KENYA MARINE AND FISHERIES RESEARCH INSTITUTE

FRESH WATER SYSTEMS

A technical report on the post-harvest losses assessment of one major commercial fish (*Rastrineobola argentea*, Omena) in Lake Victoria.

TECHNICAL REPORT

KMF/GoK/2020-21/C8213(3)

MAY 2021

DOCUMENT CERTIFICATION

Certification by Director, Freshwater Systems

I hereby certify that this report has been done under my supervision and submitted to the Director.

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Abstract

In spite of the broad economic benefits acquired from Lake Victoria's capture fisheries, a lot of fish post-harvest losses are usually incurred by artisanal fishers and small-scale fish traders or processors, many of whom are low income earners. This study was meant to establish the causes and current status of fish post-harvest losses (specifically omena) in the Kenyan sector of Lake Victoria. The information from the study is crucial for designing intervention measures that are meant to curb fish post-harvest losses. Data was collected through a mixture of socio-economics techniques which included direct observation, key informant interviews and questionnaire survey. It was established that 75% of fishermen and 97% of fish traders/processors experienced fish post-harvest losses, mainly in *omena* fishery, amounting to a per capita gross post-harvest fish loss of Ksh 1600 in high fishing season and Ksh 490 in low season, when the losses occur. The main cause of losses included surface run offs occasioned by heavy rain (41%), rotten fish (29%), lack of buyers (12%), lack of fish preservation equipment (8%), delays in fish landing (8%) and high temperatures. This study recommends that technological modifications should be introduced to put the captured fish in driers that are installed beyond the reach of surface run off water. Boat propulsion should also be modernized to enable the fishers to land their catches in good time.

Key words: Post-harvest losses, omena Lake Victoria**.**

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1.0 INTRODUCTION

Lake Victoria, which is the second largest lake in the world, traverses three East African countries of Kenya (6%), Uganda (43%) and Tanzania (51%) in varying proportions. In Kenya, whereas the lake's sector is the smallest, it provides the most economically important fishery nationally. Lake Victoria's capture fisheries constitute 77% of total annual fish catches in Kenya which translates to 128, 708 mt, providing value to fishermen to the tune of Ksh 14.3 billion (SDF, 2013; KNBS, 2015) . A proportion of 93.7% of the total catches from the lake's sector are dominated by only three species, namely *Rastrienobola argentea* (Omena), *Lates niloticus* (Nile perch), and *Oreochromis niloticus* (Nile tilapia). However, according to (LVFO, 2016), omena (*dagaa*) production which is largest proportionally (55%) within the total annual fish production contributes only 16% of total value.

In spite of the broad economic benefits acquired from Lake Victoria's capture fisheries, a lot of fish post-harvest losses are usually incurred by artisanal fishers and small-scale fish traders or processors, many of whom are very low income earners. These losses can be classified as physical, quality and market force loss (Akande and Diei-Ouadi 2010). The artisanal fisheries sector of Lake Victoria is faced with high post-harvest losses, especially in the *omena* (*Rastrineobola argentea)* fishery (Ibengwe and Kristófersson, 2012). Post-harvest fish losses can be defined as nutrient or economic losses that render the commodity unavailable or nutritionally deficient for human utilization (Tesfay and Teferi, 2017).,post-harvest losses in the omena have been estimated to between 20 to 40 percent of catch, which translates to approximately 32 million USD per annum; this clearly suggests that reduction of losses in this fishery is a potential area for addressing food security and poverty alleviation (Mgawe and Mondoka, 2008; Bengwe and Kristófersson, 2012). A better understanding of the causes and status of fish post-harvest losses incurred by the artisanal fishers of Lake Victoria is useful for setting national and regional fisheries strategies. The Food and Agriculture Organization (FAO) Code of Conduct for Responsible Fisheries (CCRF) recognizes the problem of fish post- harvest losses under Article 11.1- Responsible fish utilisation (FAO, 1998),

which places an emphasis on loss reduction. Ideally, the most obvious means of increasing supply of fish, even without increased landings, is by reducing post-harvest losses of what is presently caught (Ward, 1998). In addition, data on the status of fish post-harvest losses would be greatly useful in guiding related policy dialogues among development practitioners who wish to improve the livelihoods of fishers, processors and traders.

The endemic silver cyprinid fish *Rastrineobola argentea* (Pelegrin, 1904), locally known as omena/" dagaa", is one of the three main commercial species on Lake Victoria, together with the Nile perch *Lates niloticus* and Nile tilapia *Oreochromis niloticus*. In the last few years, the biomass of "dagaa" has increased from about 31,931 tonnes in September 2011 to a mean of 42,559 tonnes with a range of 25,124-63,690 tonnes in September 2018. Omena landings was 53.5% (92,421 tonnes) and 60.4% (67,425 tonnes) of the total fish production in 2014 and 2015 respectively from Kenyan portion of Lake Victoria (LVFO, 2016).

The production of "dagaa" (*Rastrineobola argentea*), one of three major commercial fish species in Lake Victoria, has increased and it now contributes about 60 % of the catch, but only16% of its value. Less than 30% of production is utilized for human consumption, with the rest being used for stock feed (Odongkara. *et al* 2018).

This study assessed the omena production, processing and trade from the standpoint of post-harvest losses. It involved different categories of stakeholders from 5 landing sites. Information was gathered through direct observation, key informant interviews, questionnaire survey and Focus Group Discussion.

It was also meant to establish the causes and current status of fish post-harvest losses incurred by fishers and traders in the Kenyan sector of Lake Victoria. Overall, information from this study will bring to fore the main avenues of fish post-harvest losses along the supply chain. This information is crucial in designing intervention measures that are meant to curb fish post-harvest losses with a view to increasing fish supply and income to fisheries dependent occupations.

Objectives

To conduct post-harvest losses of omena fishery in Lake Victoria Kenya

3.0. Study area

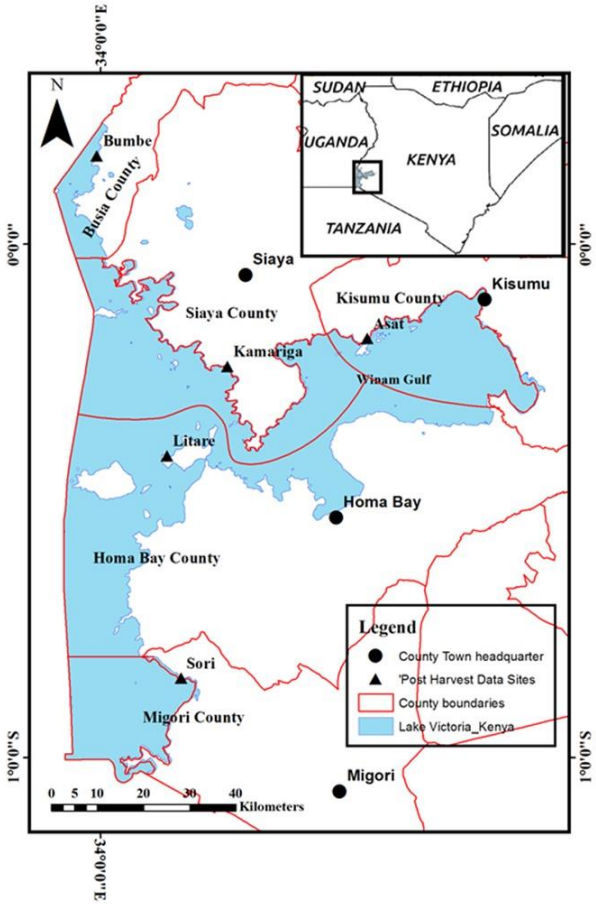

Fig. 1. Map of the study sites

This study was conducted within five riparian Kenyan counties of Lake Victoria namely: Migori, Homa-Bay, Siaya, Kisumu and Busia. In each county, one beach landing site was picked for data collection depending on prominence, accessibility and severity of perceived fish post-harvest losses (Fig. 1). The five beach landing sites studied were: Sori (Migori), Litare (Homa-Bay), Kamariga (Siaya), Asat (Kisumu) and Bumbe (Busia)

