Framework for Community-based Dam Aquaculture (FCODA)

Aquaculture Business Development Programme (ABDP)

SEPTEMBER 2022

DECLARATION

Participants herein include experts sourced from the Kenya Marine and Fisheries Research Institute (KMFRI), the Aquaculture Business Development Programme (ABDP), the Kenya Fisheries Service (KeFS), the State Department for Fisheries, Aquaculture, and Blue Economy (SDFA&BE) and University of Eldoret (UoE).

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FORWARDING LETTER

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RE: SUBMISSION OF FINALIZED FRAMEWORKS ON COMMUNITY DAM AQUACULTURE AND COMMUNITY AND COMMUNITY CAGE FISH FARMING FOR AQUACULTURE BUSINESS DEVELOPMENT PROGRAMME

This is in reference to your letter with reference number MOALF/SDFA&BE/ABDP/KMFRI/RL/09-02 and dated 9th September 2022.

In-line with the aforementioned, Kenya Marine and Fisheries Research Institute (KMFRI) led participants from ABDP, Kenya Fisheries Service (KeFS), SDFA & BE, and Universities in the development of following frameworks:

i) Framework for Community-based Dam Aquaculture; and
ii) Framework for Community Cage Fish Farming.

The purpose of this letter is therefore to submit the aforementioned frameworks to your office for further actions.

Thank you.

Dr. Christopher M. Aura (PhD)
Director, Freshwater Systems Research
FOR: CHIEF EXECUTIVE OFFICER-KMFRI

FOREWORD

The Framework for Community-based Dam Aquaculture (FCODA) is developed in accordance with Government policies and development plans, Blue Economy strategies and policies, and it is anchored in the Kenya Vision 2030, the Fourth Medium Term Plan (MTP IV), taking into account the provisions and expectations of the Kenyan Constitution of 2010. The Kenyan Constitution of 2010 and the Kenya Vision 2030 explicitly emphasize the creation and management of a knowledge-based economy, as well as the need to increase productivity and efficiency. In light of this, the Aquaculture Business Development Programme has sponsored the development of FCODA for dam owners to supplement and support dam investment in order to increase fish production and income for local communities.

National and county governments will continue to provide relevant resources, data, and knowledge required for the development of the Blue Economy sector during the dam leadership's implementation of FCODA. This is in line with rising demand for fisheries products and other aquatic resources while also ensuring their long-term viability for current and future generations.

The framework proposes an improved governance structure to improve dam efficiency and service delivery. The framework considers the requirements of the Devolved Government System, the Blue Economy, and emerging issues. A participatory process involving key internal and external stakeholders is proposed for the framework's implementation, which will result in the provision of effective and quality services to Kenyans.

I am confident that, with the cooperation and support of all stakeholders, including government ministries, departments and state agencies (MDAs) and development partners, the FCODA will significantly contribute to transforming the Blue Economy sector into an innovative and commercially oriented sector in line with the aspirations of Vision 2030 and his H.E The President's Government development agenda.

HON.
CABINET SECRETARY FOR AGRICULTURE, FISHERIES AND COOPERATIVES

PREFACE

Dam restocking has emerged as one of the enhancement techniques to supplement fish production and fish products due to increased pressure on global inland and marine fisheries. Dams can thus promote community-aquaculture initiatives to increase fish production and availability in rural areas with proper management and husbandry.

The Framework for Community-based Dam Aquaculture (FCODA) lays a solid foundation for National and County Governments to fulfil their mandates, which are based on poverty alleviation and food security. In carrying out this mandate, the State Department will focus on environmental, economic, and social considerations that are critical for the Blue Economy's long-term development.

The FCODA is in line with the Fourth Medium Term Plan (MTP IV), the Blue Economy agenda, and Kenya's 2010 Constitution. This new Framework focuses on three key outcomes: (i) increased economic benefits to communities; (ii) development of infrastructure and human capacity; and (iii) creation of an enabling environment for sustainable dam aquaculture.

The framework outlines strategies and interventions aimed at addressing the current situation by promoting effectiveness and efficiency of dam aquaculture, the development of alternative financing options, human capacity, and the enhancement of the sector's capacity.

The FCODA could be used to develop annual work plans, resource mobilization plans, and performance contract targets for national and county governments. As a result, I urge all relevant stakeholders to collaborate in order to achieve the strategic objectives outlined in this Framework. I am confident that with the effective implementation of this Framework, dam management structures will achieve the best results in their efforts to invest in stocking and restocking based on sound scientific recommendations and decisions.

DR…….

PRINCIPAL SECRETARY,

STATE DEPARTMENT FOR FISHERIES, AQUACULTURE AND THE BLUE ECONOMY

DEFINITION OF TERMS

Key Results Areas/Strategic Focus Areas: This is an outline of the organization's areas of focus. It also refers to the general areas of outputs or outcomes for which an organization's role is responsible.

PESTEL Analysis: It is a framework or tool used to analyse and monitor the environmental (external) factors that have an impact on an organization.

Programme: A grouping of similar projects and/or services performed by a Ministry or Department to achieve a specific objective; a programme must be mapped to strategic objectives.

Project: A project is a set of coordinated activities implemented to meet specific objectives within defined time, cost and performance parameters. Projects aim at achieving a common goal from a programme.

Strategic Objectives: These are what the organization commits itself to accomplish in the long term; they establish performance levels to be achieved on priority issues and measures of success in fulfilling critical mission statement elements.

SWOT Analysis: It is used for understanding the strengths and weaknesses (internal factors) of the organization and for identifying both the opportunities open to the organization and the threats it faces (external factors).

Target: A target refers to planned level of an indicator's achievement.

ACRONYMS AND ABBREVIATIONS

ABDP	Aquaculture Business Development Programme
ASTGS	Agricultural sector transformation and growth strategy
BMPs	Best Management Practices
CBDMC	Community-based Dam Management Committee
DMS	Dam Management Strategy
EIA	Environmental Impact Assessment
FAO	Food and Agriculture Organisation of the United Nations
FCODA	Framework for Community-based Dam Aquaculture
GoK	Government of Kenya
IEC	Information Education and Communication
IFAD	International Fund for Agricultural Development
KeFS	Kenya Fisheries Service
KMFRI	Kenya Marine & Fisheries Research Institute
KRA	Key Results Areas
MDAs	Ministries, Departments, and Agencies
MTP	Medium Term Plan
NEMA	National Environmental Management Authority
NGO	Non-Governmental Organization
PESTEL	Political, Economic, Social, Technological, Environmental, and Legal
RMS	Risk Management Strategy
SDFA&BE	State Department for Fisheries Aquaculture & the Blue Economy
SWOT	Strength, Weakness, Opportunities and Threats
VMGs	Vulnerable Marginalized Groups

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EXECUTIVE SUMMARY

The Framework for Community-based Dam Aquaculture (FCODA) lays a solid foundation for the operationalization of aquaculture in dams using best management practices, with an emphasis on poverty alleviation and food security through increased income. The framework draws from the Kenyan Constitution of 2010, the Kenya Vision 2030, the Fourth Medium Term Plan (MTP IV), the Kenya Blue Economy Policies Executive Orders, the National Oceans and Fisheries Policy draft 2022, the African Agenda 2063, the United Nations Sustainable Development Goals (SDGs), and other government policy documents. The FCODA is also guided by lessons learned, constraints, and challenges encountered based on research findings from baseline data.

