



THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF LIVESTOCK AND FISHERIES

**NATIONAL FISHERIES AND AQUACULTURE
RESEARCH AGENDA (2020-2025)**

NOVEMBER, 2019

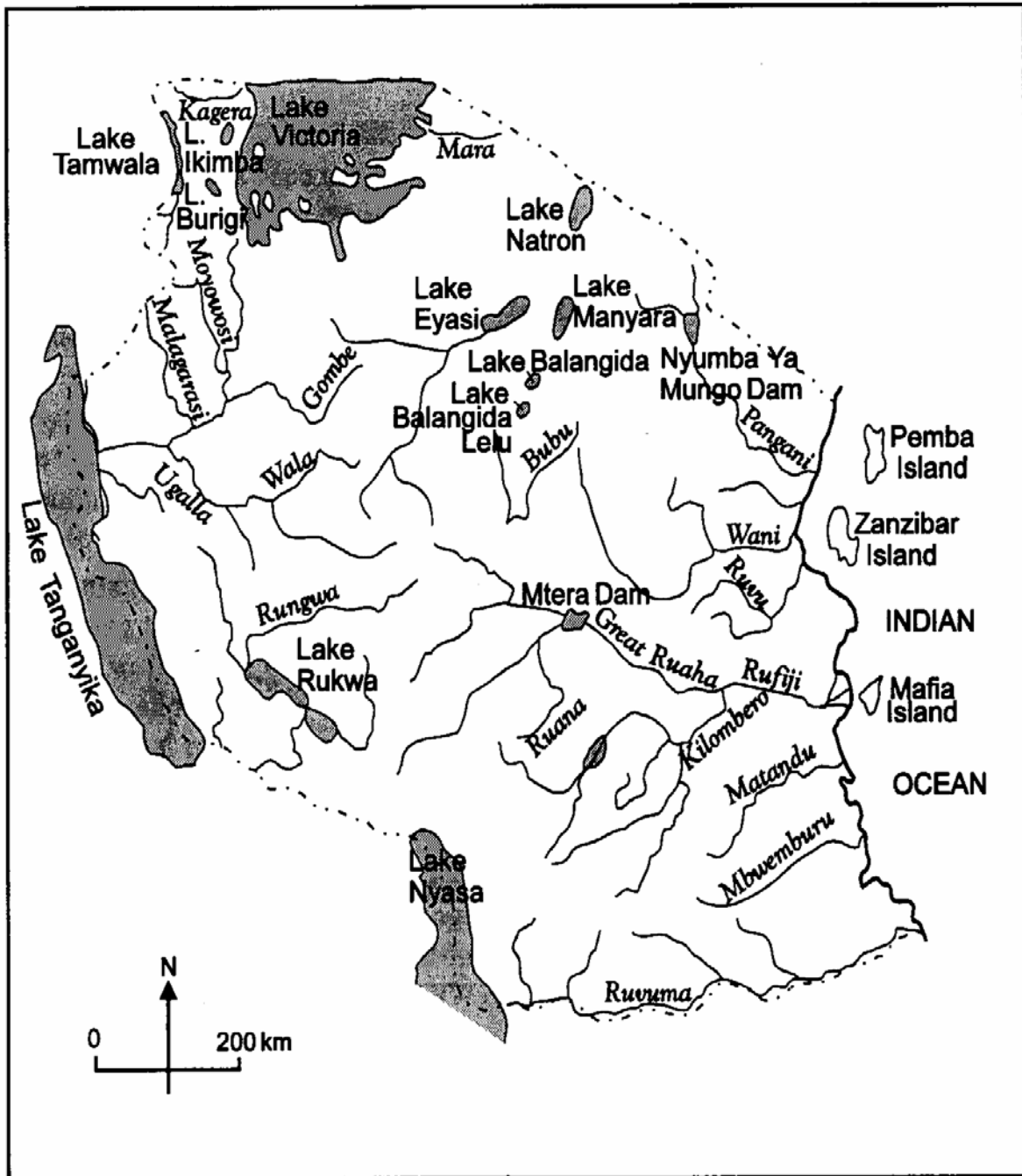


Figure 1: Major and minor water bodies in Tanzania

Major water bodies: - Lake Victoria, Tanganyika, Nyasa and Indian Ocean

Minor water bodies: - Small lakes, Dams, Rivers and Wetlands

FOREWORD



Fisheries and Aquaculture Sectors are among the important economic sectors in the country as they contribute to food security and households' income to fishing communities and other related fisheries communities. The sectors contribution to the National Gross Domestic Products (GDP) for year 2018 was 1.7% with an annual growth rate of 9.2. The growth rate is low compared to the numerous and vast water resources, such as the

great lakes, marine waters, minor lakes, dams, rivers and wetlands. However, the contribution to the National GDP can rise to more than 5% if capture fisheries and aquaculture are sustainably managed and rationally utilized.

The low growth rate is contributed by several constrains such as sharp increase in fishing effort, unsustainable harvesting of fisheries resources accelerated by population growth, fish protein demand, use of illegal fishing gears and methods, environmental degradation, ecological changes, climate change and diversification of natural water flow from rivers and streams for differnt

uses, fish post harvest losses and slow growth rate in aquaculture industry.