3.1. Sample Size Determination

Whereas too large a sample can be impossible to study or could imply wastage of resources, too small a sample diminishes the utility of the results. This study utilized a framework provided for in sampling theory to determine the ideal sample size within the sampling units. In this respect, we answered the three requisite research questions: how accurately do we need the answer (**ME**)? What level of confidence do we intend to use (**p**)? and, what is our current estimate of the percentage of BMU members who suffer fish post-harvest losses (**p̂**)? In application, since we know that the Margin of error is given by 1.96 times the standard error, the general formula was as shown below (Formula 1).

$$ME = z\sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \qquad \textit{Eqn. (1)}$$

In this case, we set the Margin of Error (***ME***) to **5%**, the Confidence interval (***p* = 5%**), ***p̂*** which is our prior judgment of *p* to be **8%** and thus ***n*** becomes our sample size for infinite populations. The value of *n* was then calculated as follows.

$0.05 = 1.96\sqrt{((0.08*0.92)/n)} \rightarrow$ **n = 113.1** **(1)**

We then apply the finite population correction (**fpc**) factor (**Formula 2**) to determine our desired sample size (n_1) for the finite population of ***N*≈ 8000** as follows.

$n_1 = n^* N/(n + (N-1))$ **Eqn. (2)**

$n_1 =$ $(113.1*8343) / (113.1 + 8342) \rightarrow n_1 =$ **111.6** **(2)**

This study set the target sample size at 112 respondents and this was distributed equitably across the studied BMUs (Table 1).

3.2. Data collection

This study entailed collection of both primary and secondary data which were quantitative and qualitative in nature. Primary data was collected by six researchers who were introduced and guided in the chosen landing sites by respective chairmen of the BMUs. The Beach Management Unit (BMU) officials aided the research team in

identifying fishers and fish traders within fishing units or areas of operation. Data was collected through a mixture of socio-economics techniques to enhance validity. These included direct observation, key informant interviews and questionnaire survey.

Direct observation mainly entailed examination of fishing and trading infrastructure and activities, familiarization with dominant fish species landed at the study sites, and filming of spectacular and relevant scenery and activities at the landing sites. The questionnaires, which targeted practicing fishers and traders, were administered in either Luo or Kiswahili, since these were the most favorable dialects of interaction. Key informant interviews were administered to selected BMU officials, veteran fishers and traders, and community administrators. Information from key informants and secondary sources - which included relevant published and unpublished papers - was largely used to triangulate results. The research team debriefed informally on a daily basis by discussing the progress of research and ensuing individual or group data collection difficulties as and when they occurred. At the end of the field work, all data sheets were combined and coded for entry into previously designed Microsoft excel templates.

3.4. Data collection

3.4.1 Analysis

The information gathered from the three data collection protocols was pooled and analyzed using an in-depth descriptive analysis and elementary tests for relationships. Raw data was entered and cleaned in Microsoft Excel. Elementary analysis was conducted in Excel while more complex statistics were either generated through the Analysis Tool Pack provided as an add-in of Microsoft excel or using SPSS version 20 software. The descriptive analyses were conducted to display the data in a form that could summarize a set of factors in a way that is easy to understand and interpret. Measures of central tendencies and dispersion, graphical summaries, and frequency tables, were the outputs from these analyses for the various cases. On the other hand, qualitative techniques were employed to interpret all data that expressed detailed explanations of perceptions

4.0. Results

4.1. Study Sample Statistics

Whereas this study targeted at least 112 respondents a total of 128 respondents were interviewed over and above expectation. The interviews were facilitated by timely co-ordination with BMU officials who helped in mobilizing potential respondents for the researchers in advance. The relevance of the research topic studied also aroused expectations in the affected landing sites thus translating into increased willingness to participate in the interviews. Based on actual BMU membership data (Table 1), it was expected that Sori and Bumbe BMUs would produce the highest and lowest numbers of respondents respectively. However, a majority of respondents were from Litare beach (23%) in Siaya County whereas the least number of interviewees were from Asat (16%) beach in Kisumu County.

Table 1 Statistics on respondent interviewed during the study

County	BMU	No. of Resource Users	Actual Proportion	Expected Sample (n_1= *112*)	Realized Sample	Variation
BUSIA	*Bumbe*	350	4%	5	24	+19
HOMABAY	*Litare*	2063	25%	28	30	+2
KISUMU	*Asat*	730	9%	10	20	+10
MIGORI	*Sori*	4000	48%	54	28	-26
SIAYA	*Kamariga*	1200	14%	16	26	+10
TOTAL		8343	100%	112	128	+16

4.2. Educational background /management strategies

Formal Education was characterized by very low levels. Our analysis of educational levels of respondents revealed that 8% had no formal education, 71% attained various levels of primary school education, 19% reached different levels of secondary school and

2% cited apprenticeship training in various trades. Educational levels varied across the study sites as shown (Fig. 2). Sixty-four percent of respondents reported that they were aware of good fish handling and preservation techniques. However, only 57% of these respondents who were aware confided that they put their knowledge to practice while conducting their fisheries related economic activities. On the other hand, only 13% of respondents who were aware indicated that they had undergone some training in fish handling or processing. The various trainings entailed fish handling (72%), fish processing (14%) and value addition (14%). These trainings were undertaken between the years 2011 and 2017 and were largely conducted at the Beach Management Unit (BMU) offices by government institutions (LVEMP and County Fisheries Officers) or interested NGOs. Overall, only 35% of respondents indicated that they were satisfied with the fish handling, processing and preservation techniques that they use.

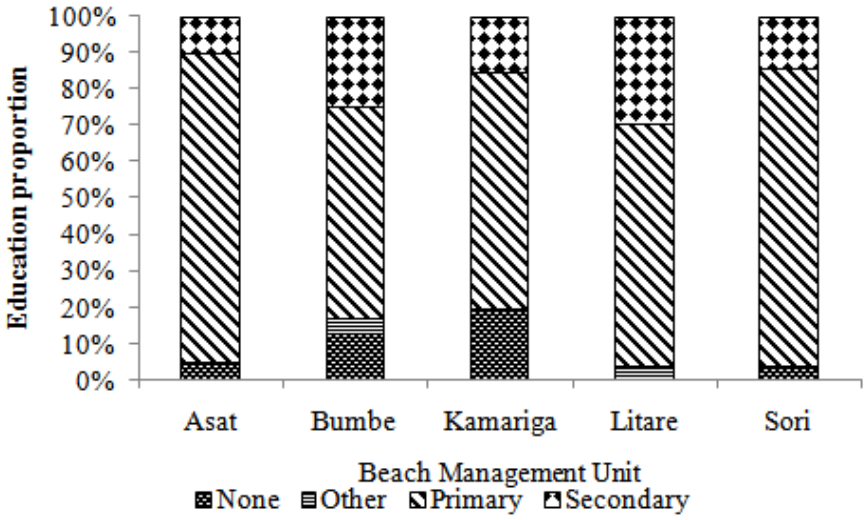

Fig. 2. Educational Levels across the BMUs

4.3. Physical interventions that result in post-harvest losses

The end market varied in distance from the landing site itself (0 Kms) to Kenya Coastal region at a maximum of 800Km. The mean distance to the market was estimated at 35 Kms and it takes a typical fish trader an average of 3 hours to arrive at the end fish market. Majority of traders walked (52%) while the rest used public service

vehicles/*matatu* (22%), motorbikes and three wheelers (19%), bicycles (5%) and hired vehicles (2%). Individual fish dealers/middlemen (50%) were the main buyers from the small scale fish traders/processors in each studied beach followed by local consumer markets (45%). Very small proportions fish was reportedly sold internationally (3%) or to processing plants (2%). Theft of fish (6%), surface run offs occasioned by heavy rain (41%) and as yet unquantified product predation are other factors affecting post-harvest loss. It was observed that drying fish was carried out on the bare ground, rocks or nets surfaces.

