efficient and effective agricultural knowledge management system.

Policy Intervention	Lead/Key Responsible Institutions	Expected Outputs/Outcomes	Timeline Short-term (≤3 years) Medium-term(3-7 years) Long-term (7-10 years) Continuous
(1) Establish mechanisms for enhancing sharing and dissemination of agricultural knowledge. a) Develop a mechanism for integration of all information, technological and communication platforms from the agricultural research ecosystem.	NARSF	All information, technological and communication platforms from the agricultural research ecosystem integrated.	Short term (≤3 years)
b) Establish a Kenya Integrated Agricultural Management Information System (KIAMIS). This will ensure a one stop shop for all information related to agricultural research.	NARSF	• KIAMIS established and operationalized • Improved access, processing, storage, sharing and dissemination of agricultural knowledge and information	Short term (≤3 years)

Policy Intervention	Lead/Key Responsible Institutions	Expected Outputs/Outcomes	Timeline Short-term (≤3 years) Medium-term(3-7 years) Long-term (7-10 years) Continuous
c) Strengthen the agricultural knowledge management resource centres in NARS institutions to provide all agricultural research related content to stakeholders.	NARSF	Agricultural knowledge management resource centres strengthened	Continuous
(2) Establish mechanisms for sensitization of communities on the protection of agro-biodiversity and associated indigenous knowledge. a) Formulate a communication strategy that will ensure communities are adequately sensitized on the appropriate measure to protect, and benefit from genetic resources and indigenous technical knowledge.	NARSF and CARSF	• Communication strategy developed • Improved sensitization of communities on the protection of genetic resources and indigenous knowledge	Short term (≤3 years)
(3) Improve performance monitoring and evaluation of agricultural research programs a) Develop and roll out, in consultation with stakeholders, an Integrated Monitoring and Evaluation System that captures all aspects of agricultural research.	NARSF	IM&ES Improved performance monitoring and evaluation of agricultural research programs	Continuous

4. Thematic Area: Adoption, Upscaling and Commercialization of Agricultural Research Innovations and technologies

Specific Policy Objective
To promote effective mechanisms for adoption, upscaling and commercialization of agricultural research innovations and technologies.

Policy Intervention	Lead/Key Responsible Institutions	Expected Outputs/Outcomes	Timeline Short-term (≤3 years) Medium-term(3-7 years) Long-term (7-10 years) Continuous
(1) Facilitate adoption of agricultural technologies and innovations a) Establish a mechanism to empower agricultural research institutions to increase the uptake and adoption of innovations and technologies.	NARSF	• Mechanism developed • Improved uptake and adoption of agricultural technologies and innovations	Continuous
b) Develop an all-inclusive multi-stakeholder system to support ownership and adoption of research outputs.	NARSF	• System developed • Enhanced ownership and adoption of research outputs	Continuous
(2) Improve upscaling and commercialization of agricultural technologies and innovations a) Give research institutions suitable incentives and facilitate them to develop appropriate technologies and innovations that are demanded by industry.	NARSF	• Incentive package designed • Improved upscaling of agricultural technologies and innovations	Continuous
b) Promote public-private partnerships to support commercialization of technologies and innovations e.g. through platforms for engagement and incubation	NARSF	• Public-private partnerships promoted • Improved upscaling of agricultural technologies and innovations	Continuous

Policy Intervention	Lead/Key Responsible Institutions	Expected Outputs/Outcomes	Timeline Short-term (≤3 years) Medium-term(3-7 years) Long-term (7-10 years) Continuous
c) Give suitable incentives to research institutions that have developed technologies and innovations so as to encourage upscaling.	NARSF	• Suitable incentive packages developed • Improved upscaling of agricultural technologies and innovations	Continuous
(3) Equitable sharing of royalties among agricultural researchers, institutions, communities and industry a) Develop an enforceable incentive framework to facilitate equitable sharing of intellectual property rights benefits amongst researchers, institutions, communities and industry.	NARSF	Framework developed Equitable sharing of intellectual property rights benefits in place Enhanced commercialization of research innovations and technologies.	