In order to curb the above constraints an effective research program is of paramount importance. Research plays a very crucial role in the socio-economic development of fishing communities leading to improved standards of living for fisheries dependent societies e.g. enhancement of fisheries and aquaculture productivity, food security and development of technologies that would simplify people's lives. Also research provides information for guiding the management in decision making in relation to fisheries management, socio-economic transformation and proper areas of investment for attainment of sectors set objectives.

Thus, the existence of a vibrant National Fisheries and Aquaculture Research Agenda that specifies priority research areas countrywide is important in order to achieve the sectors objectives. It is apparent that, the previous National Fisheries Research Agenda (2015–2020) had several shortfalls in relation to socio-economic development particularly in addressing the current needs and demand of the sectors. Such gaps included but not limited to:- 1) lack of a political dimension, 2) implementation of the obsolete National Fisheries Policy and Strategy of 1997, 3) emerging micro and macroeconomic policy changes, 4) emerging challenges in fisheries sector such as illegal fishing practices associated with environmental destruction, 5) renaissance of Tanzania Fishing Company (TAFICO) and 6)

reflection of the current principles of blue economy. Consequently, based on the limitations of the previous Research Agenda (2015-2020), the National Fisheries and Aquaculture Research Agenda (2020-2025) is developed in order to comprehensively cover these areas as well as research needs in the country.

Therefore, this Research Agenda intends to strengthen the science, policy and political crossing points in fisheries and aquaculture sectors, strategic and efficient deployment of resources, strengthening linkages between the Ministry, Academia, research Institutions, Local Government Authorities, Ward to Village level, and finally Nationally, Regionally and Internationally.

Moreover, this Research Agenda, is geared to provide opportunity for the numerous research findings laying under the shelves in Universities, research Institutions, NGOs, Private Sector and Individuals, and in particular the Masters and PhDs studies to be brought up and made useful for fisheries management. This is motivated by fact that, for many years students have been undertaking significant scientific researches which have never been translated into tangible products, processes and services for developmental purposes. Hence, these findings should be consolidated and disseminated to contribute to the government's industrialization efforts and quenching the technological development in Tanzania.

Furthermore, the Ministry of Livestock and Fisheries (Fisheries Sector), will establish a research coordination

team that will act as a link between the Ministry and other research Institutions within and outside the country as an overseer of all fisheries and fisheries related research and research findings. Also the Ministry will conduct an annual fisheries scientific fora with assemblage of different researchers and related scientists in order to receive and translate the research findings into practical terms.

Also, the Ministry of Livestock and Fisheries (Fisheries Sector), will set aside some funds in its annual budget to allow the interested Tanzanian students to carryout fisheries research within the framework of this National Fisheries and Aquaculture Research Agenda 2020-2025 priority research areas. This will enable the Ministry to harness expertise and experience from Tanzanians who otherwise would have remained unutilized or underutilized. Moreover, regulations will be developed for smooth and rational implementation of the Agenda. In line with that, students carrying out research in fisheries and fisheries related matters will be required to write *Policy Briefs* for Ministry consumption upon completion of their research work.

Pursuant to the aforesaid, My Ministry and I, called for the development of this National Fisheries and Aquaculture Research Agenda (2020–2025). This Research Agenda is also anticipated to contribute to the achievement of the Tanzania Development Vision (TDV) 2025, which one of its goals, is to have a Fisheries and

Aquaculture sectors, which to large extent are commercially operated and sustainably managed based on scientific and demand driven research by year 2025. Thus, research can't be separated from management and development of fisheries and aquaculture industry in Tanzania.



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MINISTER FOR LIVESTOCK AND FISHERIES

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LIST OF ABBREVIATIONS

AUC	African Union Commission
AU-IBAR	African Union Inter-African Bureau for Animal Resources
CBD	Convention on Biological Diversity
CBO	Community Based Organization
COSTECH	Tanzania Commission for Science and Technology
CSO	Civil Society Organizations
DSFA	Deep Sea Fishing Authority
EEZ	Exclusive Economic Zone
ETP	Endangered and Threatened species
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FETA	Fisheries Education and Training Agency
GDP	Gross domestic products
ICM	Institute of commercial Management
ICT	Information, Communication and Technology
IDRC	International Development Research Centre
IMS	Institute of Marine Sciences
IUCN	International Union for Conservation of Nature

IUU	Illegal, Unreported and Unregulated
KMFRI	Kenya Marine and Fisheries Research Institute
LGAs	Local Government Authorities
LVFO	Lake Victoria Fisheries Organization
MLF	Ministry of Livestock and Fisheries Development
MPRU	Marine Parks and Reserves Unit
MWI	Ministry of Water and Irrigation
M&E	Monitoring and Evaluation
NaFIRRI	National Fisheries Resources Research Institute
NEMC	National Environment Management Council
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organization
PhD	Postgraduate Doctoral Degree
SADC	Southern Africa Development Community
SAREC	South African Renewable Energy Council
SIDA	Swedish International Development Cooperation Agency
SUA	Sokoine University of Agriculture
SWIOFish	South West Indian Ocean Fisheries
TAFIRI	Tanzania Fisheries Research Institute
TAFICO	Tanzania Fishing Corporation
TDV	Tanzania Development Vision
TFPA	Tanzania Fish Processors Association

TMA	Tanzania Meteorological Agency
UDOM	University of Dodoma
UDSM	University of Dar es Salaam
URT	United Republic of Tanzania
WB	World Bank
WIOMSA	Western Indian Ocean Marine Sciences Association
WWF	World Wild Fund for Nature

EXECUTIVE SUMMARY



Fisheries resources in Tanzania are subjected to drivers of ecosystem changes such as anthropogenic and natural drivers which need a consistency benchmarking for proper utilization of the ecosystem services. The government of Tanzania through the Ministry of Livestock and Fisheries has a role of ensuring that fisheries research is conducted in all water bodies, for the purpose of benchmarking the fisheries resources and their environment. This calls for the need to develop a National Fisheries and Aquaculture Research Agenda 2020-2025. The preparation and development of the National Fisheries and Aquaculture Research Agenda involved the participation of different fisheries stakeholders in the country who specifically categorized five (5) research priorities.

