COUNTY GOVERNMENT OF KISUMU

THE COUNTY ASSEMBLY OF KISUMU
3RD ASSEMBLY
DATE: 7/09/2023
Time: 2:30pm
Day: Thursday
TABLED BY: Hon Bill Oliver
CLERK AT THE TABLE: A. Obonyo

COUNTY ASSEMBLY OF KISUMU

THIRD ASSEMBLY – SECOND SESSION

AGRICULTURE, FISHERIES, LIVESTOCK DEVELOPMENT AND IRRIGATION COMMITTEE

REPORT ON A MATTER SOUGHT IN THE HOUSE BY HON. JAMES WERE, MCA FOR NYALENDA "B" WARD, ON FISH KILLS IN CAGES ALONG DUNGA BEACH

BY

HON. EUNICE ALANDOH

CHAIRPERSON

Directorate of Committee Services
Clerks Chambers
The County Assembly
Kisumu

SEPTEMBER, 2023

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LIST OF ABREVIATIONS AND ACRONYMS

KEMFRI	Kenya Marine and Fisheries Research institute
LAKE	Lake Victoria
DEPARTMENT	Department of Agriculture, Livestock Development, Fisheries and Irrigation
FISH KILL	Fish Kill in cages along Dunga Beach
S.O	County Assembly of Kisumu Standing Orders
AFLC	Agriculture, Fisheries, Livestock Development and Irrigation
MAT	Multi Agency Team

CHAPTER ONE

1. FOREWORD

Mr. Speaker Sir and Hon. Members, Pursuant to Standing Order no. 41 (2), Hon. James Were during the assembly sitting on **Tuesday, 4th July, 2023,** sought for a statement regarding mysterious Fish Kills in cages along Dunga Beach in Lake Victoria (**see annex 1**). The statement was accordingly committed to the Sectoral Committee on Agriculture, Fisheries, Livestock Development and Irrigation pursuant to its mandate as enshrined in County Assembly S.O No. 193 (5) to investigate, probe, inquire and report back the Findings and Recommendations to the House within a period of two weeks.

My Committee in gratifying this noble task, has adopted this report which I now present before this Hon. House for determination.

2. QUESTIONS SOUGNT FOR IN THE STATEMENT

1. Plans/interventions in terms of remedying on the loss by providing fingerlings, fish feeds or any compensation towards the same?

2. What measures is the Department putting in place to address any future occurrence on the same?

3. RECOMMENDATIONS

Mr. Speaker and Hon. Members, with regards to the Committee observations and findings contained herein, we present the following recommendations for consideration;

a. On Plans/interventions in terms of remedying on the loss by providing fingerlings, fish feeds or any compensation towards the same?

The Committee Recommends;

1. That, the Kshs. 2,000,000 set aside in the current budget for cage farmers in Dunga, priority be given to the affected farmers by providing a stimulus program such as fingerlings and fish feeds.

2. That, the Department to strengthen and expedite their engagements with Partners/stakeholders like Victory Farms, Equity Bank among others to find a way of providing a support to the affected farmers.

b. What measures is the Department putting in place to address any future occurrence on the same?

3. The Department to continuously provide targeted technical services to Fish Cage Farmers in Dunga and the entire County.

4. The Department to implement the Multi Agency Team recommendations on Fish Kills in Lake Victoria which include; Purchase of Water quality monitoring kit and act as an early warning sign for remedial measure and Establishment of cold chain facilities and marketing strategies at strategic beaches.

5. The Directorate to train more Fish Quality Assurance Officers to enable them handle quality assurance issues in case of Massive Fish Deaths.

6. The National Government to complete the Process of legislation on Aquaculture to enable easy regulation of Cage Culture activities.

4. ACKNOWLEDGEMENT

Mr. Speaker Sir and Hon. Members, on behalf of the Agriculture, Fisheries, Livestock Development and Irrigation Committee members, I wish to extend my gratitude to your office and the Clerk's office for providing us with a condusive environment which has enabled us to achieve our objective within the limited timeframe.

I am also appreciative to my members who despite their busy schedule sacrificed their time and generously participated in this exercise to its conclusive end.

I equally, comment the line Department for their full cooperation on this process by promptly submitting the responses as requested by the Committee.

Lastly, I applaud my technical team for showing commitment throughout, planning and coordinating activities, drafting and compiling this report

Hon. Speaker Sir and Members, now it is my pleasant duty and honor, to table this response report on the questions sought for by the Hon. James Were regarding the Fish Kills in cages along Dunga Beach and recommend it to the House for adoption.

.....

HON. EUNICE ALANDOH
COMMITTEE CHAIPERSON

CHAPTER TWO

5. LEGAL FRAMEWORK UNDERPINNING COMMITTEE ACTIVITIES

Mandate of the Committee

The Agriculture, Fisheries, Livestock Development and Irrigation Committee derives its mandate from Article 185 of the Constitution of Kenya 2010, read together with Standing Order No. 193 of the Kisumu County Assembly Standing Orders.

Standing Order Number 193 (Second Schedule) of the County Assembly of Kisumu stipulates as follows.

That the Committee shall inquire into, investigate and report on;

All matters relating to agriculture, including crop and animal husbandry, livestock sale yards, County abattoirs, plant and animal disease control, veterinary services (excluding regulation of the profession) and fisheries; animal control and welfare, including licensing of dogs and facilities for their accommodation, care and burial of animals.

Provision of County Assembly Standing Order No. 193(5)

1. The functions of Sectoral committees shall be;
    a) Investigate, inquire into, and report on all matters relating to the mandate, management, activities, administration, operation and estimates of the assigned departments;
    b) Study the programme and policy objectives of departments and policy objectives of departments and the effectiveness of the implementation;
    c) Study and review all the County legislation referred to it;
    d) Study, access and analyze the relative success of the departments as measures by the results obtained as compared with their stated objectives;
    e) Investigate and inquire into all matters relating to the assigned departments as they may deem necessary, and as may be referred to them by the County Assembly;
    f) To vet and report all appointments where the Constitution or any law requires the County Assembly to approve, except those under Standing Order No. 187 (Committee on Appointments).

g) Make reports and recommendations to the County Assembly as often as possible, including recommendation of proposed legislation.