4.3.1 Quality loss post-harvest occurrences:

The main causes cited as the reason for fish post-harvest losses included: delays in fish landing (25%), lack of fish preservation facilities (20%), fish squashing in the boat (10%), capturing already dead fish (6%), and rotten fish due to high moisture content more so during the rainy season (29%). In assessing the main fish preservation technique, 85% of traders/processors extended the shelf life of their fish by sun drying, 5% performed gutting on the fish and 1% practiced frying. A significant 9% did not practice any preservation technique on the fish sold. Among these respondents who experienced losses 88% indicated that they experience losses rarely while the rest stated that they experienced it frequently. Delay in fish landing was found to be greatest in Sori and Asat beaches (50%). Temperature and humidity affect preservation and poor storage of fish in the fishing boats by some of the fishermen was an area of concern.

It was established that 97% of fish traders/processors experienced fish post-harvest losses. In the same tune, 62% of these fish loss victims indicated that they experience the losses frequently with the remaining minority reporting that the losses were infrequent. These statistics provide an indication that the scale of fish post-harvest losses in the landing sites is very extensive. The fish traders attributed fish post-harvest losses to the following: surface run offs occasioned by heavy rain (41%), rotten fish (29%), lack of buyers (12%), lack of fish preservation equipment (8%), delays in fish landing (8%) and high temperatures (2%) (Fig. 3).

4.3.2. Other factors leading to post harvest economic losses:

Fish processing began immediately after the fishermen landed and sold their fish catches. Even damaged and dead omena were transported from fishermen boats in addition to fresh fish in troughs which is the unit of quantification and trade of wet *dagaa.* When asked about the incidence of fish post-harvest losses, 78% of fishers affirmed that they experienced losses while fishing. Post-harvest losses were found to constitute an average of 4 troughs of *omena* each costing Kshs 600 in high fishing seasons and 1 trough of omena valued at Kshs 750 in low fishing seasons. This implied a gross loss of Ksh 2400 per affected stock in a high fishing season and likewise a Kshs 750 loss in low fishing seasons. Many secondary traders adapted to the rampant losses by selling rotten fish to firms that prepare animal feed at a cost of Kshs 500 per kilogram of spoilt *omena* fish. Of the total respondents 8% indicated that lack of buyers' affected post-harvest losses. This was in addition to lack of supporting infrastructural amenities which also had a negative social effect and both directly and indirectly promoted post-harvest losses (fig. 4). It was established that 97% of fish traders/processors experienced fish post-harvest losses. In the same tune, 62% of these fish loss victims indicated that they experience the losses frequently with the remaining minority reporting that the losses were infrequent. These statistics provide an indication that the scale of fish post-harvest losses in the landing sites is very extensive. The fish traders attributed fish post-harvest losses to the following: surface run offs occasioned by heavy rain (41%), rotten fish (29%), lack of buyers (12%), lack of fish preservation equipment (8%), delays in fish landing (8%) and high temperatures (2%) (Fig. 3).

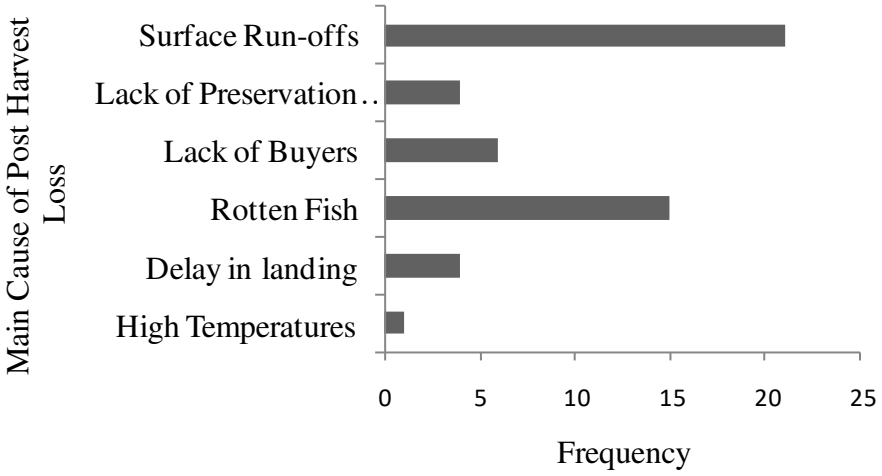

Fig. 3. Main causes of fish post-harvest losses

Table 2 Fish post-harvest losses among *omena* fishermen

		High Season Loss		Low Season Loss	
		Quantity	Price/Unit	Quantity	Price/Unit
N	Valid	31	34	9	12
	Missing	41	38	63	60
Mean		7.71	811.76	3.389	650.00
Std. Error of Mean		1.653	281.287	.6334	70.173
Std. Deviation		9.206	1640.171	1.9003	243.086
Minimum		1	100	.5	400
Maximum		50	10000	7.0	1000

Table 3 Fish post-harvest losses to *omena* traders/processors

		High Season		Low Season	
		Quantity (Trough)	Price/Unit	Quantity (Trough)	Price/Unit
N	Valid	43	43	11	10
	Missing	6	6	38	39
Mean		5.872	809.77	4.955	712.00
Std. Error of Mean		1.0969	117.175	3.5165	111.204
Median		4.000	600.00	1.000	750.00
Std. Deviation		7.1930	768.367	11.6629	351.656
Minimum		.5	200	.5	200
Maximum		40.0	4000	40.0	1200