The five research priorities include: Aquatic ecosystems; Sustainable capture fisheries; Aquaculture growth; Marketing and trade of fish and aquatic products and

Cross Cutting. In each research priority different research areas were developed, totaling into 73 research areas of which 39 are short term and 34 are long term.

Implementation of this Research Agenda requires adequate and timely availability of resources as well as collaboration with other research institutions at national, regional and international levels. Therefore, it is the responsibility of the Ministry of Livestock and Fisheries to advise and direct researchers and research institutions and in particular the Tanzania Fisheries Research Institute (TAFIRI) on the implementation of the Agenda. Hence, the coordination of all activities and dissemination of research findings will be done not only by the Ministry of Livestock and Fisheries but also with other institutions.

The Ministry of Livestock and Fisheries (Fisheries Sector) will monitor the implementation of this Research Agenda by conducting at least annual scientific meeting that will draw members from fisheries research Institutions and other related stakeholders in order to ensure its effectiveness during implementation. The Research Agenda will be reviewed after every five years or upon changes in national policies or depending on demand or when deemed necessary.

In conclusion, the fisheries Research Agenda is an important tool to guide fisheries managers in decision

making for the purpose of sectors development, hence, leading to increased contribution to the national economy and the livelihoods of all Tanzanians. Also it contributes to the attainment of the Tanzania Development Vision (TDV) 2025 goals.



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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Tanzania is well endowed with natural resources in terms of fisheries potential such as lakes, dams, rivers, several wetlands and marine waters (figure 1). It has a coastline of 1,424 km along the coast of Indian Ocean and it share Lake Victoria with countries like Kenya and Uganda with Tanzania having 51% of the lake equivalent to km² 35,088) Lake Tanganyika with Congo Republic, Burundi and Zambia and Tanzania having 41% equivalent to km² 13,489 and Lake Nyasa shared with Malawi and Mozambique and Tanzania having 18.51% equivalent to km² 5,700. Also it has a territorial sea of about 64,000 km² along the coast of Indian Ocean and an Exclusive Economic Zone (EEZ) of about 223,000 km². Therefore, the total water coverage is 346,337 km² which is equivalent to 36.7% of 945,000 km² of the total land area.

The fisheries potential from all water bodies is estimated at 750,000 metric tons whereby 100,000 metric tons is from marine waters and 650,000 metric tons is from

inland waters with exclusion of EEZ potential. Currently, the total harvesting potential is at an average of 450 metric tons per year which signifies a difference of 300 metric tons of allowable catch yet to be exploited. Also these potentialities have contributed to a total of 26,445 fish ponds and 408 fish cages with total production of 18,075.6 metric tons from aquaculture.

Therefore, for better utilization of the endowed natural resources, fisheries research which is an integral part of fisheries management is crucial for development of fisheries and aquaculture sectors. However, fisheries research in Tanzania is conducted mainly by the Tanzania Fisheries Research Institute (TAFIRI) which was established through Act No. 6 of 1980. Other institutions that conduct fisheries research include Fisheries Education and Training Agency (FETA), Sokoine University of Agriculture (SUA), University of Dar es salaam (UDSM), Institute of Marine Sciences (IMS), University of Dodoma (UDOM), Non-governmental Organizations at national and international levels as well as individual researchers.

Implementation of the fisheries research activities is hampered by several constraints, which include shortage of scientists in some specialized disciplines (such as gear technology, taxonomy, social science, fisheries stock

assessment and molecular biology); insufficient infrastructure (offices, laboratory facilities and research vessels) and inadequate research funds. In order to meet the objectives of the Ministry, the development of implementable and effective Research Agenda is important as it maps out the key areas whereby if well implemented the research results can hasten the sectors development objectives. Thus, the focus of current Research Agenda is particularly on aquatic ecosystem, sustainable capture fisheries, aquaculture growth, marketing and trade of fish and aquatic products and cross-cutting.

1.2 Rationale

Responsible governance of fisheries is central for the realization of food security, poverty eradication, sustainable livelihood, economic growth, social development and ecosystem maintenance. In this context, the importance of research to address challenges of developing the industry can't be over emphasized. Fisheries research aims at providing scientific information and advice on fisheries management for sustainable development of the fisheries sector. The fisheries and aquaculture sectors in 2018 contributed about 1.7% of the GDP with an annual growth rate of 9.2,

mainly through capture fisheries and aquaculture. Currently, per capital fish supply depicts a declining trend over time due to increased post-harvest loss, population growth and export trade that takes away about one third of the total landings.