6. COMMITTEE MEMBERSHIP

Mr. Speaker and Hon. Members,

The composition of Agriculture, Fisheries, Livestock Development and Irrigation Committee as currently constituted comprises; -

MEMBERS PRESENT:

1. **Hon. Eunice Alando** - **Chairperson**
2. Hon. Bill Oliver - **Vice Chairperson**
3. Hon. Samuel Dede - Member
4. Hon. Pamela Oyoo - Member
5. Hon. Vincent Jagongo - Member
6. Hon. Maurice Ngeta - Member
7. Hon. Nereah Okombo - Member

Secretariat

1. Peter Anditi - Committee Clerk
2. Omollo Isaac - Clerk Assistant
3. Zablon Otiende - Hansard/Secretariat
4. Kennedy Okise - Sergeant-at-Arms
5. Wycliffe Owade - Researcher

7. COMMITTEE MEETINGS

Mr. Speaker sir and Hon Members, the Committee held a total of four meetings to deliberate on the statement, prepare terms of references, communicate with the Department, analyze and scrutinize and get just justifications to the responses and cause adoption this report.

8. TERMS OF REFERENCE FOR AFL COMMITTEE;

I. Inquire on the possible Causes of the Fish Kills in Cages along Dunga Beach.

II. Get a profile of the losses incurred by affected farmers as a result of the Fish Kills.

III. Get details of plans or interventions in terms of remedying on the loss by providing fingerlings, fish feeds or any compensation.

IV. Measures being put in place by National and County Government to address any future occurrences.

9. FORWARDING CONCERNS TO THE DEPARTMENT AND SUBMISSION OF RESPONSES

Mr. Speaker Sir and Hon. Members, following the Committal of the statement, the Committee through its resolution directed the Clerk of the Assembly to make written communication on the concerns sought for on the statement to the Line Department. The letter was referenced: **CAK/ALFC/CG/VOL.8/2023 dated Tuesday, 8th August, 2023 (see annex ii).**

Consequently, the Department responded by submitting a detailed and comprehensive written response vide a letter Ref: **CDF/KSM/ADM/10/VOL.II/197** dated **23rd August, 2023** which was received by Clerk on **Monday, 28th August, 2023 (see annex iii).**

10. BACKGROUND INFROMATION

Mr. Speaker Sir and Hon. Members, Fish Kill is an annual phenomenon that usually occurs on Lake Victoria and is associated with weather patterns. In 2020 Lake Victoria as well as the Riparian regions experienced severe weather patterns where mass Fish Kills were reported on the Kenyan side around late January and February, 2020. Changes in weather conditions triggers mixing of the Lake, an event that could lead to fish kills due to low dissolved oxygen levels in the water.

In May, 2021 there were cases of mysterious deaths of Nile perch in Lake Victoria, after investigations it was concluded that this was an annual phenomenon that usually occurs on Lake Victoria and is associated with weather patterns that causes mixing of the Lake at different spots causing anoxia (low dissolved oxygen below critical levels).

In 2022, reports from Fishermen at different points in Kisumu East, Kisumu West, and Seme Sub-Counties of fish kills, bad smell and bad smell were received. Fishermen and Cage Fish Farmers were greatly affected. For instance cage Fish Farmers in Othany, Kaloka, Asat and Ogal beach Seme-County, the loss was estimated at One Billion Kenyan Shillings.

Due to this mysterious happenings, the CS for mining, Blue Economy & Maritime Affairs on Wednesday 23rd November, 2023 formed a Multi-Agency Team (MAT) tasked to look into issues of Fish Kills and report the Findings and Recommendations to the CS within 14 days from 23rd November, 2022 i.e. by 6th December, 2022 which further confirmed that low oxygen levels is the main cause of fish kills in cages or in the wild.

CHAPTER THREE

11. COMMITTEE OBSERVATIONS AND FINDINGS

Mr. Speaker and Hon. Members, the Committee noted the following after conducting inquiry and investigation into this matter;

1. That, the Phenomenon that lead to Fish Kills on Cages along Dunga Beach is called (ANOXIA-low dissolved oxygen below critical level) and happened in the month of April, 2023.

2. That a total loss incurred from the misfortune is totaling to Kshs. 15M.

3. That a total of 22 farmers were affected with a total of 60 Cages with average size of the Cages at 5M*5M* and 4M depth each having a capacity of 5000 fish.

4. That, the Fish Kills in Dunga occurred after finalization of an inventory by the Multi Agency Team lead by PS. Blue Economy and Fisheries therefore Dunga farmers did not benefit from the stimulus package offered jointly the National Government and County Government since farmers considered were based on the MAT report.

5. That there were engagements with stakeholders like Victory Farms, Equity Bank among other stakeholders to find a way of providing a stimulus program for Dunga Farmers.

6. That in the FY 2023/2024, the Department has set aside a Budget of Kshs. 2,000,000 for cage farmers in Dunga and farmers who lost will be given first priority.

12. CONCLUSION

Mr. Speaker Sir and Hon. Members,

Mr. Speaker and Hon. Members, I would like to implore this House to deliberate and consider adopting this report and further ensure that resolutions passed herein are communicated to the Department and promptly implemented. I therefore move the motion and call upon Hon..... to second.

Thank you.

HON. EUNICE ALANDOH

CHAIRPERSON, AGRICULTURE, LIVESTOCK AND FISHERIES.

13. LIST OF ANNEXES

1. Statement raised by Hon James Were (**see annex i**)
2. Letter to the Line Department (**see annex ii**)
3. Response from the Line Department (**see annex iii**)

ANNEX I

COUNTY ASSEMBLY OF KISUMU

04 JUL 2023

THIRD ASSEMBLY – SECOND SESSION

REQUEST FOR STATEMENT

Hon. Speaker,

I rise under Standing Order no 41(2)(b) to seek for a statement from the Chairperson, Committee on Agriculture, Livestock and Fisheries regarding the death of fish in cages along Dunga Beach

Aware that about two months ago, there was a calamity which lead to death of fish reared in cages along Dunga Beach in Lake Victoria resulting to losses in millions to the farmers.

I humbly request the Chairperson, Committee on Agriculture, Livestock and Fisheries to provide a statement before this House as follows:

1. What plans or interventions in terms of remedying on the loss by providing fingerlings, fish feeds or any compensation towards the same.
2. What measures is the department putting in place to address any future occurrence of the same.

.....

HON JAMES WERE
MCA,
DATE: 4/7/2023
THIRD ASSEMBLY, 2ND SESSION.