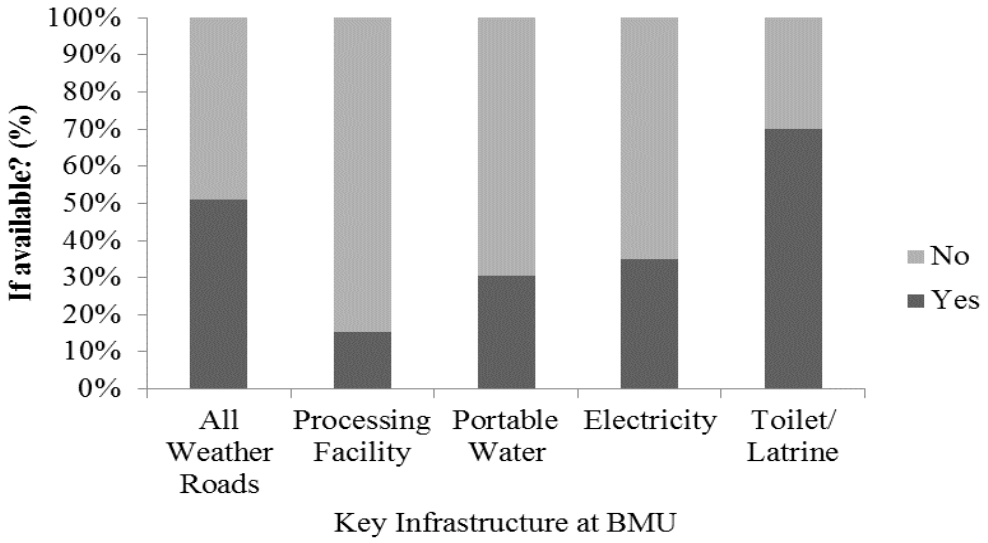

Fig. 4. Availability of key infrastructure at the landing beaches

5.0. Discussion

5.1. Study Sample Statistics

The willingness to participate as a respondent may be taken as a measure of the level of understanding of the problem and a willingness to contribute in the quest for solutions. Based on actual BMU membership data (Table 1), it was expected that Sori and Bumbe BMUs would produce the highest and lowest numbers of respondents respectively. However, a majority of respondents were from Litare beach. The relationship between willingness to participate and desire to contribute may thus not be very reliable. Probably it is affected by other subsidiaries like level of curiosity and expectation of reward it should be noted that the highest educational background was in Litare.

5.2. Educational background /management strategies

The number of respondents who were aware of good fish handling and preservation techniques and yet did not put their knowledge in practice may be an indication that the training process is not proving effective either because of their low educational level of the participants or cultural egocentricity that makes them unwilling to accept or absorb new ideas. Probably the trainers should embrace an all-inclusive training bottoms up approach and are also following an egocentric top down approach.

5.3. Physical interventions that result in post-harvest losses

Long distance to markets through poor roads and lack of locally based processing infrastructure may result in lack of incentive or willingness with some stakeholders feeling that the cost is not worth the effort. Improved infrastructure access is associated with movements. An assessment was done with regards to key support infrastructure and social services in each of the landing beaches (Fig. 4). The analysis reveals that the landing sites still lack very key infrastructure and social amenities.

Fish drying on the bare ground or nets is very susceptible to food contamination from human, animal, bird and insect contact, as well as mixture of the drying fish with beach sand particles in addition physical loss is incurred during the drying process by predating birds and animals. The fish processors were also observed to turn the drying fish frequently to ensure uniform drying through the use of brooms that could equally expose the fish to secondary contamination.

Rotting of fish was caused in part by delays in landing, but mostly due to dull or rainy weather condition in an otherwise sun drying dependent region. Many traders adapted to the rampant losses by selling rotten fish to firms that prepare animal feed at a throw away price.

In some study sites (Litare, Bumbe and Kamariga) trial improved raised solar driers had been installed by the Kenya Marine and Fisheries Research Institute (KMFRI) however currently only Bumbe beach showed usage. The main misgiving of the traders/processors was that the racks were narrow and too small in size to be adequate enough to accommodate many troughs of omena for effective economic drying purposes. In Kamariga beach where the BMU had also up-scaled the solar driers, none usage was blamed on additional expenses charged for rack maintenance and local rebellion due to perceived capture of the drying equipment by the BMU officials.

Fish drying on the bare ground or nets is very susceptible to food contamination from human, animal, bird and insect contact, as well as mixture of the drying fish with beach sand particles in addition physical loss is incurred during the drying process by predating birds and animals. The fish processors were also observed to turn the drying fish

frequently to ensure uniform drying through the use of brooms that could equally expose the fish to secondary contamination.

It is to be noted that this study was conducted during heavy rains and the resultant immense post-harvest losses were experienced at first-hand, especially in Sori beach where predators like birds and roaming pigs consumed the omena while they were in the drying process.

5.3.1. Quality loss post-harvest occurrences

The main method of preservation used by the artisanal fishers was cooling, icing or freezing Temperature and humidity are key factors in fish preservation. The modified temporary storage within the fishing boats and the fishing net layers facilitated seepage of water from captured fish and served as basic technologies to capitalize on their regulation and enhance the freshness of fish. They can however be negatively affected by delays. Fish quality loss is largely affected by carelessness in handling and preservation techniques. Insistence on the use of customary techniques and indifference to modern techniques is a throwback. Damage during transportation, rotting and contamination during drying and storage are specific to quality losses.

5.3.2. Other accompanying factors leading to post harvest economic losses:

Mainly on poor land practices leading to surface runoff during the heavy rains that results in the drying omena being washed away and thus contributes to post harvest loss oversupply to the available market and lack of supporting infrastructure.

Challenges

1. In respect to MoH guidelines towards Covid-19 pandemic spread control, there only could be a controlled number of people for the Focused Group Discussions at each landing site.

2. Respondents were a bit hesitant to give information demanding or requesting to be facilitated because they left their jobs to attend to the interview.

3. This survey was carried during the heavy down pour which made it a bit difficult to access the landing sites.

6.0. CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

Overview of dagaa sub-sector reveals that there has been a steady growth in production of dagaa on Lake Victoria but its value has remained low, compared to other commercial species.

High post-harvest losses characterized the dagaa sub-sector, consisting of physical and quality losses.

The levels of education among operators are low, which hinder them from acquiring new knowledge and skills for quality control, value addition and business management. Membership of groups is high among operators, which enables them to purchase inputs collectively obtain training, save together and borrow from each other. In production, fishers maximise their earnings by selling their dagaa fresh, processed or in both forms.

The number of days fished per month does not vary significantly between low and high catch seasons, showing lack of alternative activities for the fishers. Net revenues of fishers vary from low to high catch seasons, due to the levels of production. There is a high risk of post-harvest losses during high catch seasons that fishers need to cope with by sealing leaking boats and early landing of catch. Dagaa fishing is constrained by bad weather and rains, low dagaa catches and insecurity on the lake.

Dagaa processing, largely done by drying on nets or on bare ground, still lacks equipment, improved technologies and value addition. Seasonal variations affect quantities, prices and net revenues of processors, leading to fluctuating incomes. Processors market their dagaa mostly at the beaches, which limits their earnings given the low beach prices, compared to elsewhere.

Processors need to respond to avoid the frequent post-harvest losses through rotting, dagaa swept away by rains or loss of colour by using effective measures of spreading dagaa on raised drying racks to avoid dagaa being washed away.

Most processors do not comply with the health and fish quality standards in place, limiting their ability to access high value markets for dagaa.

The equipment used in dagaa trading are simple, including bicycles, motorcycles, trucks or weighing scales, showing limited investment in dagaa trading.

6.2. Recommendations

- Spatially map key areas where the problems lie and the driving forces that result in post harvest losses along a spatial scale.
- Desighn and evaluate techniques and institutional innovations tat can assist in problem solving solutions on a priority problem domain.
- Design how the improvrnment of post harvest lossescan be coupled with environmental improvement.
- Introduce modelling and remote sensing techniques into post harvest control studies.
- Networks need to be developed to improve information and support among stakeholders in the industry while government and NGOs should strengthen their support for the industry through training, market identification, supervision, inspection and improved technology.
- Operators along the dagaa value chain should be sensitized and trained on the best processing methods to reduce post-harvest losses, which fetch high prices on both local and export markets.
- Dagaa operators, with support of Government, should provide suitable storage facilities for the products which may affect post harvest loss to avoid leakage when it rains and to eliminate pests.
- Operators along value chain should adopt coping strategies to avert post-harvest losses through early landing, observing bad weather, proper handling of dagaa, improved processing methods and storage and quick selling of dagaa products..