The Framework is divided into five chapters. Chapter one provides background information on the FCODA; sector development challenges at the global, regional, and national levels; rationale; the framework's development process; and its structure. Chapter two provides a brief evaluation of the Political, Economic, Social, Technological, Environmental, and Legal (PESTEL) analysis; Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis; and stakeholders' analysis. Chapter three outlines the framework's Key Result Areas (KRAs), strategic focus areas, strategic objectives, and strategic interventions. The fourth chapter documents the framework's implementation and coordination context, which includes the governance structure, staff, financial resource requirements, and risk analysis and mitigation measures. The framework is monitored, evaluated, and reported on in Chapter five. The chapter also includes an implementation matrix with strategic actions to be taken and budget estimates to put the framework into action. The framework's three KRAs are as follows: (i) Enhanced economic benefits to the communities; (ii) infrastructural and human capacity development; and (iii) Enabling environment for sustainable dam aquaculture. During the framework's implementation, the resources required to operationalize a given business enterprise over a three-year period will be mobilized through ploughing back mechanisms, lobbying development partners, the government for additional funding, and other stakeholders. To ensure that the framework is implemented effectively, monitoring and evaluation should be done on a regular basis.

CHAPTER ONE: INTRODUCTION

1.1 Background

Kenya boasts a vast network of freshwater resources comprising lakes, rivers, dams/reservoirs, streams, and wetlands all suitable for different types of aquaculture development[1]. Dams are standing waters that have been created as a result of erected barriers to stop or restrict the flow of water or underground streams. In terms of size, dams are usually greater than 1.0 ha, but less than 100 ha with a depth of not less than 2 meters[2]. Dams contribute to socioeconomic development and environmental sustainability through fisheries and aquaculture, tourism, and other activities that are dependent upon the existence of water masses. Cognizant of the ever-dwindling capture fisheries resources against the rapid growth in demand for fish protein in Kenyan households, deliberate efforts have been made to increase fish production, mainly through land-based fish farms in the past. While such efforts have inherent challenges of competing interests on land and lake water resources, there exist several vast inland water masses whose fish production potential has not been fully utilized.

Aquaculture is a key pillar in the production sector and an important contributor to wealth creation, food security, economic growth and poverty reduction. It directly addresses SDG 1 – no poverty; SDG 2 - zero hunger, SDG3 - good health and well-being; and SDG 13 – climate action. These strategies also support the Africa's agenda 2063 on rural food production, the Kenya's vision 2030 and closer home, the Government's Economic Transformation Agenda in its endeavor to support farmers raise productivity and enable them to not only feed themselves, but also generate a surplus that contributes to national food security and the economy.[3] Aquaculture production bridges the widening gap between fish demand and supply. In 2020, the global aquaculture production, including aquatic plants, was approximately 214 million tonnes, with an estimated value of USD 424 billion[4]. The contribution of Africa aquaculture production to global production was estimated at 2196 million tonnes in 2018 [5]. In 2018, the aquaculture sector contributed 13.3% (19,945 tonnes) of the country's total fish production output[6].

Dams have a great role in the development of fish productivity and biodiversity by providing new habitats and niches for their survival and growth in a suitable environment. Dams have great potential for fisheries and play a significant role in the sustainable growth of inland fisheries, productivity of the dams leads to economic wealth [7]. The growing number of mainstream dams in the world's major river basins and their potential impact on riparian communities has received a lot of attention in recent years. However, the role of dams in aquaculture has been largely neglected, and the current national fish production statistics do not include all dams. Also, the role

[1]KMFRI, 2021, The State of Aquaculture Report in Kenya 2021: Towards Nutrition Sensitive Food Production Systems

[2] DMS, 2020. Dams Management Strategy (DMS). Funded by the International Fund for Agricultural Development (IFAD) and The Government of Kenya through the Aquaculture Business Development Programme (ABDP). Submitted to The Programme Coordinator (PC),

[3]THE PLAN The Bottom Up Economic Transformation Agenda 2022 - 2027

[4] FAO, 2022, The State of World Fisheries and Aquaculture: Towards Blue Transformation. FAO, Rome Italy

[5]FAO 2018, Aquaculture Production in Africa. FAO, Rome Italy

[6]Kenya National Bureau of Statistics, 2021, Economic Survey 2021

[7]Parihar, Chandan & Gupta, Rajender & Dahiya, Tejpal. (2021). Impact of dams in fisheries-a review. 10. 000-000.

of dams in reducing rural poverty has not been adequately explored[8]. Dam management harbors the potential to enhance sustainable food production opportunities, local employment for the youth and the Vulnerable Marginalized Groups (VMGs), nutrition, and resilience in the Kenyan aquaculture and fisheries sector. Fish consumption is crucial for human health because it supplies essential elements, which are necessary for the reduction of malnutrition or deficiencies, thus contribute to a healthy nation and vibrant economy[9]. This Framework for Community-based Dam Aquaculture (FCODA) provides a systematic approach to manage community dam resources sustainably, so that the community can benefit from all activities that can be supported by such a resource.

1.2 Sector Challenges

1.2.1 Global challenges

Global challenges to aquaculture development result from the increasing demand for the "blue" space driven by competing needs in economic development to support the growing populations. Climate change remains a threat to sustainable economic development from habitat degradation thereby shrinking available habitats for fisheries production. Globally, fish is one of the most traded food commodities with developing countries contributing to 50% of fish exports by value [10]. Fish consumption has increased from 9 kg/person/year in 1961 to 20.2 kg/person/year in 2015 [11], leaving a deficit in the fish production sector. These creates a gap in the demand-supply value chain that cannot be met from the dwindling wild capture fisheries

1.2.2 Regional challenges

At a regional scale, aquaculture related challenges mainly originate from developments within the basin. This has resulted in pollution from agricultural, industrial and municipal sources limiting productivity of the aquatic ecosystems. Other challenges include: Fragmented policies for aquatic resources management/development, inadequate policy intervention and poor regional institutional frameworks for collaboration. Low membership in trade cooperatives and a poor savings culture limits access to financial services for enterprise growth along the aquaculture value chain. Direct challenges on aquaculture expansion include: high costs of fish feeds, limited availability of good quality seed, inadequate technical capacity, inadequate promotion and support by Governments to stimulate medium and large-scale commercial investments in aquaculture, low uptake of commercial aquaculture by the private sector, insufficient commercial aquaculture

[8]DMS, 2020. Dams Management Strategy (DMS). Funded by the International Fund for Agricultural Development (IFAD) and The Government of Kenya through the Aquaculture Business Development Programme (ABDP). Submitted to The Programme Coordinator (PC),

[9]Aura, M.C., Nyamweya, C.S., Owili, M., Gichuru, N., Kundu, R., Njiru, J.M., Ntiba, M.J. 2020. Checking the pulse of the major commercial fisheries of Lake Victoria Kenya, for sustainable management. Fish Manag Ecol. 27: 314–324.

[10]https://www.fisheries.noaa.gov/national/aquaculture/global-aquaculture

[11]FAO. (2016) Fisheries and aquaculture division. Fishery and aquaculture country profiles. The Republic of Kenya. Available at: https://www.fao.org/fishe ry/facp/KEN/en

demonstration business models and inadequate planning for development and expansion of aquaculture[12].