INDEX I

ANNEX II

P.O Box 86-40100, Kisumu
Email: kisumuassembly@gmail.com

Email: owenojuok@gmail.com
Web: www.kisumuassembly.go.ke

County Assembly of Kisumu

OFFICE OF THE CLERK

REF: CAK/ALFC/CG/VOL. 8/2023

DATE: TUESDAY, 8TH AUGUST, 2023

The County Executive Committee Member,
Department of Agriculture, Livestock and Fisheries,
County Government of Kisumu,

Thro'
The County Secretary.

7/8/23

RE: RESPONSE TO THE CONCERNS RAISED ON THE FLOOR OF THE HOUSE

The above matter refers:

The Constitution of Kenya, 2010 under Article 185 (3) & Article 195 (2) (b) and Kisumu County Assembly Standing Orders No. 174 & 204 give the County Assembly or any it's Committees the power to request and compel production of documents or information.

This is to inform you that a statement was raised in the House during its session on Tuesday, 4th July, 2023 by Hon. James Were the MCA for **Nyalenda "B"** regarding a calamity that lead to Fish kills in cages along Dunga Beach and was committed to the Committee on Agriculture, Livestock Development and Fisheries.

You are therefore directed to submit a detailed written response to the questions sought for therein on or before **Tuesday, 15th August, 2023.**

Annexed to this letter is a copy of the approved statement for your action.

Kindly oblige.

PETER ANDITI
FOR CLERK OF THE ASSEMBLY

CC: Hon. Speaker
Chairperson, Committee on Agriculture, Fisheries and Livestock Development
Chief Officer, Agriculture, Livestock Development, Fisheries and Irrigation

ANNEX II

ANNEX III

C/Clerk Agriculture.
Deal
Owengurui

COUNTY GOVERNMENT OF KISUMU

DEPARTMENT OF AGRICULTURE, IRRIGATION, LIVESTOCK AND FISHERIES

Office of the Chief Officer – Agriculture, Livestock, Fisheries & Irrigation

Telephone: 020-2047148
Fax: 057-2024979
Email: colfksm2020@gmail.com
When replying please quote:

Prosperity House
4th Floor, Wing 'C'
P.O. Box 1700-40100
KISUMU

KISUMU COUNTY ASSEMBLY
OFFICE OF THE CLERK
28 AUG 2023
RECEIVED

Ref: DAI;F/COLF-KSM/GC/ADM.1/VOL.1/100

25th August, 2023

Clerk of The County Assembly
KISUMU

RE: A REPORT ON FISH KILLS IN CAGES ALONG DUNGA BEACH

Attached herewith please find the said report.

Kind Regards.

25/08/2023

Erick O. Omondi
Chief Officer Agriculture, Livestock, Fisheries and Irrigation
KISUMU

Copy to:

Chair Person Agriculture Committee

III 42444

REPUBLIC OF KENYA

COUNTY GOVERNMENT OF KISUMU

DEPARTMENT OF AGRICULTURE, IRRIGATION, LIVESTOCK AND FISHERIES

Telegrams: "KINGFISH", Kisumu
Telephone: Kisumu 2024953
Email:cdfkisumu@yahoo.com

FISHERIES SECTION OFFICE
KISUMU COUNTY
P. O. Box 4031
KISUMU

When replying Please Quote
Ref: CDF/KSM/ADM/10/VOL.II/197

Date: 21st August, 2023

Chief Officer
Agriculture, Irrigation, Livestock & Fisheries
KISUMU

Through

Director Livestock & Fisheries
KISUMU

23/08/23

FORWARDED
23 AUG 2023
DIRECTOR OF LIVESTOCK PRODUCTION - KISUMU

RE: A REPORT TO THE COUNTY ASSEMBLY ON FISH KILLS IN CAGES ALONG DUNGA BEACH

Background information

Fish kill is an annual phenomenon that occurs on Lake Victoria and is partly associated with weather patterns. In 2020 Lake Victoria as well as the riparian regions experienced severe weather patterns where mass fish kills were reported on the Kenyan side around late January and February2020. Changes in weather conditions triggers mixing of the lake, an event that could lead to fish kills due to low dissolved oxygen levels in the water.

Inquiries from Uganda reviled significant fish kills observed in January 2021 attributed to weather patterns, the fish kills incidences were localized and were

reported to have resulted from a usual phenomenon called hypoxia (Kaliro). In May 2021, there were reported cases of mysterious deaths of Nile perch in Lake Victoria, after investigation by KMFRI it was concluded that this was an annual phenomenon that occurs in Lake Victoria and is associated with weather patterns that causes mixing of the lake at different spots causing anoxia (low dissolved oxygen below critical levels).A brief was done to the County Assembly and the report adopted. In 2022 reports from fishermen at different points in Kisumu East, Kisumu West and Seme Sub Counties of fish kills, bad smell and discolored water were received. Fishermen and cage fish farmers were greatly affected. For instance cage farmers in Othany, Kaloka, Asat and Ogal beach Seme Sub County, the loss was estimated at One Billion Kenyan shillings. KMFRI did an investigation and concluded that the deaths were as a result of low oxygen levels in the water.

In response to the standing order NO.41(2)of the third assembly-second session seeking the chairperson of the committee on Agriculture, Livestock and Fisheries regarding the death of the fish kill at the cages in Dunga Beach.

1. On the plans on remedying on the loss by providing fingerlings, fish feeds or any compensation, the directorate submits that a total 22 farmers lost their fish from 60 cages as a result of anoxic conditions witnessed in the lake. The average size of the cages were 5M by 5M and 4M depth each having a capacity of 5000 fish. The loss incurred in this misfortune was more than 15million.The fish kills occurred in the month of April, 2023 after finalization of an inventory by the Multi Agency Team led by Permanent Secretary Blue Economy and Fisheries. The team documented a total of 135 farmers who lost fish valued at 927,969,000 as per the report attached, this meant that it was not possible to provide a stimulus package for Dunga Cage farmers due to budget constraint because they were not among the farmers to be considered based on this report . However there were engagements with stakeholders like Victory farms, Equity bank among other stakeholders to find a way of providing a stimulus programme for the Dunga farmers.