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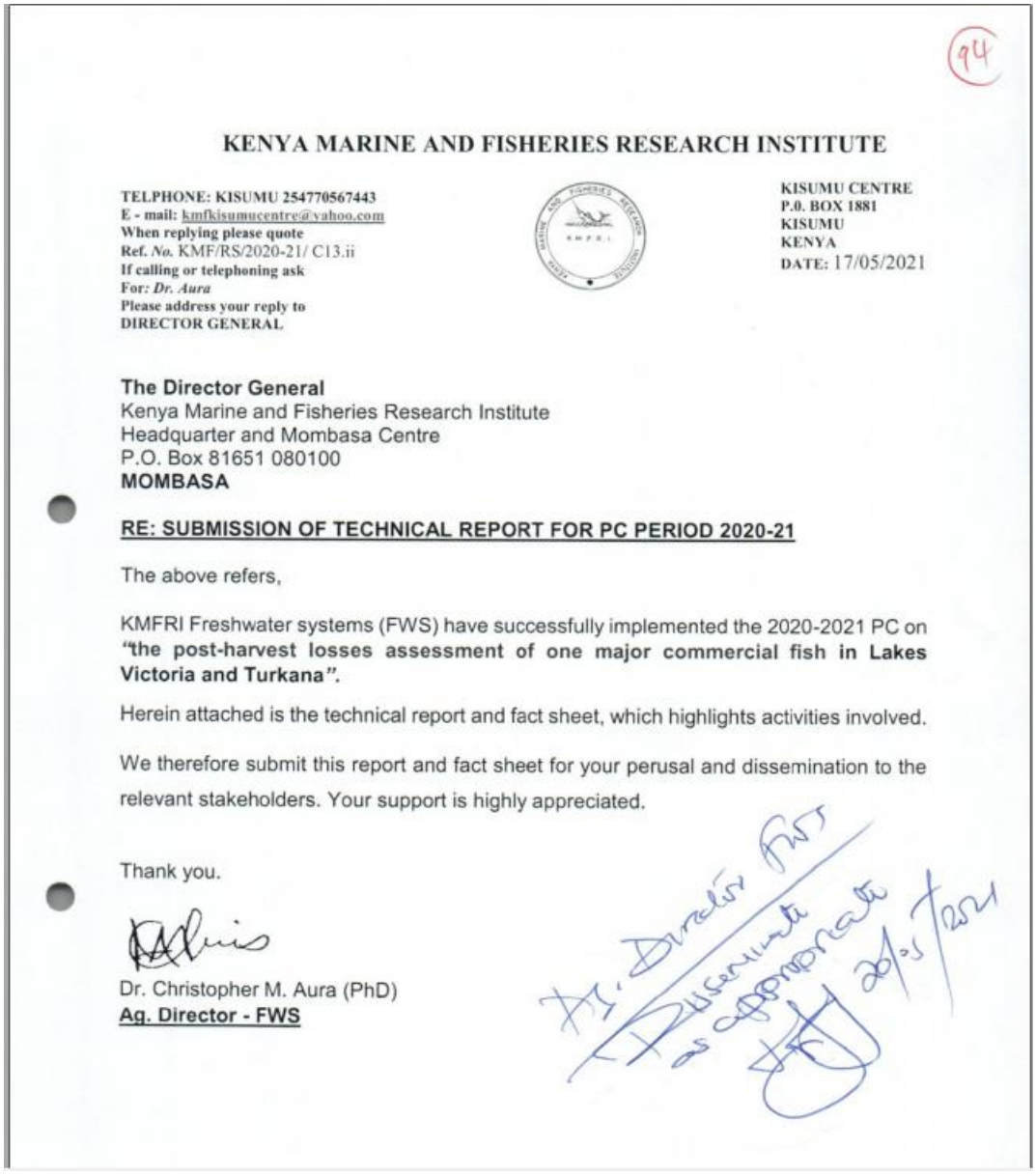
APPENDICES

Appendix 1: Submission letter of the technical report to the Director General KMFRI



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KENYA MARINE AND FISHERIES RESEARCH INSTITUTE

TELPHONE: KISUMU 254770567443
E - mail: kmfkisumucentre@yahoo.com
When replying please quote
Ref. No. KMF/RS/2020-21/ C13.ii
If calling or telephoning ask
For: Dr. Aura
Please address your reply to
DIRECTOR GENERAL

KISUMU CENTRE
P.0. BOX 1881
KISUMU
KENYA
DATE: 17/05/2021

The Director General
Kenya Marine and Fisheries Research Institute
Headquarter and Mombasa Centre
P.O. Box 81651 080100
MOMBASA

RE: SUBMISSION OF TECHNICAL REPORT FOR PC PERIOD 2020-21

The above refers,

KMFRI Freshwater systems (FWS) have successfully implemented the 2020-2021 PC on **"the post-harvest losses assessment of one major commercial fish in Lakes Victoria and Turkana".**

Herein attached is the technical report and fact sheet, which highlights activities involved.

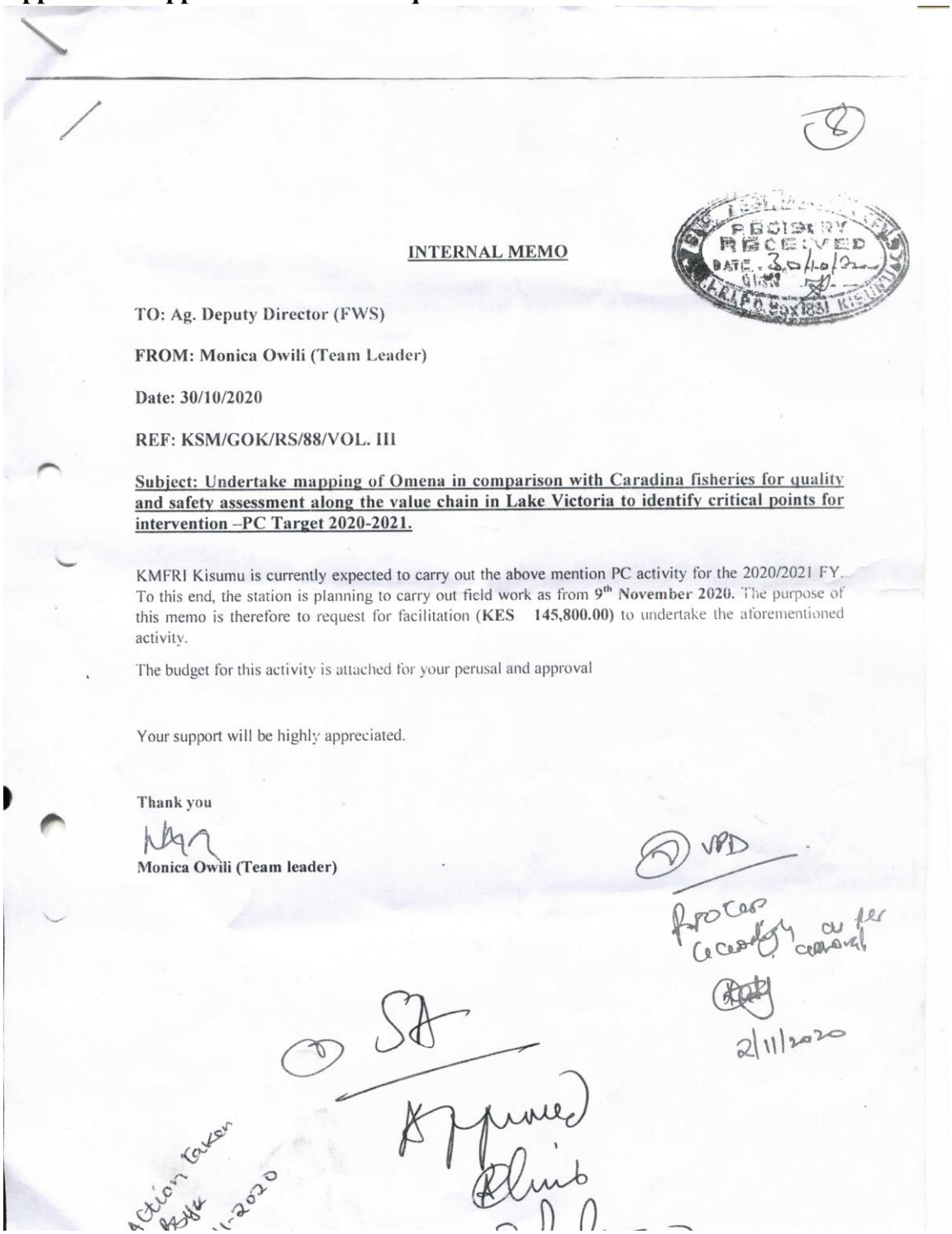
We therefore submit this report and fact sheet for your perusal and dissemination to the relevant stakeholders. Your support is highly appreciated.