1.2.3 National Challenges

The national aquaculture potential is approximately 11 million tonnes[13] against the current production of 20,973 tonnes[14]. Kenya's aquaculture industry is evolving from traditional to modern systems, but the sector has been unable to realize its full potential due to the following constraints: Poor supply of affordable and quality fish seed (fingerlings) and fish feeds; Inadequate supportive infrastructure e.g., fish propagation hatcheries; fish feed industries & fish marketing systems; Inadequate budgetary provision for aquaculture sector; Weak research- extension farmer linkages; Slow uptake of fish farming Technologies Innovations and Management Practices (TIMPs); Poor book-keeping and record management along the aquaculture value chain e.g., input costs, labor, quantities of fish harvested and value; Sub optimal staffing levels/inadequate facilitation for extension personnel and increasing competition from cheaper imported farmed fish products[15].

1.2.4 Local challenges

Majority of aquaculture farmers in Kenya fall under the smallholder demographics. Aquaculture farmers face the following challenges at local level; predation; insufficient knowledge on aquaculture production systems and record keeping; inability to market farmed fish; lack of access to credit facilities and schemes for fish farmers; and limited access and adoption of new technologies that would increase their production.

1.3 Role and Rationale

The fisheries potential of SWBs remains underexploited in most developing countries as they are least investigated and often excluded from fisheries management plans. However, these SWBs/dams could significantly increase productivity and fisheries yield and contribute to food security. This would in turn bridge the fish consumption deficit per capita of 10 kg/person/year nationally[16]. Development of Aquaculture in dams bears good prospects for diversification of livelihood streams for the local communities thereby creating employment and generating tax revenue from both direct and indirect aquaculture activities along the fisheries value chain (Multiplier effect). Coupled with efficient and reduced production costs, the costs of creating jobs will be significantly reduced as envisioned in the Government's Economic Transformation

[12]KMFRI (2020) Corporate Strategic Plan 2018 – 2022. Kenya Marine and Fisheries Research Institute (KMFI)

[13]FAO. (2016) Fisheries and aquaculture division. Fishery and aquaculture country profiles. The Republic of Kenya. Available at: https://www.fao.org/fishe ry/facp/KEN/en

[14]KNBS (2022) Economic Survey Report. Kenya National Bureau of Statistics. available at www.knbs.or.ke

[15]Fonda, J. A., Mary, A. O., Kevin, O. O., Jonathan, M. M., Jacob, A., Betty, M. N., ... & Gilbert, V. S. (2021). Aquaculture extension service in Kenya: Farmers and extension officers perspectives. Journal of Agricultural Extension and Rural Development, 13(1), 14-22.

[16]Aura, C.M., Mwarabu, R.L., Nyamweya, C.S., Owiti, H., Ongore, C.O., Guya, F., et al (2022) Exploring the potential of small water bodies as an integrative management tool for fisheries production. Fisheries Management and Ecology, 29, 254–268. https://doi.org/10.1111/fme.12529

Agenda[17]. Improvement in the aquaculture production industry has seen farmers stock fast growing fish seeds (fingerlings) and use quality feeds thereby reducing the payback period.

1.4 Development Processes of the Framework

The development of this framework was a participatory and consultative process based on primary and secondary data and information and expert opinions. The primary information was sourced from scientific findings on dam surveys. Secondary data and information sourced included the draft Dam Management Strategy, Government policy documents on aquaculture such as Agricultural Sector Transformation and growth strategy (ASTGS) 2019-2029, Kenya Blue Economy Strategy and policy documents, Government's Economic Transformation Agenda, the fourth medium term plan (MTP IV) and strategic plans for MDAs. This was guided by the government of Kenya Vision 2030 and the Constitution of Kenya 2010. Other secondary information was obtained from the United Nations Sustainable Development Goals, Africa Agenda 2063, and regional policy documents on aquaculture.

[17]THE PLAN The Bottom Up Economic Transformation Agenda 2022 - 2027

CHAPTER TWO: SITUATIONAL ANALYSIS

2.1 Overview

With the rapid human population growth in Kenya and the increasing demand for food, the fisheries sector has a vital role in meeting the nutritional requirement of the population. However, the capture fisheries sector in Kenya has been in decline because of myriad challenges ranging from overfishing, environmental degradation and limited investment. Aquaculture is poised to play an increasingly important role in bridging the shortfall in fish production. Kenya is ranked fourth in aquaculture production in Africa, mainly from Nile tilapia (*Oreochromis niloticus*) and African catfish (*Clarias gariepinus*). Aquaculture production in Kenya is low despite the high potential in aquatic resources and fish demand. Based on available data, only nearly 20,000 ha of potential aquaculture area (1.4 million ha) are under aquaculture, and 95% of aquaculture is practised in small-scale earthen ponds with low productivity[18]. Thus, there is a need to expand the area under aquaculture to increase fish production from this sector.

Dams and reservoirs in Kenya have the potential for fish production through culture and restocking initiatives. With this realization, the government and private sector are focusing on dams for capture fisheries and aquaculture as critical drivers of the blue economy and food and nutrition security. However, it is important to promote sustainable fisheries development that does not degrade the environment and safeguards the interests of all stakeholders. Sustainable aquaculture from dams require a multi-stakeholder approach within a framework that guides investment and operations. This framework proposes a coordinated approach for guiding the operation and investment in dam aquaculture as an enterprise for community empowerment and livelihoods support.

2.2 Review of Existing Strategies

This Framework for Community-based Dam Aquaculture (FCODA) is the first to be developed for dam aquaculture in Kenya. Thus, the FCODA has not been reviewed regarding milestones, achievements and impacts. Also, there are no challenges regarding its implementation, and no lessons learnt. The FCODA has eight (8) strategic objectives that address three (3) key result areas that include; i) Enhanced benefits to communities, ii) Infrastructural and human capacity development, and iii) Enabling environment for sustainable dam aquaculture.

2.3 Environmental Scan

2.3.1 Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis

SWOT analysis evaluates an entity's strengths, weaknesses, opportunities, and threats. The tool identifies internal (strengths and weaknesses) and external (opportunities and threats) elements favourable or unfavourable to achieving defined goals. Capabilities and resources are examples of a entity's strengths. Weaknesses are internal features that disadvantage the entity's strength relative to others (or specified aims) and must be minimized to attain stated objectives. Opportunities are external variables that help achieve goals. Threats are external elements in

[18] Opiyo, M. A., Marijani, E., Muendo, P., Odede, R., Leschen, W., & Charo-Karisa, H. (2018). A review of aquaculture production and health management practices of farmed fish in Kenya. *International Journal of Veterinary Science and Medicine*, *6*(2), 141-148.

the operating environment that lower the entity's chance of accomplishing its goals. Table 1 lists internal and external issues that will affect FCODA's performance.