2. In the 2023/24 FY budget a total of Kshs. 2,000,000 has been set aside for cage farmers in Dunga, farmers who lost will be given the first priority to enable them come back to business using a model that will be advised by the technical team.
3. The directorate will continue providing targeted technical extension services to the fish cage farmers in Dunga and the entire County.
4. The directorate will implement all the recommendations made by the Multi Agency Team where Kisumu is represented to ensure that the team achieves its objectives.
5. The directorate has recommended training of more Fish Quality Assurance Officers to be trained to enable them handle quality assurance issues in case of massive fish deaths.
6. On fisheries regulations, it was recommended that the national government completes the process of legislation of the Aquaculture to enable easy regulation of cage culture activities.

Susan C. Adhiambo
Section Head
FISHERIES

AH: FIBTJ
Kindly deal 8/12/2022

MINISTRY OF MINING, BLUE ECONOMY AND MARITIME AFFAIRS

STATE DEPARTMENT FOR BLUE ECONOMY AND FISHERIES

OFFICE OF THE PRINCIPAL SECRETARY

MEMO

TO: **CABINET SECRETARY**

FROM: **PRINCIPAL SECRETARY**

REF: **MOM/SDBEF/ADM/VOL.1(112)**

DATE: **6TH DECEMBER 2022**

PS- Betsy
Go ahead and impliment the recommendations of the task force.

RE: REPORT ON FISH KILLS IN LAKE VICTORIA DEVELOPED BY THE MULTI-AGENCY TEAM

The Cabinet Secretary for Mining, Blue Economy & Maritime Affairs on Wednesday 23rd November, 2023 directed the formation of a Multi-Agency Team (MAT) to be headed by the Principal Secretary State Department for Blue Economy and Fisheries. The MAT was tasked to look into issues of fish kills and report the findings and recommendations to the Cabinet Secretary within 14 days from 23rd November, 2023 i.e. by **6th November 2022.**

The MAT developed Terms of Reference as follows:

a) Assess and document the possible causes of the fish kills in the reported areas in Lake Victoria;
b) Examine and profile losses incurred by the affected farmers/investors as a result of the fish kills;
c) Document/estimate possible impacts experienced by the affected cage farmers/investors;
d) Recommend immediate mitigation measures;
e) Recommend short-term mitigation measures, identify key actors and stakeholders with their specific roles; and
f) Recommend long-term mitigation measures, identify key actors and stakeholders with their specific roles.

In the report, it has been noted that low oxygen level is the main cause of fish kills either in cages or in the wild. The low oxygen level is caused

by decomposition of organic matter/pollutants due to increased nutrient enrichment within the lake or from land.

Attached to this memo find the detailed report on fish kills for consideration and further guidance.

BETSY MUTHONI NJAGI
PRINCIPAL SECRETARY

Encl.

STATE DEPARTMENT FOR BLUE ECONOMY AND FISHERIES

MULTI-AGENCY REPORT ON FISH KILLS IN LAKE VICTORIA, KENYA AND ITS MITIGATION MEASURES

SUBMITTED TO:
HON. SALIM MVURYA, EGH
CABINET SECRETARY
MINISTRY OF MINING, BLUE ECONOMY & MARITIME AFFAIRS
WORKS BUILDING, NGONG ROAD
P.O. BOX 30009-00100
NAIROBI

06.12.2022

1.0 Preamble

1.1 This report is a culmination of engagements among various state actors, Beach Management Units (BMUs) and fish cage farmers in Lake Victoria.

1.2 The purpose of the engagements was to identify causes of reported cases of fish kills in Lake Victoria specifically in Kisumu and Homa Bay County, identify the economic losses and recommend mitigation measures.

1.3 The multi-agency team was constituted by the office of the Principal Secretary, State Department for the Blue Economy and Fisheries in November, 2022 following the Cabinet Secretary for Mining, Blue Economy and Maritime Affairs directive. The terms of reference of the taskforce were:

i. Assess and document the possible causes of the fish kills in the reported areas in Lake Victoria;
ii. Examine and profile losses incurred by the affected farmers/investors as a result of the fish kills;
iii. Document/estimate possible impacts experienced by the affected cage farmers/investors;
iv. Recommend immediate mitigation measures;
v. Recommend short-term mitigation measures, identify key actors and stakeholders with their specific roles; and
vi. Recommend long-term mitigation measures, identify key actors and stakeholders with their specific roles.

2.0 Introduction

2.1 Cage aquaculture is quickly expanding in the African Great Lakes Region, with the potential to boost fish output and act as a source of food security, poverty reduction, and job creation.

2.2 This is in line with Kenya's Vision 2030, East African Community Vision 2050, African Union Agenda 2063 and United Nations Sustainable Development Goals (SDGs).

2.3 The growing population along Lake Victoria has increased pressure on the lake's capture fisheries, resulting in a decline in the resource. As a

result of the reduction, many fishermen and investors have turned to cage fish farming for alternate livelihoods and trade.

2.4 Installation of cages has expanded significantly from 1663 in 2016 to over 5,500 cages presently. This has in turn spurred growth within the blue economy sector within the Lake Victoria region and provided employment opportunities for the people.

2.5 There is growing concern that the proliferation of fish cages in Lake Victoria may have significant consequences on the lake's ecology.

2.6 Sustainable cage culture requires strict adherence to proper husbandry procedures which can be determined by water quality and the lake environment as well as fish health and the gross profit margin.

2.7 Notably, over the last four months (September – November 2022), there has been sporadic cases of fish kills in Lake Victoria especially in cages in Kisumu and Homabay counties.

2.8 Therefore, the purpose of this report is to briefly discuss the possible causes, inventorize the losses and suggest possible mitigation measures.

3.0 Possible causes of fish kills in reported areas of Lake Victoria

3.1 There are higher concentrations of Chlorophyll in the water (more than 200 mg L^{-1}) and algal blooms indicating an increased amount of organic matter in the Lake that is undergoing increased rate of decomposition. Decomposition in this case utilizes dissolved oxygen, hence reducing it to very low levels of less than 3.5 mg L^{-1}.

3.2 The increased organic matter is originating from the lake itself (such as water hyacinth and other water plants) and from land sources (such as fertilizers from agricultural farms, river discharges, possible point sources, among others).

3.3 The rapid growth of water hyacinth and other macrophytes is exacerbated by increased eutrophication of the lake.

3.4 Extreme temperatures (more than 26°C) during the day and at night (very cold) as effects of climate change have also been recorded in the lake waters from the months of September to November 2022. High

temperature levels have further speeded up the decomposition of organic matter.