Thank you.

Dr. Christopher M. Aura (PhD)
Ag. Director - FWS

Dr. Director FWS
Dissemination as appropriate
20/5/2021

Appendix 2. Approved fieldwork requisition



RECEIVED
DATE: 30/10/20

INTERNAL MEMO

TO: Ag. Deputy Director (FWS)

FROM: Monica Owili (Team Leader)

Date: 30/10/2020

REF: KSM/GOK/RS/88/VOL. III

Subject: Undertake mapping of Omena in comparison with Caradina fisheries for quality and safety assessment along the value chain in Lake Victoria to identify critical points for intervention –PC Target 2020-2021.

KMFRI Kisumu is currently expected to carry out the above mention PC activity for the 2020/2021 FY. To this end, the station is planning to carry out field work as from **9th November 2020.** The purpose of this memo is therefore to request for facilitation (**KES 145,800.00)** to undertake the aforementioned activity.

The budget for this activity is attached for your perusal and approval

Your support will be highly appreciated.

Thank you

Monica Owili (Team leader)

VPD

Process accordingly as per comment

2/11/2020

Approved

Action taken

PROTOCOL MEETING HELD ON 05TH NOVEMBER 2020 AT THE CONFERENCE HALL FOR THE GoK 2020-2021 PC TARGETS

Agenda:

1. Protocol meeting for Performance Contracting Targets for FY: 2020-2021
2. A.O.B

Attendance:

- Attendance list attached. (Appendix 1)

Absent with an apology:

- Horace Owiti
- Megan Kinara

Meeting started at 0910hrs with opening remarks from Mr. Fred Guya and word of prayer from Mr. Zablon Awuonda. The chairman invited the DD-FWS, Dr Christopher Aura, to chair the meeting.

MIN 1/05/11/2020: PC TARGETS PROTOCOL MEETING

The chairman highlighted the limitations caused by Covid-19 pandemic on the budget allocation and called on all members to keep calm and be understanding of the situation. Members were called upon to keep time and the DD-FWS stressed on the need to observe time and always be punctual in meetings. The chair instructed that all absent members without an apology were to be excluded from undertaking on this activity unless they present a valid reason for absconding the meeting.

The chairman called upon the team-leaders to always ensure that all team members per group observed the laid-out Ministry of Health protocols in regards to Covid-19 spread control and personnel safety. Team leaders were called upon to make their protocol presentations:

i. PC Target 1: Monitoring of the point sources of pollution in Lake Victoria for protection of ecosystem services and use. This team will be led by Mr. George Basweti. The team will undertake sampling of water from major rivers, river mouths and other point sources and this data will be crucial as this are the same point sources monitored by KIWASCO.

ii. PC Target 2: Undertake continued bi-annual monitoring and mapping of water hyacinth and other macrophytes in Lake Victoria, Kenya for improved lake surveillance to inform lake users. This team will be led by Mr. Joseph Nyaundi. The team undertaking Target 1 and Target 2 will be undertaking their activities concurrently and thus had synchronized schedule and sampling places. The activity was pointed out to be a validation exercise and thus the team was tasked to come up with a correlation showing the water hyacinth locations as sampled vis a vis the macrophyte locations shown by the satellite imagery.

iii. PC Target 3: Assess the ecological status of cage culture in relation to wild fisheries in Lake Victoria. This team will be led by Mr. Fred Guya. The team will undertake sampling and plans to use a plankton net to collect the zooplankton which will be preserved under formalin. This team was also tasked to collect samples on macroinvertebrates.

iv. PC Target 4: Undertake mapping of Omena in comparison with Caridina fisheries for quality and safety assessment along the value chain in Lake Victoria to identify critical points for intervention. This team will be led by Monica Owili. The team will undertake the activity using a Focus Group Discussion protocol approach.

v. PC Target 5: Assessment of the socioeconomic effect of illegal fishing in Lake Victoria. The team will be led by Mr. Patrick Otuo with the proposed protocols to be used being: Key Informant Questionnaire and Focused Group Discussions. Both Target 4 & 5 deploy a socioeconomic approach, on the FGDs, and were called to observe social distancing during the discussions. The team will undertake on understanding the major illegal fishing gears and their percentage contribution towards fishing illegality. Also, the team will undertake on understanding the local names of the fishing gears and also new and upcoming illegal fishing ways.

vi. PC Target 6: Conducting an Economic and Financial Impact Assessment (EFIA) of Lake Victoria fisheries in Kenya and make recommendations for management. This will be a workshop held in Vihiga County, with the team already equipped with data collected from an LVFO sponsored project. The team will be led by Hilda Nyaboke. Part of the project data collection had already been done by July 2020 from funding by GIZ and the team will undertake to develop a report for the PC Target.

vii. PC Target 7: Roll-out the revamped EFMIS application for increased fisheries data dissemination for blue growth. The team will be led by Eric Odari under supervision from Horace Owiti. The chairman noted that this was a roll-out action for an application and thus the reporting should be able to show the roll-out success.

MIN 2/05/11/2020: A.O.B

- Time observation was called upon by the chairman whilst respecting colleagues and other personnel in the field. This was to apply to all members, whether going to the field or attending the workshop.
- Also, timely surrender after the field work was advocated for to ensure effective and timely accountability. All members were called upon to carry out splendid and outstanding research work that reflects the quality of the institute.
- All members were called upon to be very serious about the Balanced Score Card.

Having no any other business, the meeting was adjourned by the DD-FWS with a word of prayer from Mr. Joseph Nyaundi at 1110hrs.

Minutes confirmed by:

Secretary: ..... Chairman: .....