Table 1. Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis of Dam Aquaculture enterprises

Strengths	**Implications**
Many dams and small water bodies spread across the country	• Plentiful habitat for community-based dam aquaculture fish production
Different kinds of fish exist in different dams	• Diversification of fisheries can increase and stabilize production and revenue, despite unpredictable changes in ecosystems and markets.
Many fishery colleges, faculties and research institutes	• Educating a large number of people about aquaculture enterprise through formal training and short courses.
Strong network of national, regional and international collaborators and partners	• National and international recognition and support for community-based dam aquaculture
Weaknesses	**Implications**
Inadequate cooling chain at the stage of marketing	• High post-harvest losses that may arise from dam aquaculture business
Inadequate financing from the Exchequer	• Inadequate funding for community-based dam aquaculture
Insufficient technical expertise in the community groups	• Inability to address all technical aspects in the community-based dam aquaculture venture
Lack of historical data and information	• Limits knowledge of extent of impact by emerging issues (e.g., Climate change)
Opportunities	**Implications**
Increased focus on the Blue Economy	• Increased support to organizations in information generation for the sustainable exploitation of the Blue Economy
Increased demand for fisheries and other aquatic resources	• Need to explore and exploit untapped fisheries and other aquatic resources • Increased demand for data and information on aquaculture • Increased demand for certified fish seed and feed
Recognition of fisheries as an important economic sector in the Vision 2030 and MTP IV	• Increased support for sustainable utilization of fisheries resources for income generation, food security and employment creation
Recognition of climate change as a national challenge in the realisation of Kenya Vision 2030 development agenda	• Data collection and analysis on the effects of climate change on fisheries and aquaculture, as well as effective adaptation and mitigation strategies
Increase in number of dams and water reservoirs	• Increase in available space for community-based aquaculture in dams
Unexploited potential in some dams	• Research expeditions to inform fisheries status and aquaculture potential in dams
Increased interest and training in aquatic fields	• Blue Economy (aquaculture) literacy and awareness programmes

Presence of regional and global bodies that have interests in dam aquaculture	• Collaboration with regional and global bodies in different countries to bench-mark development of community-based dam aquaculture
Enabling political environment	• Increased support from both national and county governments
Spatial planning and zoning	• Allocating available space to different uses based on their suitability in order to reduce resource use conflicts.
Threats	**Implications**
Insecurity	• Reduced revenue for the community groups due to theft and vandalism
Resource use conflicts	• Low production due to inefficient use of dams for aquaculture
Political interference	• Low adoption of proposed dam aquaculture by community groups
Natural calamities (drought and floods)	• Losses as result of floods and fish mortalities during drought due to deteriorating water conditions
Weak governance structures within the community groups	• Lack of cohesion leading to dismal performance
Eutrophication and pollution	• May compromise fish quality and safety in extreme cases

2.3.2 Political, Economic, Social, Technological, Environmental and Legal (PESTEL) Analysis

The analysis was conducted in light of the PESTEL factors, as well as their strategic implications and responses. Table 2 shows the results of the analysis.

Table 2. Political, Economic, Social, Technological, Environmental and Legal (PESTEL) analysis of dam aquaculture enterprises

Political Factors		
Factor	**Strategic Implication**	**Strategic Response**
Political goodwill and Stability	• A favourable environment for community-based dam aquaculture. • County government support. • Favourable policies supporting community-based dam aquaculture; and • Goodwill from relevant Ministries, Departments, and Agencies (MDAs)	• Expanded Extension and Outreach Programs • Strategic Partnerships with County Governments • Increased research and resource mobilization for community-based dam aquaculture • Improved working conditions and output
Prioritization of the Blue Economy (Aquaculture) by the National Government	• Increased prominence of aquaculture contribution to the blue economy	• Increased community-based dam aquaculture to drive the Blue Economy • Increase collaborations with other players in the Blue Economy
Favorable global political agenda for emerging issues such as climate change,	• Availability of financing from international	• Develop collaborations in relevant global issues

international disputes under UNCLOS and Piracy	organizations for relevant global issues of concern • Increased awareness and sensitization on emerging global issues	• The Community-based Dam aquaculture would contribute to the global issues
Economic Factors		
Factor	**Strategic Implication**	**Strategic Response**
Economic growth expected as a result of investments in community-based dam aquaculture	• New business, training, and research opportunities • Demand for community-based dam aquaculture and investments	• Contribute data and information for the development of Spatial Planning and Zoning • Strengthen collaborations and linkages to address opportunities and investment in Community-based dam aquaculture
Aquaculture funding	• Increased investment in the community-based dam aquaculture	• Increased lobbying for the GOK to support community-based dam aquaculture as a driver of Blue Economy investments. • Collaborate with strategic collaborators and donors to fund community-based dam aquaculture • Public-Private Partnership (PPP)
Regional Integration (East African Community, COMESA, IGAD)	• Opportunities for larger market • Reduced cost for doing business • Free cross boarder movement • Common platforms for doing business	• Enhanced sale of value-added products
Post-harvest fish losses	• Food insecurity and economic loss	• Develop innovative technologies to reduce fish post-harvest losses • Formulation of value-added products
Social Factors		
Factor	**Strategic Implication**	**Strategic Response**
Indigenous Knowledge	• Create opportunities to use, develop and improve community-based dam aquaculture technologies that are appropriate to the various communities	• Provide opportunities to utilize the knowledge in the development of community-based dam aquaculture.
Cultural Diversity	• Tapping of indigenous knowledge to support management of the	• Value addition to promote fish consumption

	community-based dam aquaculture • Demand of fish food • Affects investment in fisheries and aquaculture industry	• Provision of data and information for sensitization on fish food diversity
Rapid population growth	• Demand for alternative livelihoods • Reduced employment opportunities • Decline in capture fisheries in artisanal fishers	• Develop Blue Economy technologies and programmes that create employment and improve food security • Promote Value-addition to enhance incomes
Technological Factors		
Factor	**Strategic Implication**	**Strategic Response**
Information and Communication Technology (ICT) and e-resources	• Better access to online information resources • Improved avenues for information dissemination	• Promote use of technology in all functional lines
Emerging technologies	• Inadequate capacity to utilize emerging technologies	• Collaborate with relevant institutions
Environmental Factors		
Factor	**Strategic Implication**	**Strategic Response**
Climate change and natural calamities	• Destruction of community-based dam aquaculture infrastructure areas • Loss of fish	• Opportunity for research on climate mitigation and adaptation • Conduct research and disseminate information on Climate Change • Training and sensitization on climate change • Opportunity for mapping of potential natural calamity in various dams
Legal Factors		
Factor	**Strategic Implication**	**Strategic Response**
The Constitution of Kenya 2010	• Changed governance and operational environment including devolution, gender balance, bill of rights, affirmative action, leadership and integrity, and cost of compliance • Public participation has empowered and enlightened the citizenry to participate in development projects • Increased litigations	• Alignment of the community-based dam aquaculture operations with the Constitution • Inclusion of gender balance and focus on vulnerable and marginalized groups • Avail information to the public in line with requirements of the Constitution • Sensitization on constitutional and statutory requirements • Embrace public participation in decision-making

Fisheries Management and Development Act No. 35 of 2016	• Allows for consultation among stakeholders on fisheries and aquaculture development issues. • Provides for protection and conservation of aquatic resources including small water bodies	• To align with the provisions of this Law and collaborate with the relevant Fisheries agencies • Compliance to existing laws and regulations
International and regional conventions, treaties and agreements	• Obligation to comply with these conventions and agreements	• Collate and provide relevant information for compliance

2.3.3 Stakeholder Analysis

An analysis was undertaken to identify different stakeholders directly or indirectly involved in the implementation of the FCODA. Table 3 provides the key stakeholders, their expectations, and their contribution to the successful implementation of the framework.