3.5 These levels of low dissolved oxygen concentrations are the major cause of fish kills in the cages and in a few cases that were reported in the wild, and especially in the shallow zones of the lake.

3.6 The existence of cages in shallow zones (less than 10.0 m, which is mainly in the gulf) has exacerbated the fish kills and death phenomenon due to minimal cases of water circulation and confined cultured fish with no room to escape.

3.7 Upwelling of the lake waters has added to the phenomenon with pockets of this natural activity occurring in various spots in the lake (known as spotted upwelling – which is unpredictable and occurs many times and anytime).

3.8 Upwelling occurs when (cold) bottom waters with low (or zero oxygen due to increased decomposition) oxygen replaces warm surface water due to water currents. In this case, these low (or zero) oxygen waters is dispersed over a distance and the scope of which could be at a cage site that suffocates the fish which may have no room to escape.

3.9 However, upwelling alone could not kill the fish, unless the waters experiencing turnover have low dissolved oxygen levels.

4.0 Profiled losses and possible impacts incurred by cage farmers/investors

4.1 A total of 135 cage farmers in 10 beaches were affected as a result of the reported fish kills as by November 2022 (Table 1).

4.2 The highest losses were experienced by Kentila Farms and Lake Aqua Ltd at Kshs. 200,400, 000 and 138,000,000, respectively both of which are in Ogal beach in Kisumu County (Annex 1). The lowest losses were experienced by Green Purple Group (Kshs. 138,000) in Kobudho beach and Ochonga Women group (Kshs. 156,000) in Asat in Kisumu County.

4.3 The estimated loss due to fish kills within the two counties was Khs. 927,969,000, with Kisumu County at Kshs. 927,969,000, with Kisumu County at Kshs. 884,814,000 and Homabay County at Kshs. 43,155,000

4.4 Of the 10 landing beaches reported to have experienced fish kills, Ogal had the highest number of cage farmers who were affected (n = 64; 47.41%) with the greatest proportion of the total value lost (84.67%).

4.5 The landing beaches with the least number of farmers affected were Asat, Kobudho, and Nyamarwaka (Kisumu County) which had similar percentages of 0.74% and reported the lowest proportion of value lost at 0.02%, 0.01% and 0.08%, respectively. These low percentages could be a result of the few cages in these beaches which were mainly managed in groups.

Table 1. The estimated value of fish kills in the affected beaches in Kisumu and Homabay counties in November 2022 (F = Females, M = Males and G = Group)

County	Beach	Gender	Total farmers (sum of Col K)	Totals by county	Estimated value of fish kills per beach	Totals by county
Kisumu	Ogal	F = 14.06% (n = 9)	64	109	785,700,000	884,814,000
		M = 79.69% (n = 51)				
		G = 6.25% (n = 4)				
	Othany	F = 18.52% (n = 5)	27		26,160,000	
		M = 81.48% (n = 22)				
	Paga	M =100% (n = 6)	6		15,240,000	
	Achuodho	M= 100% (n = 4)	4		9,900,000	
	Asat	G = 100% (n = 1)	1		156,000	
	Kaloka	F = 60% (n = 3)	5		46,800,000	
		G = 40% (n = 2)				
	Kobudho	G = 100% (n = 1)	1		138,000	
	Nyamarwaka	G = 100% (n = 1)	1		720,000	
Homabay	Obaria	M = 100% (n = 6)	6	26	12,250,000	43,155,000
	Kamolo	M = 90% (n = 18)	20		30,905,000	
		G = 10% (n = 2)				
Total			**135**	**135**	**927,969,000**	**927,969,000**

4.6 A total of 747 cages were reported to have experienced fish kills in the two counties. All fish kills were reported in cage farms with rectangular dimensions with the most preferred sizes by farmers as 6x6x4 (n = 421;

56.36%), 6x6x6 (n = 147; 19.68%), and 6x12x4 (n = 59; 7.90%) (Annex 2).

4.7 Of all the cage farmers/ investors affected by fish kills only 14 had NEMA license, particularly in Ogal beach in Kisumu county. Homabay County had concession with the Beach Management Units (BMU). Other licenses by regulatory bodies such as Kenya Fisheries Service (KeFs) and National Lands Commission (NLC) were lacking in both counties.

4.8 The lack statutory requirements by such bodies makes it difficult to determine the efficacy of management to address such threats. Therefore, harmonized continuous lake monitoring and data sharing between institutions is proposed.

4.9 There were inadequate record keeping with significant gaps in Kisumu county. In the absence of proper and sufficient data to better understand and assess the lake ecosystem and its related impact, management decisions can only be based on best estimations, which are unlikely to address impact in an optimal manner.

5.0 Recommended immediate mitigation measures

No.	Mitigation measure	Responsible	Cost (KES)	Timelines	Comments/Notes
1.	Awareness & sensitization using media platforms	KMFRI, SDBEF, KeFS & BMU	Nil	Sep- Dec 2022	To cover large audience
2.	Establish a national inter-agency cage farming committee to be domiciled in SDBEF	KMFRI, SDBEF, KeFS, NEMA, WRA, County departments responsible for fisheries & BMU	KES 10,000,000	By February 2023	This constituted multi-agency working team on cage fish kills be converted into a national standing committee to spearhead and advise on cage farming in the country.

3.	Provide an economic stimulus package/Subsidy and relocation plan to affected farmers accordingly	County/National Government department responsible for fisheries	>10,000,000	June 2023	Priority to be given to legal farmers in suitable sites
4.	Guiding and counselling of affected farmers	County/National Government department responsible for fisheries & BMU	~KES 1,000,000	March 2023	To show support and create room for future engagement
5.	Rapid investigation on the possible causes	KMFRI, NEMA & BMU	~KES 500,000 per expedition	Dec 2022	KMFRI to include this their work plans
6.	Rapid and continuous periodical monitoring & surveillance on point sources of pollution	WRA, NEMA & County Government department responsible Environment	~KES 350,000 per expedition	By Jan 2023	To spot any (sewage) contamination leaks
7.	Disposal of decomposing dead fish	County Government department responsible for fisheries & Environment & NEMA	~KES 450,000 per site	By Dec 2022	For improved sanitation, biosecurity & safety
8.	Preservation of uncompromised dead fish	County Government department responsible for fisheries, BMU & Farmers	~KES 100,000 per site	By Dec 2022	KMFRI & KeFS to guide on fish quality before preservation