Appendix 3: Attendance register during fieldwork

KENYA MARINE AND FISHERIES RESEARCH INSTITUTE-KISUMU CENTRE

Undertake mapping of Omena in comparison with Caradina fisheries for quality and safety assessment along the value chain in the Lake Victoria to identify critical points for intervention – PC Target 2020-2021

DATE: 9th-12th November, 2020

Attendance register

No	Name	Designation	9/11/2020	10/11/2020	11/11/2020	12/11/2020
1	Naftaly Mwirigi	A-R'S	[signature]	[signature]	[signature]	[signature]
2	MONICA OWILI	RS	[signature]	[signature]	[signature]	[signature]
3	Michael George Onyango	Lab Techno II	[signature]	[signature]	[signature]	[signature]
4	Salima Olicno	LAB TECH I	[signature]	[signature]	[signature]	[signature]
5	Naftali-O-Egesa	ADM Asst II	Ogesa.			
6	MUSUMBA NDONJ	S.A.S.	[signature]			
7	Reuben Mairura	Lab tech	[signature]	[signature]	[signature]	[signature]
8	Paul Odhach	Driver	[signature]	[signature]	[signature]	[signature]

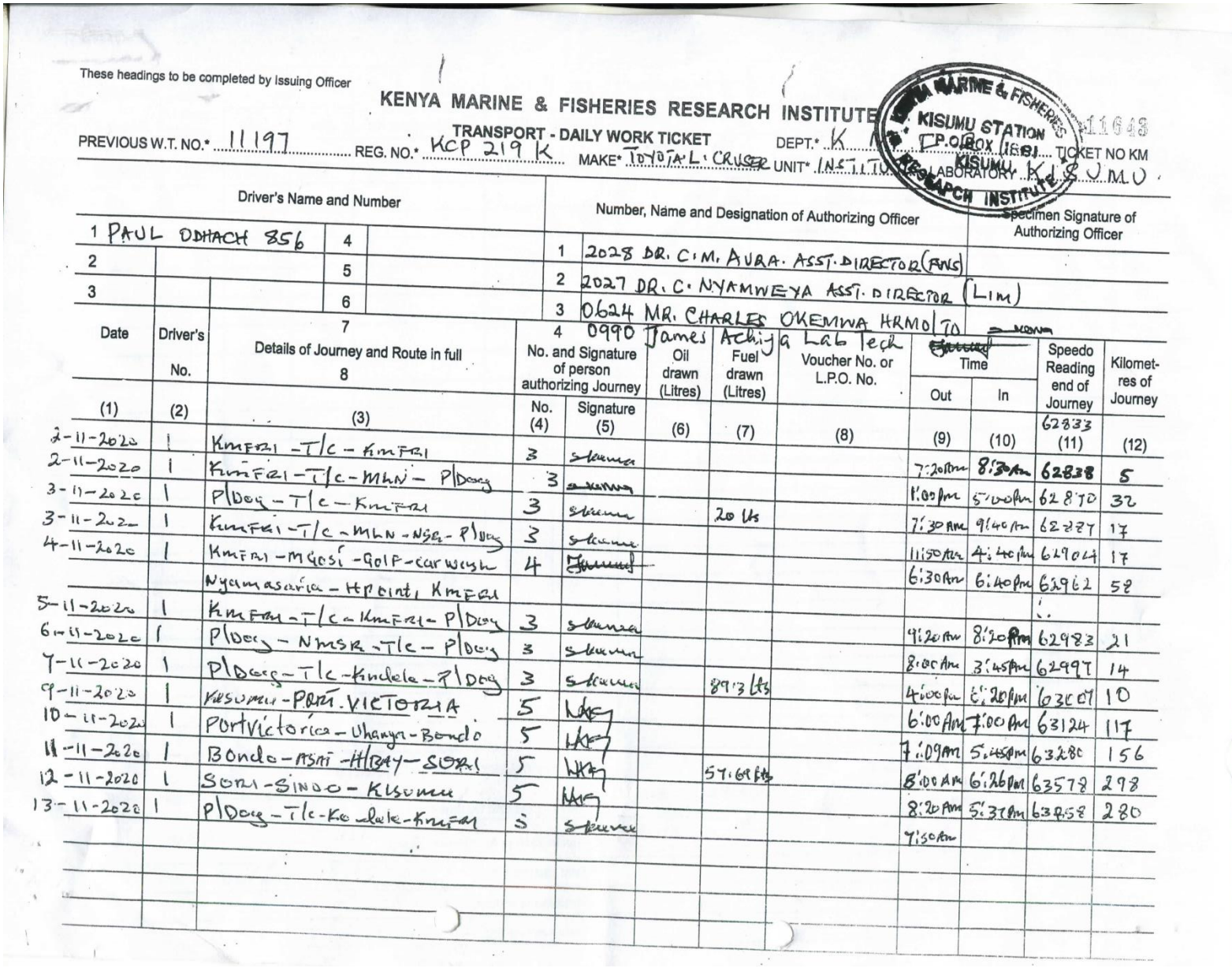
KENYA MARINE AND FISHERIES RESEARCH INSTITUTE-KISUMU CENTRE

Undertake mapping of Omena in comparison with Caradina fisheries for quality and safety assessment along the value chain in the Lake Victoria to identify critical points for intervention – PC Target 2020-2021

DATE: 9th-12th November, 2020

Attendance register

No	Name	Designation	9/11/2020	10/11/2020	11/11/2020	12/11/2020
9	VENNY MUIRI MWANGE	RS				
10	IKEMA USENGE OTUGI	A-S				