To increase landings from capture fishery and aquaculture would entail resolving problems that have hampered fisheries development projections in the past. Research that address reduction of post-harvest losses, promotion of fish farming and exploitation of the existing potential in the Exclusive Economic Zone (EEZ) appear to be some of the possible immediate options for increased fish supply. The key objective of this research agenda is to address the current and emerging challenges in fisheries research and identify priority areas that require new scientific knowledge in the short and long term.

1.3 Methodology

Preparation and development of the National Fisheries and Aquaculture Research Agenda 2020 – 2025 involved participation of several stakeholders in the fisheries sector countrywide following the shortfalls of the National Fisheries Research Agenda (2015-2020). Hence, the Ministry held a stakeholders workshop to identify list

of fisheries research priorities and areas. The outcomes from the workshop lead to the development of research priorities and corresponding research areas that were discussed, consolidated and prioritized based on short and long term. The key stakeholders who participated in this process are from Fisheries and Aquaculture Departments, FETA, COSTECH, UDSM, SUA, IMS, NEMC, MPRU, TFPA, WWF, DSFA, TAFICO, Tuna Alliance and Directorate of Research, Training, and Extension.

CHAPTER TWO

2.0 THE STRATEGIC CONTEXT OF FISHERIES RESEARCH

National Fisheries Research Agenda is not a standalone strategic management tool to guide, coordinate, monitor and review effectiveness of the implementation of research activities. It relates and ties closely with national legal frameworks

2.1 National Policies and Legal Framework

2.1.1 National Research and Development Policy (2010)

The policy in Sec 1.2.2 recognizes TAFIRI as one of the Public institutions in Tanzania mandated to carry out fisheries research. As such TAFIRI will play a major role in implementing this Research Agenda.

2.1.2 The National Fisheries Policy 2015)

The National Fisheries Policy area 3.4, policy statement (ii) recognizes and promotes fisheries research by other institutions and dissemination and utilization of research finding.

2.1.3 National Water Policy (2002)

The National Water Policy (2002) addresses issues related to water resources management, rural and urban water supply and sewage. The policy is relevant to the National Fisheries Research Agenda as it address the key issue that includes: accessibility to clean water, for both urban and rural inhabitants and management of aquatic systems and biodiversity.

2.1.4 National Biotechnology Policy (2010)

The general objective of this policy is to ensure that Tanzania has the capacity and capability to capture the proven benefits arising from health, agriculture, industry and environmental applications of biotechnology while protecting and sustaining the safety of the community and the environment. Therefore the National Fisheries Research Agenda will implement issues related to industrial and environmental biotechnology.

2.1.5 National Environmental Management Act (2004)

The Act recognizes management of fisheries resources in accordance with the provisions of the Fisheries Act, 2003. Management of these fisheries resources requires

scientific research. The National Fisheries Research Agenda will provide the scientific information generated through research to help achieve management of fisheries resource as stated in sec 65 (1) of the Act.

2.1.6 The Fisheries Act (2003)

The Act No. 22 of 2003, Sec 53.-(1) empowers director in collaboration with research institutions and other stakeholders to outline areas that require research for fisheries and aquaculture management and development. This has been followed through the formulation process of this current research Agenda.

2.1.7 Tanzania Fisheries Research Institute Act (2016)

Tanzania Fisheries Research Institute Act No. 11 of, 2016, identifies TAFIRI as a Parastatal body responsible for carrying fisheries and aquaculture research in all fresh and marine water bodies. The institute has been mandated to promote, conduct and coordinate research within and in relation to any part of the territorial waters or in relation to any part of the territory of the United Republic of Tanzania. Hence, they are the primary implementers of this Research Agenda.

2.1.8 Deep Sea Fishing Authority Act (2007)

The Deep Sea fishing Authority (DSFA) is a corporate body established by the Act of Parliament No. 1.of 1998 and its Amendments of 2007 (Act No.4 of 2007). DSFA has a primary function among others to formulate and co-ordinate scientific research (Sec 4(4)(d) in the deep sea. They will therefore oversee that research is carried out within the framework of this Research Agenda and that such information is available for management.

2.1.9 Marine Parks and Reserves Act (1994)

The Act in section 3(3)(a) mandates Marine Parks and reserves to manage these ecosystems. Management of these resources requires scientific research. The Research Agenda will help to provide the necessary information to inform management of the resources in marine parks and reserves.

2.2 National, Regional and International Obligations Related to Fisheries

2.2.1 National Integrated Coastal Environment Management Strategy (2003)

The strategy 5 in Section 4.2 of Strategies and Implementation Mechanisms describes development and use of coastal ecosystem research to allow available scientific and technical information to inform ICM decisions

2.2.2 Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region (1996)

Contracting parties shall establish protected areas in areas under their jurisdiction with a view to safeguarding the natural resources of the Eastern African region and shall take all appropriate measures to protect those areas and shall take into account their importance as (a) Natural habitats, and in particular as critical habitats for species of fauna and flora, especially those which are rare, threatened or endemic; (b) Migration routes or as

wintering, staging, feeding or molting sites for migratory species.

2.2.3 AUC- NEPAD (2014). Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa

The Fisheries Sector Policy Framework and Reform Strategy provides framework and identifies strategic steps to be taken by member states for unlocking the full potential of fisheries and aquaculture for food security, livelihood and wealth creation of which fisheries research is among the tools.

2.2.4 SADC Protocol on Fisheries (2011)

Article 17, of SADC protocol (2011) entails cooperation in establishing joint research programme and projects with particular reference to shared resources such as great lakes and the marine waters.