6.0 Recommended short-term mitigation measures

No.	Mitigation measure	Responsible	Cost (KES)	Timelines	Comments/Notes
1.	Capacity-building of affected farmers on best management practices &	KMFRI, SDBEF, KeFS, BMU, NEMA, County Government department responsible	~KES 2,000,000 per expedition	By Feb 2023	To ensure further short-term investment is less risky

	benchmarking expeditions	for fisheries & cage investors			
2.	Explore compensation options to be included in the regulations by ensuring that as part of the licensing requirement, cage farmers insure their business	SDBEF, KeFS, NEMA, KMFRI, County Government department responsible for fisheries, BMU & cage investors	~ KES 1,000,000	By December 2023	To ensure farmers are adequately compensated for the any possible losses.
3.	Document operational cage farmers in Lake Victoria to identify (i) No. of legal cage farmers (ii) No. of illegal cage farmers	NEMA, KeFS, BMUs, County Government department responsible for fisheries & Kenya Coast Guard Services	~ KES 1,000,0000	By June 2023	Ensure adherence to the established regulatory requirements.
4.	Periodical and continuous monitoring & surveillance on point sources of pollution	WRA, NEMA & County Government department responsible for Environment	~KES 500,000 per expedition	By June 2023	To spot any (sewage) contamination leaks
5.	Documentation and record keeping of cage culture inputs & outputs	KeFS, County Government department responsible for fisheries, cage farmers & BMU	~KES 5,000,000	By June 2023	For easy of attaining information to guide inter-period comparisons.

6.	Establishing hotline numbers (an App that is real time) by water and sewerage companies to report cases of leaks	SDBEF, County Government department responsible for environment	~KES 5,000,000	By June 2023	To minimize prolonged discharges.

7.0 Recommended long-term mitigation measures

No.	Mitigation measure	Responsible	Cost (KES)	Timelines	Comments/Notes
1.	Fast-tracking the completion and publication of cage culture guidelines & regulations	SDBEF, KeFS, KMFRI, NEMA, County Government department responsible for fisheries, BMU & cage investors	~KES 30,000,000	By December 2023	To streamline the sector and eliminate illegal cage farming
2.	Continuous capacity-building of all cage farmers on best management practices & benchmarking expeditions	KMFRI, SDBEF, NEMA, KeFS & cage investors	~KES 3,000,000	By June 2023	To ensure further investment is less risky
3.	Decommissioning or transfer of cages that are illegal or in the wrong places to suitable sites	KeFS, SDBEF, NEMA, KMFRI, County Government department responsible for fisheries, KCGS, BMU & cage investors	~KES 5,000,000	By Dec 2023	For improved governance and management of the lake

4.	Periodical and continuous monitoring & surveillance and enforcement on point sources of pollution	WRA, NEMA, County Government department responsible for environment, BMU & KCGS	~KES 500,000 per expedition	Quarterly	To spot any (sewage) contamination leaks
5.	Develop a framework for periodical reporting of point source of discharge to relevant stakeholders	County Government department responsible for environment, WRA, NEMA, Point source discharge companies (Sewerage, industries, factories, agrochemicals, institutions, hospitals etc)	~KES 5,000,000	By December 2023	This will involve doing presentations and site visits to check on efficiency and performance
6.	Dredging further of Mbita cause-way to its original depth of about 10.0-12.0 m	KeNHA, Kenya Shipyard Ltd, NEMA, Homabay Public works department	To depend on BQ given by Public works	By December 2024	Previous dredging to about 1.0-2.0 m and to a further about 4.0 m improved water circulation in the gulf. Thus, such a depth will provide positive results to the lake water quality. Kenya Shipyard Ltd supervised the second dredging activity.
7.	Fast-tracking Lake Victoria spatial planning to sharpen the	KMFRI, SDBEF, KeFS, NEMA, County Government	~KES 20,000,000	By December 2024	To minimize lake use conflicts & improved citing of cages.

	suitable sites for various lake use activities and a better scheme for licensing of small-scale & large-scale fishers and cage investors	department responsible for environment, BMU & Farmers			
8.	Control, monitor and survey the certified hatcheries and feed manufacturers to ensure production standards are adhered to	KeFS, SDBEF, County Government department responsible for fisheries & Farmers	~KES 20,000,000	By December 2023	To minimize use of feed with poor stability
9.	Due to the high capital and operational costs of cages, the small cage investors are highly recommended to form groups or Savings and Credit Cooperative Organizations (SACCO's) to enable them to have the financial capacity to purchase larger cages and operate them.	SDBEF, KeFS, County Government department responsible for fisheries and Cooperatives, BMU & Farmers	~KES 10,000,000	By December 2023	To be part of SMEs for increased purchasing of inputs

10.	Purchase of water quality monitoring kit and act as an early warning sign for remedial measures	Farmers	~KES 300,000 per meter	By December 2023	To help as an early warning measure
11.	Establishment of cold chain facilities and marketing strategies at strategic beaches	SDBEF, Kenya Fishing Industry corporation, KFMA, County Government department responsible for fisheries, BMU & Farmers	~KES 120,000,000 per site	By December 2024	To preserve uncompromised dead fish

8.0 Summarised recommendations

8.1 Sensitization of Cage farmers on best practices (that should also be imbedded in regulations and guidelines) and suitable areas for cage aquaculture to minimize losses and increase compensation through insurance.

8.2 Low oxygen level is the main cause of fish kills either in cages or in the wild – emanating from decomposition of organic matter/pollutants due to increased nutrient enrichment within the lake or from land.

8.3 Strengthen coordination among state actors and programmes involved in management of the environment and cage farming in the lake.

8.4 Establishment of a national standing committee on cage aquaculture. The committee shall include representatives of state and non-state actors involved in the research and management of aquaculture and cage farming.

8.5 The identified state actors represented in the national standing committee on aquaculture and cage farming undertake to include in their work plans the management of the fisheries environment and their resources.

9.0Conclusions and way forward

9.1 It is a scientific fact that spotted upwelling with low oxygen levels can occur any time and any place in the lake hence the need to observe best management practices such as best stocking density of fish (to avoid over-crowding), changing of net material at every level of cage fish growth, cage sizes and seeking advice on the location of cages and as well using the required feeds.

9.2 The best management practices require adherence and enforcement only if the cage culture regulations and guidelines are fast-tracked and enforced.