5. Thematic Area: Improving Research Capacity			
Specific Policy Objective To develop an effective system-wide framework for planning, developing and managing human and physical resources to facilitate efficient capacity utilization in agricultural research.			
Policy Intervention	**Lead/Key Responsible Institutions**	**Expected Outputs/Outcomes**	**Timeline** Short-term (≤3 years) Medium-term(3-7 years) Long-term (7-10 years) Continuous
5.1 Human Resource Capacity			
(1) Improve the human resource capacity in public research institutions a) Develop a vibrant and competitive system that will allow for attracting, training, retooling, retaining and enhancing performance of human resource.	NARSF	Enhanced number of well trained staff.	Short term and continuous
b) Review Schemes of Service to make them favorable and improve the work environment.	NARSF	Motivated workforce.	Short term and continuous
c) Develop a recognition and reward system to incentivize researchers, technologists and young scientists.	NARSF	Motivated workforce.	Short term and continuous
d) Establish a suitable incentive programme to attract and retain staff	NARSF	Motivated workforce.	Short term and continuous
e) Develop adequate succession plans.	NARSF	Adequate talent pool.	Short term and continuous
(2) Enhance inter-institutional collaboration in research staff management a) Create a central data base of researchers, technical staff and equipment.	NARSF	Increased staff utilization for optimum research out put	Short term (≤3 years)
b) Develop a suitable collaboration mechanism, including one which allows/encourages mobility of scientists across institutes	NARSF	Increased staff utilization for optimum research out put	Short term (≤3 years)
c) Establish and support agricultural professionals bodies	NARSF	Motivated workforce.	Short term (≤3 years)

Policy Intervention	Lead/Key Responsible Institutions	Expected Outputs/Outcomes	Timeline Short-term (≤3 years) Medium-term(3-7 years) Long-term (7-10 years) Continuous
(3) Enhance capacity of national institutions that manage and support research. a) Strengthen capacities of institutions which regulate, enable and manage agricultural research.	NARSF	Compliance to national, regional and international standards enhanced.	Short term (≤3 years)
(4) Promote collaboration between the research agencies, universities, tertiary institutions and other stakeholders a) Develop a framework for sharing human resource and infrastructure among the NARS institutions, universities and other stakeholders for purposes of research and capacity building.	NARSF	Framework developed	Medium-term(3-7 years)
b) Create joint PhD, MSc and multi-level programs in agricultural research capable of attracting youth in agriculture	NARSF Institutions	Collaboration agreements expanded	Medium-term(3-7 years)
c) Strengthen linkages between the academia, research institutions and industry	NARSF	Collaboration agreements expanded	Medium-term(3-7 years)
5.2 Physical Infrastructure			
(1) Modernize research infrastructure a) Upgrade and maintain agricultural research infrastructure	NARSF Institutions	More and Improved infrastructure and research out put	Medium term and Continuous
(2) Promote sharing and use of agricultural research infrastructure a) Promote sharing of facilities such as land and laboratories for agricultural research	NARSF	More and Improved infrastructure and research out put	Medium term and Continuous
b) Support Centers of Excellence so that their equipment and other research facilities are regularly maintained, calibrated and upgraded	NARSF	Regularly maintained, calibrated and upgraded equipment	Medium term and Continuous

5.3 Agricultural Research Funding

Policy Objective
To establish innovative mechanisms aimed at achieving sustainable funding for agricultural research.