Table 3. Stakeholders Analysis of dam aquaculture enterprises

Stakeholder category	**Stakeholder expectations from FCODA**	**Stakeholder contribution to FCODA**
The National Treasury	• Contribution to GDP and socio-economic development • Prudent management of resources	• Resource mobilization, adequate and timely funding and budget approval • Public Financial Policy Guidelines
Ministry responsible for Fisheries and Aquaculture	• Efficient utilization of dams for food production • Accountability and transparency in the utilization of allocated funds • Compliance with guidelines and regulations	• Support funding requests • Extension services • Policy formulation to guide the sector
State Department responsible for Fisheries, Aquaculture and the Blue Economy and Kenya Fisheries Service	• Accountability and transparency in utilization of resources • Effectiveness, efficiency, and economic use of resources • Provision of data to guide resource management	• Setting standards • Utilization of research findings for resource management • Policy formulation and fisheries management guidelines • Resource management, enforcement, and extension services • Provision of advisory and regulatory services • Clear information and data requirements
Water Resources Authority, Water Users Associations	• Compliance with guidelines and regulations on the use of water resources	• Provision of guidelines on water use • Licensing and permitting of water use • Provision of data on water quantity

Stakeholder category	Stakeholder expectations from FCODA	Stakeholder contribution to FCODA
NEMA	• Compliance with guidelines and regulations on waste management and the environment	• Provision of guidelines on dam aquaculture operations • Provision of EIA and EA services • Environmental Licensing for dam aquaculture operations • Provision of data on water quality
KenGen	• Maintenance of water quality and quantity	• Provision of data on water quality and quantity • Provision of access
Research institutions, Universities (international and national), and tertiary training institutions	• Access to dams and joint research • Collaboration in training, research programmes and projects (including student attachment and internships).	• Capacity building in dam aquaculture • Collaboration in program development and implementation • Production of skilled and competent graduates • Joint proposal development for research and investment in dam aquaculture
Law enforcement agencies	• Cooperation and compliance with relevant laws and regulations	• Provision of safety and security
County Governments	• Sustainable use of resources • Improved livelihoods of communities • Food and nutrition security • Support and co-operation on aquaculture • Dissemination of research output to the communities	• Support funding requests • Policy formulation to guide the sector at the County • Provision of funds for commissioned research to address specific needs • Sharing of county policies, plans and programmes about the use of dams • Issuance of permits and other relevant documents
Development partners and financial institutions	• Prudent management of funds and other resources • Transparency and accountability • Timely provision of required products, information and reports • Generation of data and information to support informed management of dams	• Technical support, capacity development, funding of research projects • Cooperation in research on dam aquaculture • Resource mobilization • International lobbying • Data and information exchange
Local and international Non-Governmental Organizations	• Support the implementation of Local, Regional and International Organizations initiatives	• Mobilization of resources • Community mobilization and sensitization • Advocacy, networking and lobbying

Stakeholder category	Stakeholder expectations from FCODA	Stakeholder contribution to FCODA
Community-based organizations	• Technical and logistical support • Efficiency in delivery of services • High standards of professional ethics • Accountability and transparency in the provision of services	• Resource management • Community empowerment • Awareness creation • Capacity building • Resource mobilization • Advocacy, networking and lobbying • Partnership in research • Marketing groups • Transfer of indigenous knowledge • Technology adoption • Goodwill • Compliance with management regulations • Information and data sharing
Private sector such as fish processors, feed companies, hatcheries and traders	• Provide data that will address their challenges • Technical support • High standards of professional ethics • Accountability and transparency in provision of services • Spur growth of blue economy cottage industry	• Partnership in research • Funding of research, • Adoption of technologies • Compliance with fisheries and other relevant quality assurance regulations
Media platforms i.e., Internet Service Providers (ISPs), Media Houses, printing firms	• Receive timely information • Access factual information	• Information Technology (IT) services • Packaging and timely dissemination of information • Awareness creation • Effective coverage and accurate reporting on FCODA activities
Labour relations stakeholders i.e Unions,	• Support employee welfare • Meet employer obligations	• High productivity of staff • Mediation for conflict resolution
FCODA Employees	• Provision of tools and equipment for effective service provision • Conducive work environment • Favourable terms and conditions of service	• Commitment to service delivery • Observance of work ethics

CHAPTER THREE: STRATEGIC MODEL

3.1 Vision, Mission, and Core Values

Vision

A holistic guide for sustainable dam aquaculture development

Mission

To empower communities to establish sustainable dam aquaculture enterprises.

Core Values

To fulfil the vision and mission of FCODA, the operation and management will be guided by the following core values:

a) Integrity
b) Transparency and accountability
c) Professionalism
d) Teamwork
e) Equity and equality

Table 4 presents the Key results areas and strategic objectives

Table 4: Key Result Areas and Strategic Objectives

KEY RESULT AREAS	STRATEGIC OBJECTIVES	ACTION AREAS
1. Enhanced economic benefits to the communities	i. Increased fish production	a) Supply of quality seed b) Supply of quality feed for supplementary feeding c) Restocking of dams d) Intensification through cage farming e) Post-harvest loss reduction using deep freezers f) Value addition using smoking kilns
	ii. Integrated Dam Aquaculture Model	a) Agroforestry b) Horticulture c) Apiculture
	iii. Ecotourism	a) Boat riding (outboard engine and canoe) b) Sport fishing (fishing lines, rods and floating platform) c) Bird watching view point (accessories and species guides) d) Picnic/Catering/Hotel services (capital cost) e) Events and photography f) Signage
2. Infrastructural and human capacity development	i. Improved Infrastructure for fish production and other dam uses	a) Improvement of access roads b) Landscaping and improvement of dykes c) Provision of security, fencing and predator control d) Dredging and desilting e) Enhancing capacity of existing authenticated hatcheries near the dams

	ii. Improved human capacity	f) Undertake training needs assessment g) Inception training on BMPs on aquaculture h) Annual training on best management practices (BMPs) for community and farmers i) Continuous professional development for extension officers j) Development of information education and communication (IEC) materials (e.g manuals, modules and guidelines etc) k) Employment of technical officers i.e farm managers/aquaculture technicians l) Facilitation of leaders of the dam management team
Enabling environment for sustainable dam aquaculture	i. Enabling environment for aquaculture activities	a) Provision of adequate and relevant extension service. b) Participatory action-oriented research and result dissemination c) Quarterly data collection on aquaculture production and reporting for decision making d) Budgetary allocation and funding for dam aquaculture production
	ii. Increased investment in dam aquaculture	a) Subsidizing production cost of quality feed b) Subsidizing production cost of quality seed c) Formation of functional fisheries and aquaculture cooperatives d) Access to affordable credit through functional cooperatives e) Establishment of fish aggregation systems-Linking farmers to market opportunities (Samaki Dam) f) Establishment of facility sharing arrangements e.g cooling and collection. g) Establishment of dam Aquaparks h) Enhance corporate social responsibilities (CSR)
	iii. Environmental sustainability	a) Environmental licensing for new development interventions/ installations (e.g cost of EIA, EA, and licensing b) Creating Environmental Management Plan for regular environmental monitoring, impact identification and mitigation c) Management of water quality for on dam and downstream environmental integrity d) Setting up an appropriate waste management and pollution prevention strategy e) Occupational health, hygiene and safety policy f) Pre-feasibility and feasibility studies on Environmental aspect

CHAPTER FOUR: IMPLEMENTATION AND COORDINATION FRAMEWORK

4.1 Overview

The implementation of this Framework for Community-based Dam Aquaculture (FCODA) will be carried out in a three-year period. The framework is envisioned to be applied in the initial stages of the establishment of a dam aquaculture enterprise, after which other roadmap statutory documents such as strategic plans need to be developed for guidance. Various stakeholder groups and institutions will be involved in the implementation process. This section sets out the implementation arrangements for the plan and identifies the roles and responsibilities of the various stakeholder group or institutions.

4.2 Proposed Structure of the Organization

The FCODA will be implemented by community-based dam leaders and dam management with policy guidance from the SDFA&BE, KeFS, NEMA. Research data and information sharing will be done by KMFRI and Universities. The Management structure is as shown in Figure 1.