9.3 As much as low oxygen and upwelling phenomenon can and has killed fish in the deeper waters (of more than 10 meters) and in the wild, the extent and the vulnerability and susceptibility is higher in shallower areas (of less than 6 metres).

9.4 Unlike spotted upwelling that occurs unpredictably and anytime, natural massive upwelling is known to occur in Lake Victoria around February/March or September/November. However, due to climate change that dictates the wind pattern and water circulation, the period may slightly shift. Hence farmers have to be cautious on the need to undertake remedial measures such as planning for maturity of fish on time and procuring cold chain facilities.

9.5 There is increased concentrations of organic matter in the lake (lake pollution), indicating increased nutrient enrichment of the lake from within and without. This calls for spirited conservations efforts, enforcement and adherence to regulations and guidelines for a better ecosystem and lake.

9.6 The dead fish can be consumed only if they do not show any signs of decomposition (rotting). The signs of compromised quality include sunken and cloudy eyes, pale-yellow gills with mucus, delicate skin, pungent smell – such fish require disposal through burying in appropriate depths and distances from water sources.

9.7 Fish which is less comprised will have clear eyes, reddish-brown gills, firm skin and usual smell of fish – such fish requires removal of viscera (internal organs where decomposing bacteria inhabit) and after

dissection, will require preserving through smoking of salted fish or putting them in cold chain facilities are requisite temperatures of -5°C and below (to about -15°C).

9.8 Some of the notable mitigation measures to be adhered to include being cautious on cage locations by consulting relevant authorities, keen application of the best management practices, and a discussion on the establishment of an insurance scheme by insurance companies to cushion farmers in case of such losses.

10.0 Certification and Acknowledgements

I hereby certify that this report has been done under my supervision as the Principal Secretary, State Department for the Blue Economy and Fisheries, Ministry of Mining, Blue Economy and maritime Affairs.

Name: Ms. Betsy M. Njagi, CBS **Signature:**

Date: 6th December, 2022

On behalf of:

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11.0 Annexes

Annex 1. Inventory of cage fish farmers affected by the fish kills in November 2022 and the value of losses incurred (Blue shading = High Loss > Kshs. 100,000,000; Green shading = Lowest loss < Ksh. 200,000).

No.	Name of farmer	County	Beach	Value of fish kills
1	Narus Okeyo	Homa Bay	Obaria	3,307,500
2	Nelson Awuor	Homa Bay	Obaria	2,572,500
3	Clay Ouko	Homa Bay	Obaria	490,000
4	Kennedy Omira	Homa Bay	Obaria	1,960,000
5	Joshua Onyango	Homa Bay	Obaria	3,430,000
6	Walter Ogindo	Homa Bay	Obaria	490,000
7	George Abiero	Homa Bay	Kamolo	612,500
8	Emmanuel Osewe	Homa Bay	Kamolo	612,500
9	Antipas Odhiambo	Homa Bay	Kamolo	1,225,000
10	Kepha Were	Homa Bay	Kamolo	3,062,500
11	Denish Olala	Homa Bay	Kamolo	1,225,000
12	Patrick Odhiambo	Homa Bay	Kamolo	2,450,000
13	John Muga	Homa Bay	Kamolo	612,500
14	Barrack Onyango	Homa Bay	Kamolo	980,000
15	Paul Sine	Homa Bay	Kamolo	1,225,000

16	Jared Opiyo	Homa Bay	Kamolo	3,062,500
17	Samwel Ojuku	Homa Bay	Kamolo	3,062,500
18	Dickence Odhiambo	Homa Bay	Kamolo	612,500
19	George Okeno	Homa Bay	Kamolo	1,225,000
20	Bonface Otieno	Homa Bay	Kamolo	1,225,000
21	Kennedy Opar	Homa Bay	Kamolo	612,500
22	George Ngaji	Homa Bay	Kamolo	612,500
23	Kiddy Oduya	Homa Bay	Kamolo	2,450,000
24	James Nyangor	Homa Bay	Kamolo	4,777,500
25	Kamolo Moyie WG	Homa Bay	Kamolo	630,000
26	Kendu Beach WG	Homa Bay	Kamolo	630,000
27	Moses Owino	Kisumu	Ogal	16,400,000
28	Ken Omeno	Kisumu	Ogal	4,800,000
29	Stehene otieno chore	Kisumu	Ogal	29,400,000
30	Jack Odalo/Okumu	Kisumu	Ogal	14,400,000
31	Pamela Asambo	Kisumu	Ogal	2,400,000
32	Daudi Owinyo	Kisumu	Ogal	34,000,000
33	Philip Ochweda	Kisumu	Ogal	12,000,000
34	Ogal BMU Fish Cage	Kisumu	Ogal	14,000,000
35	Erick Oloo	Kisumu	Ogal	2,400,000
36	Dolfine Okoth	Kisumu	Ogal	4,800,000
37	Gabriel Onoka	Kisumu	Ogal	2,400,000
38	Salmon Crimba	Kisumu	Ogal	2,400,000
39	Bervil Ouko	Kisumu	Ogal	2,400,000
40	Winnie Ojwando	Kisumu	Ogal	4,800,000
41	Simon Odhiambo	Kisumu	Ogal	2,400,000
42	Samwel Odero	Kisumu	Ogal	2,400,000
43	Mourice Juma Dunga	Kisumu	Ogal	2,400,000
44	Absalome Okiro	Kisumu	Ogal	2,400,000
45	Fred Ajowi	Kisumu	Ogal	2,400,000
46	Elijah Adhoga	Kisumu	Ogal	2,400,000
47	Walter Sweta	Kisumu	Ogal	2,400,000
48	Kete Cage fish farmers	Kisumu	Ogal	1,200,000
49	Nicholas Juma	Kisumu	Ogal	2,400,000
50	Domnic Ochieng	Kisumu	Ogal	2,400,000
51	Kentila Farms	Kisumu	Ogal	200,400,000
52	Bruce Obongo	Kisumu	Ogal	9,600,000
53	Kevin Okumu	Kisumu	Ogal	3,600,000
54	Julius Adundo	Kisumu	Ogal	9,600,000
55	Allan Ochieng	Kisumu	Ogal	12,000,000
56	Mathews Ondiek	Kisumu	Ogal	12,000,000
57	Detians Company LTD	Kisumu	Ogal	42,000,000
58	Henry Obare	Kisumu	Ogal	45,600,000