2.2.5 Conventional on Biological Diversity (1992)

Tanzania is adhering to Conventional on Biological Diversity (CBD) which was signed on 12th June, 1992 and ratified it on 08th March, 1996 in relation to endangered aquatic species.

2.2.6 Ramsar Convention on Wetlands (1971)

The Ramsar Convention on Wetlands (1971) is an intergovernmental treaty that embodies the commitments of its member countries to maintain the ecological character of their wetlands of international importance and to plan for the "wise use", or sustainable use, of all of the wetlands in their territories. Some of the areas that the Research Agenda identified wetlands of which their ecological characteristic should be monitored hence, this Research Agenda is a direct link to the Ramsar Convention

2.2.7 FAO Code of Conduct for Responsible Fishing

This Code sets out principles and international standards of behavior for responsible practices with a view to ensuring the effective conservation, management and development of living aquatic resources, with due respect for the ecosystem and biodiversity. States and all those involved in fisheries are encouraged to apply the Code and give effect to it. Research is an integral part in providing information required to shape behavior envisaged in the Code of Conduct.

2.2.8 Convention on International Trade in Endangered Species of Wild Fauna and Flora

Aims at ensuring that international trade in specimen of wild animals and plants does not threaten the survival of the species in the wild and it accords varying degrees of protection to the available species of animals and plants.

2.2.9 United Nations Framework Convention on Climate Change (1992)

The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial by product emissions of carbon dioxide and other greenhouse gases from various sources.

2.2.10 Voluntary Guidelines for Securing Sustainable Fisheries in the Context of Food Security and Poverty Eradication (2014)

The guidelines intend to support the visibility, recognition and enhancement of the already important role of small-scale fisheries and to contribute to national and global effort towards the eradication of hunger and poverty.

CHAPTER THREE

3.0 VISION, MISSION AND OBJECTIVES OF THE RESEARCH AGENDA

3.1 Vision

To have a well-coordinated Fisheries and Aquaculture Research that sustainably safeguards the environment, economy, and livelihoods in Tanzania.

3.2 Mission

To institute National Fisheries and Aquaculture Research that addresses sector priority needs for sustainable development of the national economy and food security.

3.3 Objectives

- i. To provide guidance and/or menu on priority research areas to fisheries and aquaculture research institutions and other stakeholders
- ii. To promote coordination and judicious use of resources availed to fisheries and aquaculture researchers
- iii. To develop and strengthen fisheries and aquaculture data base

- iv. To stimulate comprehensive monitoring and evaluation of fisheries and aquaculture research in the country

3.4 Core Values

The following are core values:

- i. Professionalism in fisheries and aquaculture research through rigorous scientific approaches to attain optimal results
- ii. Integrity in conducting fisheries and aquaculture research
- iii. Transparency and Accountability for quality services
- iv. Equal opportunity for all stakeholders
- v. Ethical considerations in fisheries and aquaculture research
- vi. Collaborative efforts to avoid duplication of efforts

CHAPTER FOUR

4.0 RESEARCH PRIORITY

The research priorities are primarily intended to contribute to achieving National Development Agenda and Africa's Agenda, such as the New Partisanship for Africa's Development (NEPAD's), Malabo Declaration, SADC Fisheries Protocol, UN Sustainable Development Goals (SDGs) and the Blue Economy agenda as well as Sustainable Development Goal 14. It is anticipated that the researches to be undertaken will address challenges associated with the fish resources; their values, threats, the balance between ecosystem services and development, and the efficiency and effectiveness with which they are governed to support human well-being. The wide ranges of issues that specifically impact on the sector are hereby categorized in five (5) research priorities;

4.1 Aquatic Ecosystems

Aquatic ecosystems are highly affected by anthropogenic activities such as illegal fishing methods/gears, inappropriate agricultural practices, mining,

deforestation, biomass burning and domestic and industrial effluents as well as natural processes which adversely impact sustainability of aquatic ecosystems. In this regard, there is a need to conduct various researches that will lead to effective ecosystem approach to fishery and aquaculture resource management. The main research areas under this are grouped into short and long term priorities:

Short term priorities:

- i. Aquatic invasive species and endangered species
- ii. Fresh and marine water ecosystems inventories
- iii. Water quality and Pollution
- iv. Aquatic productivity
- v. Effects of policies, legislation and regulations on fisheries resources and industrial development.

Long term priorities:

- i. Sustainability of aquatic ecosystems and resources
- ii. Anthropogenic activities on aquatic ecosystems
- iii. Key and Critical habitats
- iv. Eco – tourism
- v. By-catch in relation to biodiversity

4.2 Sustainable capture fishery

The capture fisheries in Tanzania country is divided into marine and inland water fisheries. With regards to marine waters, much of the fishing activities take place in the inshore waters. The exclusive economic zone (EEZ) is yet to be exploited due to a number of drawbacks including lack of data and information. On the other hand, inshore marine and inland water fisheries in the country face a number of challenges including overcapacity, overfishing, IUU fishing and environmental degradation that threatens resources sustainability. Hence, this research priority aims at generating data and information which will help to inform effective policy and decision making process and effective ways of addressing the challenges. The main research areas under this are grouped into short and long term priorities:

Short term priorities:

- i. Illegal, unreported and unregulated (IUU) fishing
- ii. Fish stock assessment of priority fisheries in all water bodies
- iii. Fish Migration patterns such as Tuna and tuna like species in EEZ, Nile perch in lake Victoria and Lates Stappersi in Lake Tanganyika
- iv. Endangered and threatened species (ETP) in all