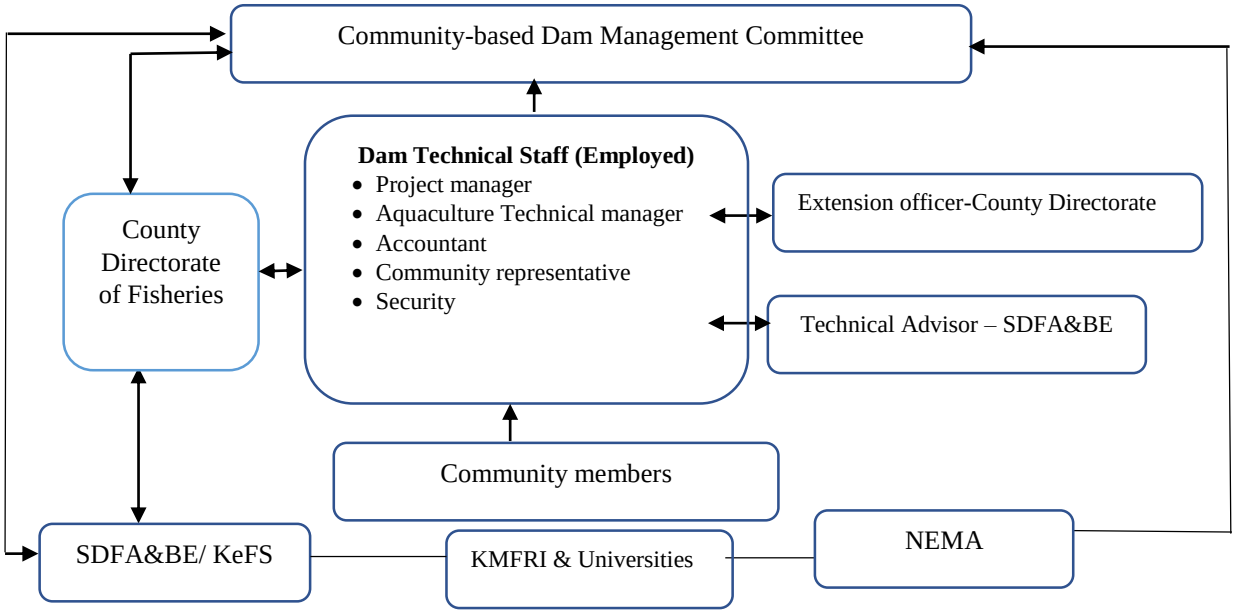

Figure 1: Proposed organisation structure for community-based dam aquaculture management. SDFA&BE-State Department for Fisheries Aquaculture & the Blue Economy; KeFS- Kenya Fisheries Service; KMFRI -Kenya Marine & Fisheries Research Institute; NEMA-National Environmental Management Authority

4.3 Personnel to manage the Community-Based Dam Aquaculture enterprise

The Community-based Dam Management Committee (CBDMC) will employ Technical staff with relevant qualifications to run the Dam aquaculture enterprise. The technical staff include the Project manager, Technical manager, Accountant, Security and a community representative. The personnel will be remunerated to ensure the enterprise is profitable and run professionally.

The project manager is the person in charge of the technical staff and would report to the CBDMC as maybe prescribed. The CBDMC is selected from the association in charge of the dam. The technical advisor from the SDFA&BE and the Extension officer are attached to the technical staff to offer technical support on the dam aquaculture operations and linkages with the respective stakeholders. The roles of the various stakeholders in the operations of the Community-based Dam Aquaculture are listed below in Table 5.

Table 5. Roles of the various stakeholders in the operations of the Community-based Dam Aquaculture

Stakeholder	Role
County Directorate of Fisheries	• Spearhead the dam management. • Offer guidance on the site survey and management • Attach an extension officer to the dam operations • Collaborate with the Community-based Dam Management Committee in sourcing for funding
State Department for Fisheries Aquaculture & the Blue Economy (SDFA&BE)	• Providing policy guidance • Training and capacity building • Attach a technical advisor to the dam management for daily dam aquaculture operations
Kenya Fisheries Service (KeFS)	• Regulation and licensing of dam aquaculture activities • Providing guidance on dam activities and operations
KMFRI & Universities	• Research on appropriate dam carrying capacity • Research on suitable species for culture including development, adoption and transfer of appropriate technologies to be adopted in dam aquaculture • Research on seed and feed for use in dam aquaculture • Research on socio-ecological and environmental issues affecting the dam
National Environmental Management Authority (NEMA)	• Environmental policy formulation • Guidance in waste management
Community-based Dam Management Committee	• Management of the dam aquaculture activities • Recruitment of the dam technical staff • Liaison with other stakeholders • Funds acquisition and management
Dam Technical staff	• Daily running of the Dam aquaculture activities • Record keeping • Reporting to the Community-based Dam Management Committee

4.4 Financial Resources

For the operationalization of this framework, the CBDMC will require to mobilize finances through internal and external sources to fund the dam aquaculture activities.

Table 6. Financial resource requirements of FCODA

Key result area	Cost of Implementation (KES millions)
I. Enhanced economic benefits to the communities;	34.8
II. Infrastructural and human capacity development;	22.09
III. Enabling environment for sustainable dam aquaculture.	To be provided from external sources
TOTAL	**56.89**

Resource gap

The resource gap for this Framework for Community-based Dam Aquaculture is KES 56.89 million.

Resource mobilization strategies

a) Internal Sources

Internal sources include cash Saving through cooperative societies, ploughing back of resources, good will contributions, contribution in kind and fund raising.

b) External Sources

External sources include grants from government projects, donors, development partners and Non-Governmental Organization (NGOs) and Government subsidies.

CHAPTER FIVE: IMPLEMENTATION, MONITORING AND EVALUATION

5.1 Monitoring and Evaluation Institutional Framework

Monitoring and Evaluation (M&E) will enhance accountability through the provision and sharing of timely and accurate information on the FCODA's performance which will be measured in terms of its effectiveness, efficiency, relevance, sustainability, and impact.

An M&E framework will be developed, based on FCODA's design, and will provide the basis for the M&E activities with regards to indicator metadata, responsibilities, timeframe, resources, methods of data collection, quality assurance, and utilisation. The M&E framework and devised systems will have to be realistic and ensure high quality, consistency, and availability of data, especially at field level. The system will support gender and age disaggregated data collection and analysis.

5.1.1 Monitoring Implementation

Monitoring will involve regular data collection and analysis of the progress of implementation, whose results will be used to inform decision making. The M&E shall be based on the key performance indicators. The M&E committee will provide a standard M&E reporting procedure that responsible stakeholders will use to report this framework's implementation. The M&E reports will inform the implementation status of the framework. Table 7 describes the monitoring and evaluation matrix of the KPAs.

5.2.2 Framework Evaluation

Evaluations provide analytical, systematic, and objective assessments of the programme outcomes and impact, by not only taking the results framework and key indicators as the main reference, but also analysing unintended effects. Evaluations will include periodic internal assessments as well as external, independent evaluation exercises. There shall be a bi-annual review meeting to review the implementation of the framework. This framework will be evaluated from time to time as deemed necessary to ensure it is up to date and it serves its purpose. Relevance, cost-effectiveness/value for money, efficiency, impact and sustainability will be the key pointers during evaluation. The framework reviewers will be required to advise on corrective actions if and when needed, and provide recommendations on resource needs. In any case, the entire framework will be reviewed after every year. The M&E committee and relevant approval organs will approve any amendment to this framework.