59	Nobert Hayo	Kisumu	Ogal	2,400,000
60	Robert Ouko	Kisumu	Ogal	9,600,000
61	Wyclife Osumba	Kisumu	Ogal	4,800,000
62	Samwel Odawa	Kisumu	Ogal	2,400,000
63	Lake Aqua Limited	Kisumu	Ogal	138,000,000
64	Wilson Onyango	Kisumu	Ogal	4,800,000
65	Grace Oduor	Kisumu	Ogal	2,400,000
66	John Siaya	Kisumu	Ogal	2,400,000
67	Hawi Venture	Kisumu	Ogal	2,400,000
68	Collins Omondi	Kisumu	Ogal	4,800,000
69	Jacob Okomo	Kisumu	Ogal	6,200,000
70	Richard Arina	Kisumu	Ogal	2,400,000
71	Kennedy Orinda	Kisumu	Ogal	7,300,000
72	Jackline Odhiambo	Kisumu	Ogal	9,400,000
73	Nicholas Okello	Kisumu	Ogal	8,400,000
74	Maurice Otieno Sweta	Kisumu	Ogal	3,600,000
75	Rose Kidiga	Kisumu	Ogal	2,400,000
76	Jacob Okumu	Kisumu	Ogal	6,200,000
77	Ogal Fish Traders	Kisumu	Ogal	2,400,000
78	Henry Ochieng	Kisumu	Ogal	2,000,000
79	Rose Ochwedo	Kisumu	Ogal	1,200,000
80	Jack Obiero	Kisumu	Ogal	4,800,000
81	Benard Okeyo	Kisumu	Ogal	12,200,000
82	Paul Abiero	Kisumu	Ogal	4,800,000
83	Benson Odhiambo	Kisumu	Ogal	4,800,000
84	Jack Okumu	Kisumu	Ogal	4,400,000
85	Perez Oyombe	Kisumu	Ogal	4,800,000
86	John Ouma Were	Kisumu	Ogal	2,400,000
87	Jenifer Aloo	Kisumu	Ogal	6,000,000
88	Peter Oyende	Kisumu	Ogal	9,400,000
89	Ronald Wagude	Kisumu	Ogal	1,200,000
90	Mourice Nyaungu	Kisumu	Ogal	1,200,000
91	Nyamarwaka Women Group	Kisumu	Nyamarwaka	720,000
92	Green purple Group	Kisumu	Kobudho	138,000
93	Ochong'a Women Group	Kisumu	Asat	156,000
94	Shalton Omolo	Kisumu	Achuodho	4,620,000
95	David Omondi	Kisumu	Achuodho	1,980,000
96	Fredrick Otieno	Kisumu	Achuodho	660,000
97	Kennedy Simba	Kisumu	Achuodho	2,640,000
98	Kepher Kiaka	Kisumu	Othany	1,980,000
99	kennedy Brandy Okello	Kisumu	Othany	1,980,000
100	Erick owino	Kisumu	Othany	600,000
101	David Mbarani	Kisumu	Othany	600,000

102	Phoebe Samson	Kisumu	Othany	1,200,000
103	John Okello	Kisumu	Othany	1,800,000
104	Rakula Okoth	Kisumu	Othany	600,000
105	Sheilla Morara	Kisumu	Othany	600,000
106	John Ouma	Kisumu	Othany	600,000
107	Peter Amollo	Kisumu	Othany	300,000
108	Clement Audi	Kisumu	Othany	300,000
109	Dancun Okello	Kisumu	Othany	1,200,000
110	Jared Ouma	Kisumu	Othany	1,800,000
111	Alice Odero	Kisumu	Othany	1,800,000
112	Conslate Apida	Kisumu	Othany	600,000
113	Hellena Adhiambo	Kisumu	Othany	600,000
114	Samwel Wamalwa	Kisumu	Othany	600,000
115	Jacob Ogidi	Kisumu	Othany	600,000
116	George Medi	Kisumu	Othany	600,000
117	Boniface Areck	Kisumu	Othany	1,200,000
118	Kepher Okoth	Kisumu	Othany	600,000
119	Spencer Odhiambo	Kisumu	Othany	600,000
120	Stephene Andango	Kisumu	Othany	1,800,000
121	Sonye Kiaka	Kisumu	Othany	1,200,000
122	Hesbon Otieno	Kisumu	Othany	1,800,000
123	Marshel Ojwang	Kisumu	Othany	300,000
124	George Ochieng	Kisumu	Othany	300,000
125	Kaloka bmu	Kisumu	Kaloka	1,200,000
126	Dorcas Nyamunga	Kisumu	Kaloka	4,200,000
127	Madam Rotich	Kisumu	Kaloka	600,000
128	Shilver	Kisumu	Kaloka	21,600,000
129	Purna	Kisumu	Kaloka	19,200,000
130	Kenneth Onyango	Kisumu	Paga	1,920,000
131	Alex Oulo Owiti	Kisumu	Paga	3,000,000
132	James Jura	Kisumu	Paga	1,440,000
133	Bonface Odhiambo	Kisumu	Paga	2,400,000
134	Mourice Guya	Kisumu	Paga	2,880,000
135	Dr.Khamas Rongo	Kisumu	Paga	3,600,000
Total			**927, 969,000**	

Annex 2. The size and number of cages affected by the fish kills

Cage Size	No. of cages	No. of farmers
2x2x2	4	1
3x3x3	24	5
4x4x4	14	5

4x6x4	6	5
6x4x4	1	1
6x6x3	2	1
6x6x4	421	54
6x6x6	147	32
6x9x7	1	1
6x12x4	59	12
9x12x4	1	1
12x6x4	41	5
12x6x5	1	1
12x12x4	18	5
12x18x7	1	1
13x6x5	3	3
13x6x7	1	1
15x29x4	2	1
Total	**747**	**135**

14. ADOPTION SCHEDULE

We the Honorable members of Agriculture, Fisheries, Livestock Development and Irrigation committee do hereby append our signatures to this report to affirm its accuracy, validity and authenticity;-

1. Hon. Eunice Alandoh	-	Chairperson	.....
2. Hon. Bill Oliver	-	Vice Chairperson	.....
3. Hon. Samuel Dedeh	-	Member	.....
4. Hon. Nereah Okombo	-	Member	.....
5. Hon. Maurice Ngeta	-	Member	.....
6. Hon. Vincent Jagongo	-	Member	.....
7. Hon. Pamela Oyoo	-	Member	P.A.O