- water bodies
- v. Monetary value of aquatic resources
- vi. The correlation between the existing fisheries and aquaculture curriculums and employment opportunities

Long term priorities:

- i. Catch assessment and frame survey in all water bodies with priority on minor water bodies
- ii. Fish ecology and critical habitats focusing on breeding and nursery areas in major water bodies
- iii. Fishing gear technology, methods and crafts
- iv. Limnology and Oceanography in all water bodies in relation to catchment, anthropogenic activities
- v. Ornamental fishery
- vi. Fish aggregation devices
- vii. Fisheries modelling – fishery specific modelling in priority fisheries

4.3 Aquaculture growth

Dwindling fish catch from natural waters and subsequent growing gap between fish supply and demand, has stimulated investment in aquaculture. Being a relatively new industry, it is facing several challenges which are

limiting its anticipated growth. For instance, its value chain is not yet well developed, resulting in inadequate supply of inputs and services critical to drive growth of the industry. Hence, there is a need to address the challenges that limit aquaculture growth such as limited availability of key inputs such as quality seeds and feeds, poor productivity of production systems, diseases, poor business skills, negative environmental impact just to mention a few. The outputs of research under this thematic area will revolutionize aquaculture development in Tanzania, increase fish supply and promote food security; to render aquaculture industry that is technologically feasible, economically viable, ecologically sound and socially acceptable. The main research areas under this are grouped into short and long term priorities:

Short term priorities:

- i. Viable aquaculture species
- ii. Quality feeds and appropriate feeding strategies,
- iii. Optimized production systems for fresh, brackish and marine waters,
- iv. Zonation and carrying capacity,
- v. Seaweed production and value addition,
- vi. Aquaculture business development

Long term priorities:

- i. Breed improvement and mass production of seeds,
- ii. Ornamental aquaculture,
- iii. Disease control and health management, and

4.4 Marketing and trade of fish and aquatic products

High demand and short supply of fish and fishery products especially in regional and international markets, means an opportunity for our country to develop capture fishery and stimulate aquaculture. However, international fish marketing takes place within the frameworks of the international trading environment. Hence, the need for understanding parameters/trends/patterns of the international trading environment in which we operate cannot be overemphasized.

The aim of this research priority is to ensure that the country has a mechanism in place for informing fisheries/fish farming stakeholders about consumers' needs and desires, marketing opportunities for fish and aquatic products, services, and changing attitudes and purchase patterns. Also, to detect shifts in buyers' behavior and attitudes in domestic, regional and

international markets. This would help the country stay in touch with the ever-changing market place. The main research areas under this are grouped into short and long term priorities:

Short term priorities:

- i. Commercialization, enterprise development and marketing of fisheries products technologies for improved food quality, quantity and storage and reducing postharvest losses
- ii. Innovations, applications and commercial value-addition advantages
- iii. Marketing strategies
- iv. Marketing processes
- v. Consumers' behavior
- vi. Use of ICT in fish marketing
- vii. Business transaction laws on trade in fish and fishery products investment in EEZ

Long term priorities:

- i. Product development/services:
- ii. Fish Products and Marketing
- iii. Marketing modeling
- iv. Globalization of fish trade
- v. Business environment influences:

4.5 Cross-cutting:-

Fisheries and aquaculture sectors are multidisciplinary in nature and, thus, have a number of cross-cutting issues that have to be addressed to make respective sectors socio-economically viable. Researches under this category include, but not limited to disaster risks and climate change, socio-economics, value chains and post-harvest management, youths development and gender equity, HIV/AIDS, communicable diseases, health and sanitation. Thus, research is required to find ways that can address challenges faced by operators, especially in following segments:

4.5.1 Social economics

Capture fishery and aquaculture sectors engage a number of actors; therefore, there is a need for integrated ecosystem and holistic approaches to ensure inclusiveness, empowerment, and safeguarding of human rights. In this regard, understanding the socio-economic aspects of the fishery and the linkages to the overall policies on fisheries and aquaculture management measures is critical. The main research areas under this are grouped into short and long term priorities:

Short term priorities

- i. Alternative livelihoods
- ii. Research – extension linkages

Long term priorities

- i. Collaborative management
- ii. Conflicts resolution

4.5.2 Value chains and post-harvest management

Promotion of value chains and reduction of post-harvest losses are among the areas that require immediate attention. High post-harvest losses are among the constraints to fish productivity, food and nutrition security in Tanzania. It is estimated that over 60% of the losses occur after fish and fish products have been harvested. This is mainly due to poor handling practices and limited post-harvest reduction technologies. The main research areas under this are grouped into short and long term priorities:

Short term priorities

- i. Effect of policies, legislation and regulations on quality and marketing.
- ii. New and emerging technologies in fish processing with respect of ICT and bio informatics
- iii. Technologies for improving quality.