Policy Intervention	Lead/Key Responsible Institutions	Expected Outputs/Outcomes	Timeline Short-term (≤3 years) Medium-term(3-7 years) Long-term (7-10 years) Continuous
(1) Establish a secure and sustainable fund a) Establish National Agricultural Research and Innovation Fund (NARIF)	CS responsible for agricultural research, NARSF	NARIF established for enhanced funding of agricultural research	Short-term (≤3 years)
(2) Enhance private sector participation in agricultural research funding a) develop a framework providing incentives for private sector investment in agricultural research	NARSF and Private sector	• Increased private sector investment in research • Enhanced private sector funding of agricultural research	Short-term (≤3 years)
(3) Enhance County Governments participation in agricultural research funding a) Develop a framework for providing incentives to County governments to support agricultural research.	NARSF, CARSF	• Framework developed • Increased County funding of agricultural research	Short-term (≤3 years)
(4) Improve funding for special commodities revenues (industry levies) a) Re-introduce commodity–tax for the special commodities	CS responsible for agricultural research, NARSF, CARSF	Commodity tax re introduced to support research	Medium-term (3-7 years) Continuous
b) Expand tax regime to other industrial and horticultural crops, livestock and fish products	NARSF, CARSF	Tax regime expanded	Medium-term (3-7 years) Continuous
c) Explore other alternative funding sources.	NARSF	Additional funding sources obtained	Continuous
(5) Diversification of internally generated sources of funds for agricultural research Encourage institutions to increase internally generated revenue to fund agricultural research	NARSF Institutions	Internally generated sources of funds diversified	Medium-term (3-7 years) Continuous

Annex II: Bibliography

Achibugi, D. and A. Coco (2004) A new indicator of technological capabilities for developed and developing countries. SPRU Electronic Working Paper Series, Paper No. 111, The Freeman Centre, University of Sussex.

African Union Science, Technology and Innovation Strategy for Africa (STISA-2024), adopted in 2015

Beintema, V.M., F.M. Murithi and P. Mwangi (2003) Agricultural science and technology indications, Kenya. Country Brief no.8, IFPRI, ISNAR, FARC, Washington, DC and The Hague.

Boehlje, M.D., S.L. Hofing and R.C. Schroeder (1999) Value chains in the agricultural industries. Staff paper no. 99–10, Department of Agricultural Economics, Purdue University, USA.

Christensen, C. (1994) Agricultural research in Africa: a review of USAID strategies and experience. SD publication series. Technical paper no. 3, USAID, Washington, DC.

Constitution of Kenya, 2010

Gill, G.J. and D. Carney (1999) Competitive agriculture technology funds in developing countries. Natural Resources Perspectives, ODI, London, UK. 9 pp.

Government of Kenya (2003) Economic Recovery Strategy for Wealth Creation and Employment. Ministry of Planning and National Development, Nairobi.

Government of Kenya (2004) Strategy for Revitalizing Agriculture. Ministry of Agriculture and Ministry of Livestock and Fisheries Development, Nairobi.

Government of Kenya (2007) Kenya Vision 2030. National Economic and Social Council of Kenya and Ministry of Planning and National Development, Nairobi.

Government of Kenya (2010). Agricultural Sector Development Strategy 2010–2020.

Government of Kenya (2019. Agricultural Sector Transformation and Growth Strategy 2019-2029.

Heisey, Paul W., and Keith O. Fuglie. *Agricultural Research Investment and Policy Reform in High-Income Countries,* ERR-249, U.S. Department of Agriculture, Economic Research Service, May 2018

Humphreys, J. (2004) Commodities, diversification and poverty reduction. Paper presented at FAO symposium on the State of Agricultural Commodity Market Research, Rome, 15–16 December 2003.

Janssen, W. (2002) Institutional innovations in public agricultural research in five developed countries. ISNAR Briefing Paper no. 52. http://www.isnar.org/publications/briefing.

Jha, D. and S. Kumar (2006) Research resource allocation in Indian agriculture. National Centre for Agricultural Economics and Policy Research, Policy Paper no. 23. New Delhi, India.

Liebenberg, F., N.M. Beintema and J.F. Kirsten (2004) South Africa Agricultural Science and Technology Indications, Country Brief no. 14. IFPRI, ISNAR and FARC, Washington, DC and The Hague.

NEPAD (2003) Comprehensive African Agricultural Development Programme (CAADP). NEPAD, Pretoria, South Africa.

Nyoro, J.K. (2002) Agriculture and rural growth in Kenya. Tegemeo Institute, Egerton University, Nakuru.

Sumberg, J. (2005) Systems of innovation theory and the changing architecture of agricultural research in Africa, *Food Policy* 30:21–41.