5.3 Monitoring and Evaluation Reporting

The reporting will be based on Key Performance Indicators (KPIs) of various activities as stipulated in the three Key Results Areas of this framework (Table 7).

Table 7: Monitoring and Evaluation Plan Matrix

Main Objective	**The main objective of the framework is to develop the FCODA for dam owners to supplement and to support investment in dams in order to increase fish production and income for local communities.**				
Key Results Areas No. 1	**Enhanced economic benefits to the communities**				
Strategic Objective	**Outcome**	**Indicators**	**Activities**	**Expected Output**	**Means of Verification**
1. Increased fish production	• Sustainable livelihoods of communities •	• Number of active dams used for aquaculture operations. • Total dam aquaculture production (tons) • Number of jobs created •	• Supply of quality seed • Supply of quality feed for supplementary feeding • Restocking of dams • Intensification through cage farming in the dams • Post-harvest loss reduction using deep freezers • Value addition using smoking kilns.	• Increased fish production from dams • Post-harvest loss reduced •	• Fisheries reports/publication/statistical bulletins • Verified data on fish production •
2. Integrated Dam Aquaculture	• Increased productivity, income and resilience through sustainable, diversified, and integrated crop, livestock, and fish production systems •	• Number of operational enterprises practiced •	• Agroforestry • Horticulture • Apiculture	• Farmers practicing Integrated Dam Aquaculture increased	• Production and sales records from enterprises
3. Ecotourism	• Increased income through asset building of	• Number of actors in the ecotourism sector employed	Boat riding (outboard engine and canoe)	• Employment opportunities created	• Records of the tourists visiting/engaging in the

	vulnerable households		Sport fishing (fishing lines and rods and floating platform) Bird watching view point (accessories and species guides) Picnic/Catering/Hotel services (capital cost Events and photography Signage		ecotourism activities • Income generated from ecotourism
Key Results Areas No. 2	**Infrastructural and human capacity development**				
Strategic objective	**Outcome**	**Indicators**	**Activities**	**Expected Output**	**Means of verification**
4. Improved Infrastructure for fish production and other dam uses	• To establish infrastructure along the aquaculture value chains. • Increased public investment, and Effective and efficient delivery of services	• Number and type of equipment infrastructure facilities acquired • Number of stakeholders accessing new technologies and innovations • Number of Infrastructure for fish production and other dam uses adopted	• Landscaping and improvement of dykes • Provision of security, fencing and predator control • Dredging and desilting • Enhancing capacity of existing authenticated hatcheries near the dams.	• Improved infrastructure for fish production and other dam uses adopted	• Reports on market infrastructure developed constructed, rehabilitated, and or maintained
5. Improved human capacity	• Improved skills and performance of people involved in the enterprise	• Number of people and stakeholders trained	• Training needs assessment • Inception training on BMPs on aquaculture • Annual training on best management practices (BMPs) for	• Effective extension services established and implemented • Skills developed for aquaculture value chain actors, including farmer	• Report on training needs assessment • Training reports • Number of IEC packages developed

			community and farmers • Continuous professional development for extension officers • Development of information education and communication (IEC) materials (e.g manuals, modules and guidelines, etc) • Employment of technical officers i.e farm managers/aquaculture technicians • Facilitation of leaders of the dam management team	organizations, women, and youth	• Meeting minutes
Key Results Areas No. 3	**Enabling environment for sustainable dam aquaculture**				
Strategic objective	**Outcome**	**Indicators**	**Activities**	**Expected Output**	**Means of Verification**
6. Enabling environment and responsive institutions for aquaculture activities	• Sector Institutions strengthened to become responsive to stakeholder needs •	• Number of policy briefs recommended for dialogue by stakeholders and policymakers • Number of policies, laws, regulations, and procedures that promote Dam aquaculture	• Provision of adequate and relevant extension service • Participatory action-oriented research and result dissemination • Quarterly data collection on aquaculture production and reporting for decision making	• Effective planning, coordination, and budgeting • Monitoring, evaluation, and evidence-based knowledge management and learning undertaken, supported by	• Financial reports • Signed contracts and agreements • Progress reports

			• Budgetary allocation and funding for dam aquaculture production	effective information systems • Evidence-based policy development and regulatory framework •	
7. Increased investment in dam aquaculture	• Effective and efficient public and private sector services in the dam aquaculture •	• Number of farmers involved in agribusiness	• Subsidizing production cost of quality feed • Subsidizing production cost of quality seed • Formation of functional fisheries and aquaculture cooperatives • Access to affordable credit through functional cooperatives • Establishment of fish aggregation systems-Linking farmers to market opportunities • Establishment of facility sharing arrangements e.g cooling and collection •	• Value chain actors supported in business/cooperative management • Famers involved in aqua/agribusiness Number of Strong and well-organized farmer groups • Increased registration to cooperatives, CIGs	• Records of memberships to cooperatives • Certificates of registration • Number of innovative start-ups / businesses created •
8. Environmental sustainability	• Sustainable use of resources and promoting environmentally	• Number of Environmental audits of the project activities	• Environmental licensing for new development interventions/	• Capacities and institutional systems are strengthened to	• EIA /EA reports • Permits and licenses

	sensitive options for development along the value chain. • Balanced dam ecosystem	• Number of EIA and social safeguards in the • identified dam aquaculture project activities • Number of trained stakeholders on EIA and audit protocol to ensure compliance during • Project implementation	installations (e.g cost of EIA/ EA, and licensing • Creating Environmental Management Plan for regular environmental monitoring, impact identification and mitigation • Management of water quality for on dam and downstream environmental integrity • Setting up an appropriate waste management and pollution prevention strategy • Occupational health, hygiene and safety policy	improve preparedness to disasters by providing timely information and having response and recovery plans and systems in place.	

CHAPTER SIX: RISK ANALYSIS

6.1 Overview

The goal of risk management is to address existing and potential threats to the long-term viability and success of aquaculture programs at each dam. The Risk Management Strategy (RMS) is a structured and coherent approach to identifying, assessing, and managing unforeseen threats identified in the SWOT analysis. This will be a progressive, proactive, and systematic process for identifying, communicating, and managing potential risks in dam aquaculture systems. Table 8 summarizes the various challenges/risks and the mitigation measures that are universally applicable in the Community-based Dam Management Committee (CBDMC).

Table 8: Potential risks, occurrence, and mitigation measures for the FCODA. Risk rating: H = High; M = Medium; and L = Low.