Long term priorities

- i. Food quality, safety and nutrition.
- ii. Utilization of by-catch and reject fishery product.
- iii. Value chain analysis

4.5.3 Disaster risks and climate change

Disaster risks and climate change is a major challenge of the twenty-first century which is adding to existing stressors, such as over-exploitation, habitat degradation, invasive species, urban development, and pollution impacting ecosystem services. There is a need to understand the direction and consequences of the changing climate on fisheries and aquaculture resources to guide adaptation and mitigation strategies of affected populations. The main research areas under this are grouped into short and long term priorities:

Short term priorities

- i. Climate change on livelihoods
- ii. Climate change variability and vulnerability
- iii. Climate change and environmental impacts
- iv. Climate change resilience
- v. Climate change effect on fish stocks

Long term priorities

- vi. Reduction/impact of greenhouse gases
- vii. Aquatic environment pollution (acidification)
- viii. Sea/lake level change
- ix. Climate change on fisheries ecosystems

4.5.4 Youth development and Gender equity

Creating safe and decent employment opportunities in fisheries and aquaculture is a major agenda in tackling youths' unemployment and gender equity in the country. However, this requires consistent efforts to enhance their involvement in the sector developmental activities, taking note of access to land, water, fisheries, aquaculture and other productive resources. Given the situation, researches are needed to inform policy making processes on how best to achieve equitable access to productive resources that provide economic and material base for their development. The main research areas under this are grouped into short and long term priorities:

Short term priorities

- i. Youth and women involvement in fisheries and aquaculture management and business
- ii. Entrepreneurship in aquatic by-products

Long term priorities

- i. Gender mainstreaming in fisheries and aquaculture
- ii. Gender mainstreaming policies and practice in fish and fishery products

4.5.5 Governance and policies

Good governance and accountability are fundamental components for creating a favorable environment for inclusive economic growth and justice in the fishery and aquaculture sectors. It ensures equitable access to and control of economic opportunities as far as fishery industry is concerned. Research in this area should contribute in achieving favorable environment among fishing communities for national economic growth and poverty reduction, civic engagement, adherence to and respect for the rule of law, human rights and absence of corruption. The main research areas under this are grouped into long term:

- i. Responsible governance of tenure
- ii. Financing systems for fishery and aquaculture enterprises
- iii. Emerging policy issues

4.5.6 HIV/AIDS, communicable diseases, health and sanitation

The nature of activities involved in fisheries necessitates movement of people, particularly fishers and fish traders in both domestic and cross-border trade. As such they are potentially at high risk of acquiring HIV and AIDS if they are not adequately sensitized. Research is required to understand the root causes and potential measures. The main research areas under this are grouped into short term:

- i. Relationship between the movement, behaviour pattern, and communicable diseases among actors in the fisheries sector.
- ii. Prevalence of HIV/AIDS among fishing communities

CHAPTER FIVE

5.0 RESOURCES FOR IMPLEMENTATION

Effective implementation of the Research Agenda will require human and non-human resources (physical and finance) at national and international levels. In this case, research institutions are obliged to each work closely and where necessary support each other technically in order to fill the existing technical gaps among them. The Ministry of Livestock and Fisheries (Fisheries Sector) in collaboration with research Institutions and other related stakeholders, establish a research committee that will act as hub in foreseeing the implementation of the Research Agenda. The role of the Committee will be to foresee all research proposals and selecting amongst them a well developed and competitive researches before submission to friends of fisheries such as such as FAO, EU, WIOMSA, WWF, AU –IBAR, for funding. Also, as a motivation mechanism, the Ministry of Livestock and Fisheries (Fisheries Sector) will set aside some funds to attract interested Masters and PhD students to carryout research in Fisheries and Aquaculture, of which the award will be on a competitive basis. Additionally, LGAs being part of the National Fisheries and Aquaculture

Research Agenda as end user are obliged to set aside funds to facilitate research findings dissemination where necessary.

5.1 Human resources

Human resource is a key component in successful implementation of the research Agenda. However, it is observed that in some research Institutions, there is insufficient human capacity in terms of research skills which is crucial for effective implementation of the research Agenda. Therefore, research Institutions such as TAFIRI, FETA, IMS, UDSM, SUA, UDOM including NGOs and other related partners are urged to ensure capacity building in terms of human resources and facilities to guarantee rational utilization of resources, transfer of knowledge and technology and other related matters. Despite of setting aside research funds by the Ministry, students under the sponsorship of the Government or any other donor or Institution will be urged to align their research proposals to National Fisheries and Aquaculture Research Agenda. The Agenda will be placed in the Ministry Web – site for general public use and also made available at all university libraries including university departments responsible for fisheries for easy tracing and tracking.

5.2 Physical resources

Physical resources are important for effective implementation of this Research Agenda. These include laboratory, library, museum, equipment, infrastructure, transport facilities, and ICT. Thus, Ministry of Livestock and Fisheries will ensure that its research Institutions such as TAFIRI and FETA are well equipped in terms of physical resources for proper implementation of the agenda

5.3 Financial resources

Always financial resources is a critical issue in many areas and funds have never been adequate or sufficient in any developmental areas and in particular research programs. Beside the financial predicament, the Agenda objectives have to be achieved for optimal benefits leading to improved fisheries management and aquaculture resources. In this case, reliable funds should be sought as it is fundamental for implementation of the research Agenda. Therefore, it is the responsibility of the Ministry, COSTECH, Research Institutions, Local Government Authorities and friends of fisheries to set aside funds to implement the Agenda. Along with setting funds, the research Institutions are urged to write

competitive research proposals which are marketable to donors such as COSTECH, WWF, FAO, LVFO, EAC, AU-AIBAR, EU, World Bank etc. As said earlier, the Ministry will set aside some funds to sponsor Masters and PhD student who in turn will carry out research in fisheries and aquaculture based on the Agenda. Also, LGAs will be encouraged to set aside funds as it is stipulated in the National Research and Development Policy to address local challenges including dissemination of new technologies.

CHAPTER SIX

6.0 IMPLEMENTATION FRAMEWORK

For effective implementation of the National Fisheries and Aquaculture Research Agenda an appropriate framework has to be established based on key players. The framework will ensure that each key player, plays the role which it has comparative advantage, hence, leading to proper research development, consolidation of research findings and dissemination. The Ministry of livestock and Fisheries (Fisheries Sector) will liaison not only with the research Institutions and other related stakeholders but also at the Local Government Authorities level (Ward levels). According to the local government reforms, the LGAs have a role in the implementation of the research activities within their areas of jurisdiction and have roles of identifying areas which require further research in their areas.

Despite, research Institutions having their own legislative mandate on matters pertaining to fisheries and aquaculture research, the Ministry of Livestock and Fisheries (Fisheries Sector) will develop Regulations

which will guide and ensure smooth implementation of the Research Agenda.

6.1 Coordination of research activities

The Ministry responsible for the National Fisheries and Aquaculture Research Agenda has a mandate to implement it and ensuring that the fisheries and national strategic objectives are achieved through scientific information derived from research. Therefore, the Ministry has a role of determining the review of the policy and legislations based on research outcomes.

On the other hand, the Ministry of Livestock and Fisheries (Fisheries Sector) will coordinate all research activities related to fisheries and Aquaculture Sectors and it will set up the terms of reference for implementation and dissemination of research findings in the country via responsible department and principally through;

- i. Develop proper modalities for collection and dissemination of fisheries and aquaculture research finding from research institutions e.g. utilization of research findings through policy briefs
- ii. Holding regular scientific fora with researchers and fisheries stakeholders'
- iii. National exhibitions,

- iv. Mass media such as radio and television programmes, magazines and newsletters,
- v. Establishment of research websites backed by an e-library and
- vi. A compiled dataset will be submitted to COSTECH as National depository.

6.2 Collaboration and linkages

The Ministry responsible for fisheries and aquaculture is mandated to coordinate fisheries and aquaculture research and fisheries and aquaculture developmental activities countrywide. Generally, the ministry has a role of soliciting funds by writing projects from friends of the Ministry and Government e.g. the ongoing SWIO Fish Project. Furthermore, it is the responsibility of the Ministry in collaboration with COSTECH and TAFIRI to offer funds for implementation of research activities. Additionally, LGAs have a responsibility to provide funds for carryout fisheries research and disseminate research findings to stakeholders within their areas of jurisdiction. At Ministerial level, the Tanzania Fisheries Research Institute (TAFIRI) is mandated to carryout fisheries and aquaculture research and other related research in the country as stipulated in Tanzania Fisheries Research Institute Act 2016 and as per National Fisheries

and Aquaculture Research Agenda. Also it has a role of collaborating with other research Institutions in carrying out any research activity and responsibility of issuing all research permits to any person or Institution interested in carrying out fisheries research in Tanzania. Also it has a role of writing research proposal and submit them to various research donors for funding.

The National Commission for Science and Technology (COSTECH), the principal advisory organ to the Government in all matters pertaining to scientific research, technological development and coordination of research activities in the country. Also has a role of providing advice on the course of implementation of the Agenda at the same time providing funds for implementation of the Agenda.

The training Institutions which offer academic training of which fisheries research is part of their training, have a responsibility of implementing the Agenda by providing research themes and areas of priorities to Masters, PhD Students and also to other interested individuals. Also they have a role of delivering research findings including policy briefs for use by the Ministry.

The Non –Governmental Organizations such as WWF, EU, IUCN, AU-IBAR etc. have a role of solicit and

provide funds for the implementation of the National Fisheries and Aquaculture Research Agenda in whatsoever way, either by doing or by providing funds to research Institutions and interested individuals.

Furthermore, the Ministry of Livestock and fisheries (Fisheries Sector) will collaborate closely with research institutions and other related stakeholders to ensure effective implementation of the National Fisheries and Aquaculture Research Agenda 2020 -2025. These institutions include but not limited to LVFO, UDSM, SUA, UDOM, IMS, Zanzibar Fisheries Department, MPRU, DSFA, University of Bergen, Tokyo Institute of Technology, WWF, WB, WIOMSA, TMA, SADC, SIDA/SAREC, IDRC, EU, KMFRI and NAFIRRI. Other collaborators include; Fishers, Fish Farmers, Processors, Traders, Consumers; Non-State Actors (NGOs, CBOs, CSOs); and Private Sectors.

6.3 Monitoring and evaluation

Implementation of the Research Agenda will be monitored and evaluated on an annual basis. On this basis the Ministry responsible for fisheries and aquaculture sector through department responsible for research, Monitoring and evaluation.

The guiding questions which will be used during monitoring process will be:-

- i. Was the program within the research themes?
- ii. What is the status of implementation (ongoing or completed)?
- iii. What are the benefits and impacts? Do they compliment national development goals?

6.4 Review and approval of the research agenda

The Research Agenda will be reviewed after every five years to incorporate policy changes and emerging issues. This will provide opportunity to adjust the research focus and maintain a quick standing point for the current Research Agenda. The review will take into consideration recommendations, deliberations and inputs from M&E reports.