Risk type	Risk factors	Rating (H, M, or L)	Impact on the project	Mitigations
Organizational risks	Ineffective community participation in dam management due to a lack of community capacity to implement and manage CBDMC approaches (leadership, financial management, procurement, and reporting).	L	M	• Increase community awareness of participatory development and fortify existing collaborative arrangements. • Financial assistance with resource utilization and management. • Establish guidelines for the formation of the dam's management, finance, and procurement committees. • Strengthen grassroots/county extension structures to provide necessary capacity building, technical support, and oversight of CBDMC-implemented activities.
	Due to the complexity of managing multi-sectoral/integrated projects, stakeholder participation in project implementation may be ineffective and inefficient.	M	H	• Establish all-encompassing management structures with clear implementation guidelines.
Legal Risks	Inappropriate procurement and contract management by CBDMC groups in carrying out activities requiring procurements for dam management, resulting in financial loss.	M	M	• Train beneficiaries on existing implementation and procurement guidelines and have implementing agencies enforce them in CBDMC activity implementation. •

Financial risks	Delayed funding Low absorption of funds	M	H	• Timely disbursement of funds • Increase CBDMC's financial management capacity
Political risks	Functional jurisdiction issues and a lack of seamless participation between the two levels of government.	L	M	• Sensitize and raise awareness among all the relevant stakeholders. • Align the dam management structure with the current legislative framework
	Lack of support (political or otherwise) for environmental interventions that conflict with the interests of many stakeholders (e.g. runoff water management, flood control, pollution control etc.).	L	M	• To ensure the efficacy and sustainability of the interventions, educate key stakeholders (political, opinion leaders, and communities) on the transboundary nature of environmental interventions and encourage them to participate in joint implementation initiatives.
	Conflicts over boundary lines and ownership of dam land could limit aquaculture operations and lower production.	L	H	• Before beginning Community-Based Dam Aquaculture enterprise, resolve any unresolved disputes over common property.
Operational Risks	Different ways that implementing agencies have prioritized activities.	M	M	• Set up frameworks that will allow implementing organizations to decide which tasks to prioritize through activity-based collaborative planning and budgeting, reporting, and performance contracting.
	The inability of project investments to be sustained after the project's completion.	L	H	• Participatory planning should be used to create operation and maintenance manuals, as well as training for beneficiaries/users. • Establish a plan for finishing the project that includes an exit strategy.
Technological risks	Cybercrime, which may result in corruption or interference with dam management datasets and software.	L	M	• Ensure tight online security to prevent hacker infiltration and adequate site security from unauthorized individuals.
Environmental Risks	Potential genetic contamination between the dam and the interconnected ecosystems	L	M	• Control of escapees and introductions • Stocking with fast-growing strains. • Restocking with native fish stocks.

ANNEX 9. ACTION PLAN AND BUDGET FOR A 7 HECTARE MODEL DAM

STRATEGIC OBJECTIVES		YR 1 (Millions)	YR 2 (Millions)	YR 3 (Millions)	TOTAL(KES.)	RESPONSIBILITY
Key Result Areas 1: Enhanced economic benefits to the communities						
1.1: Increased fish production						
1.1.1	Supply of quality seed	0.5	0.5	0.5	1.5	CBDMC
1.1.2	Supply of quality feed for supplementary feeding	6.3	6.3	6.3	18.9	CBDMC
1.1.3	Restocking of dams	0.4	0.4	0.4	1.2	SDFA&BE, ABDP, County government,
1.1.4	Intensification through cage farming in the dams	2.0	1.0	1.0	4.0	County government, CBDMC
1.1.5	Post-harvest loss reduction using deep freezers	0.7	0.3	0.3	1.3	SDFA&BE, ABDP, County government
1.1.6	Value addition using smoking kilns.	0.7	0.2	0.2	1.1	County government, CBDMC
	Subtotal 1	**10.6**	**8.7**	**8.7**	**28**	
1.2: Integrated Dam Aquaculture Model						
1.2.1	Agroforestry	1.0	0.5	0.3	1.8	CBDMC
1.2.2	Horticulture	0.3	0.1	0.1	0.5	CBDMC
1.2.3	Apiculture	0.5	0.3	0.2	1	CBDMC
	Subtotal 2	**1.8**	**0.9**	**0.6**	**3.3**	
1.3: Ecotourism						
1.3.1	Boat riding (outboard engine and canoe)	1.0	0.2	0.2	1.4	CBDMC
1.3.2	Sport fishing (fishing lines and rods and floating platform)	0.7	0.2	0.2	1.1	CBDMC
1.3.3	Bird watching view point (accessories and species guides)	0.2	0.1	0.1	0.4	CBDMC
1.3.4	Picnic/Catering/Hotel services (capital cost)	0.5	0	0	0.5	CBDMC
1.3.5	Events and photography	0	0	0	0	CBDMC
1.3.6	Signage	0.1	0	0	0.1	CBDMC
	Subtotal 3	**2.5**	**0.5**	**0.5**	**3.5**	
Key Result Areas 2: Infrastructural and human capacity development						
2.1: Improved Infrastructure for fish production and other dam uses						

2.1.1	Landscaping and improvement of dykes	1.5	0.5	0.5	2.5	County government, CBDMC
2.1.2	Provision of security, fencing and predator control	1.5	0.5	0.5	2.5	ABDP, County Government
2.1.3	Dredging and desilting	3.0	0	0	3.0	SDFA&BE, County Government,
2.1.4	Enhancing capacity of existing authenticated hatcheries near the dams.	1.0	0.2	0.2	1.4	SDFA&BE, ABDP, KeFS
	Subtotal 4	**7**	**1.2**	**1.2**	**9.4**	
2.2: Improved human capacity						
2.2.1	Undertake training needs assessment	0.2	0	0	0.2	SDFA&BE, ABDP, KMFRI
2.2.2	Annual training on best management practices (BMPs) for community and farmers	0	0.2	0.2	0.4	SDFA&BE, ABDP, KMFRI, KeFS
2.2.3	Development of information education and communication (IEC) materials (e.g manuals, modules and guidelines etc)	0.3	0	0	0.3	SDFA&BE, KMFRI, ABDP, KeFS
2.2.4	Employment of technical officers i.e. farm managers/aquaculture technicians, Accountants, project manager, community representative, security (annual salary)	1.8	1.8	1.8	5.4	CBDMC
2.2.5	Facilitation for quarterly management committee meetings	0.03	0.03	0.03	0.09	CBDMC
	Subtotal 5	**2.33**	**2.03**	**2.03**	**6.39**	
3.1: Increased investment in dam aquaculture						
3.1.1	Quarterly data collection on aquaculture production and reporting for decision making	0.2	0.1	0.1	0.4	CBDMC
3.1.2	Formation of functional fisheries and aquaculture cooperatives	0.3	0	0	0.3	County government, CBDMC
3.1.3	Development of a business plan	0.3	0	0	0.3	CBDMC
3.1.4	Establishment of fish aggregation systems-Linking farmers to market opportunities (Samaki Dam)	0.3	0.3	0.3	0.9	ABDP, County government, CBDMC

3.1.5	Establishment of facility sharing arrangements e.g cooling and collection	0.1	0	0	0.1	SDFA&BE, KeFS, County government
3.1.6	Enhance corporate social responsibilities (CSR)	0.3	0.3	0.3	0.9	CBDMC
	Subtotal 6	**1.5**	**0.7**	**0.7**	**2.9**	
4.1: Environmental sustainability						
4.1.1	Environmental licensing for new development interventions/ installations (e.g cost of EIA, EA, and licensing	0.5	0.1	0.1	0.7	NEMA, COUNTY GOVERNMENT, CBDMC,
4.1.2	Pre-feasibility and feasibility studies on the environmental aspect	0.5	0	0	0.5	SDFA&BE, KMFRI, ABDP, KeFS
4.1.3	Creating Environmental Management Plan for regular environmental monitoring impact identification and mitigation	0.2	0.2	0.2	0.6	NEMA, KMFRI
4.1.4	Management of water quality for on-dam and downstream environmental integrity.	0.3	0.3	0.3	0.9	KMFRI, County government
4.1.5	Setting up appropriate waste management and pollution prevention strategy	0.5	0.1	0.1	0.7	NEMA, KMFRI, County government
	Subtotal 7	**2**	**0.7**	**0.7**	**3.4**	
	GRAND TOTAL	**27.73**	**14.73**	**14.43**	**56.89**	