These headings to be completed by Issuing Officer

KENYA MARINE & FISHERIES RESEARCH INSTITUTE

TRANSPORT - DAILY WORK TICKET

KISUMU STATION P.O.BOX 1881 KISUMU — KENYA MARINE & FISHERIES RESEARCH INSTITUTE

11643

PREVIOUS W.T. NO.* 11197 REG. NO.* KCP 219K MAKE* TOYOTA L. CRUSER UNIT* INSTITU... DEPT.* K... TICKET NO KM

LABORATORY KISUMU

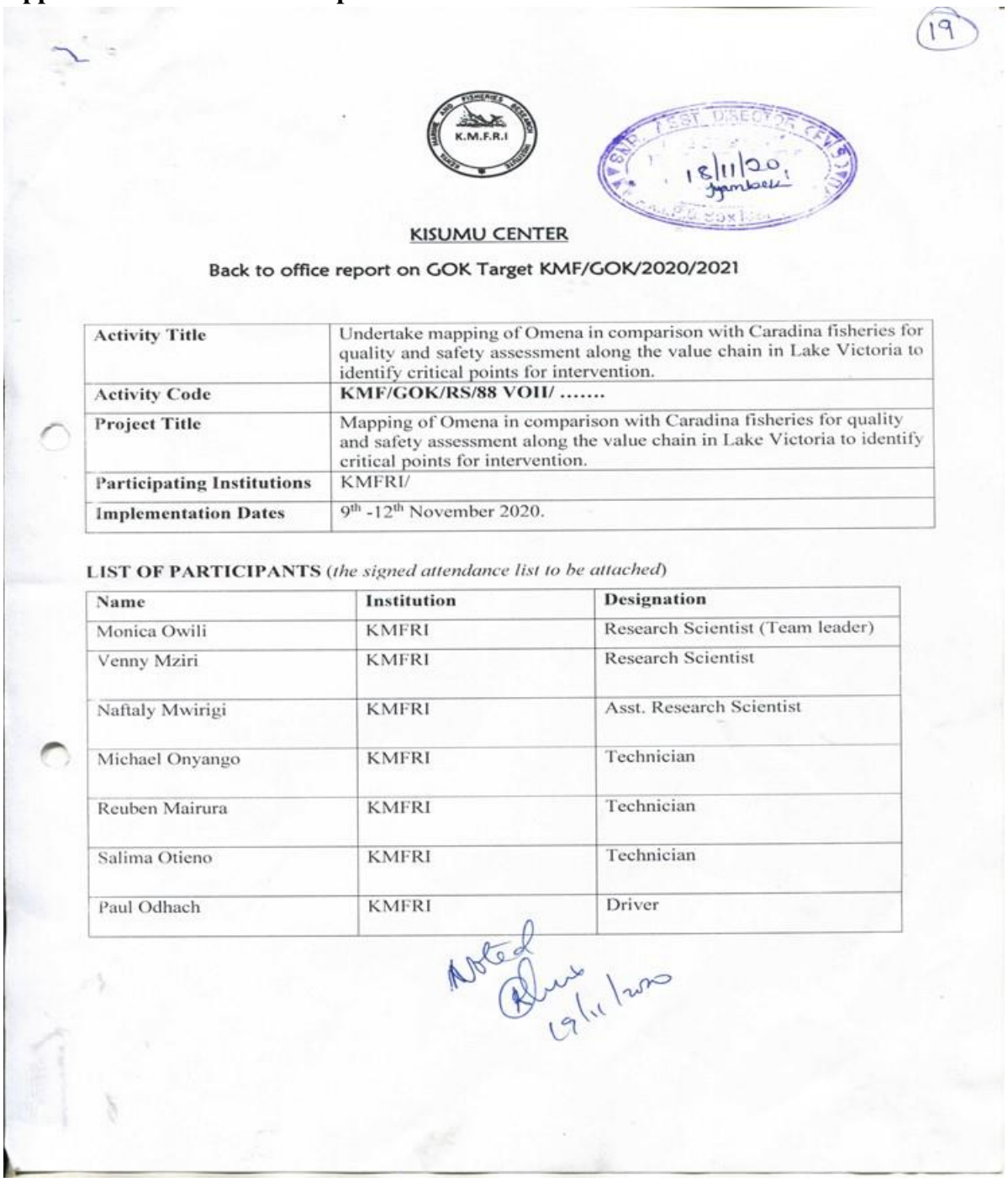
Driver's Name and Number				Number, Name and Designation of Authorizing Officer	Specimen Signature of Authorizing Officer
1 PAUL ODHACH 856	4		1	2028 DR. C.M. AURA. ASST. DIRECTOR (FMS)	
2	5		2	2027 DR. C. NYAMWEYA ASST. DIRECTOR (LIM)	
3	6		3	0624 MR. CHARLES OKEMWA HRMO/TO	

Date	Driver's No.	Details of Journey and Route in full	No. and Signature of person authorizing Journey		Oil drawn (Litres)	Fuel drawn (Litres)	Voucher No. or L.P.O. No.	Time Out	Time In	Speedo Reading end of Journey	Kilometres of Journey
			No.	Signature							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
			4 0990 James Achija Lab Tech							62833	
2-11-2020	1	KMFRI - T/C - KMFRI	3					7:20Am	8:30Am	62838	5
2-11-2020	1	KMFRI - T/C - MLN - P/Dock	3					1:00pm	5:00Pm	62870	32
3-11-2020	1	P/Dock - T/C - KMFRI	3			20 Lts		7:30 AM	9:40Pm	62927	17
3-11-2020	1	KMFRI - T/C - MLN - NSR - P/Dock	3					11:50Am	4:40Pm	62944	17
4-11-2020	1	KMFRI - Migosi - Golf - car wash	4					6:30Am	6:40Pm	62962	58
		Nyamasaria - Hpoint, KMFRI									
5-11-2020	1	KMFRI - T/C - KMFRI - P/Dock	3					9:20Am	8:20Pm	62983	21
6-11-2020	1	P/Dock - NMSR - T/C - P/Dock	3					8:00Am	3:45Pm	62997	14
7-11-2020	1	P/Dock - T/C - Kindele - P/Dock	3			89.3 Lts		4:00pm	6:20Pm	63007	10
9-11-2020	1	Kisumu - Port. VICTORIA	5					6:00Am	7:00Am	63124	117
10-11-2020	1	Portvictorica - Uhanya - Bondo	5					7:09Am	5:45Pm	63280	156
11-11-2020	1	Bondo - Asati - Hibay - Sori	5			57.69 Lts		8:00Am	6:26Pm	63578	298
12-11-2020	1	Sori - Sindo - Kisumu	5					8:20Am	5:37Pm	63858	280
13-11-2020	1	P/Dock - T/C - Kindele - KMFRI	5					7:50Am			

Appendix 5. Pictures from the field

Meeting stakeholders at landing sites

Appendix 6. Back to office report



(19)

K.M.F.R.I

18/11/20

KISUMU CENTER

Back to office report on GOK Target KMF/GOK/2020/2021

Activity Title	Undertake mapping of Omena in comparison with Caradina fisheries for quality and safety assessment along the value chain in Lake Victoria to identify critical points for intervention.
Activity Code	**KMF/GOK/RS/88 VOII/ .....**
Project Title	Mapping of Omena in comparison with Caradina fisheries for quality and safety assessment along the value chain in Lake Victoria to identify critical points for intervention.
Participating Institutions	KMFRI/
Implementation Dates	9th -12th November 2020.

LIST OF PARTICIPANTS (*the signed attendance list to be attached*)

Name	Institution	Designation
Monica Owili	KMFRI	Research Scientist (Team leader)
Venny Mziri	KMFRI	Research Scientist
Naftaly Mwirigi	KMFRI	Asst. Research Scientist
Michael Onyango	KMFRI	Technician
Reuben Mairura	KMFRI	Technician
Salima Otieno	KMFRI	Technician
Paul Odhach	KMFRI	Driver

Noted
19/11/2020

- Most if not all boat owners lacked a means of insurance for their boats and boat engines while noting that this equipment are relatively expensive and are very crucial for their daily activities. This has led to total loss in cases of theft and boat confiscation.
- Hygiene and sanitation at most beaches were quite a lax and this posed a danger to consumers from the handling of these fisheries at the landing sites.

Recommendations:

- There is need for the Kenya Coast Guard Service, introduced in 2018 under the Kenya Fisheries Service Act, to have a formal interaction with the BMU representatives. This will address the illegal fishing challenges, border demarcation issues, protection from Uganda police among others.
- The insurance policy owners need to be engaged and sensitized on this gap in their market for the to tailor-make insurance solutions that suit the boat owners.
- Interventions on alternative ways of drying and integrated means of storage to minimize postharvest losses.
- The "Eat Fish Campaign" need to be steered forward and wider to all Kenyans noting the nutritional benefits of small fish to increase their consumption.
- The BMU officials should engage in community sensitization and awareness creation on beach hygiene and sanitation to promote cleanliness. This could be in form of beach cleanups and erecting waste disposal points.

Challenges during fieldwork:

1. In respect to MoH guidelines towards Covid-19 pandemic spread control, there only could be a controlled number of people for the Focused Group Discussions at each landing site.

Prepared by: 12/11/2020

Monica Owili (Team leader)

Fact sheet no: KMF/GoK/2020-21/ C1.13.ii

Title: A technical report on post-harvest losses assessment of *Rastrineobola argentea* **(Omena) in Lake Victoria.for improved lake surveillance to inform resource users**

Reporting: Date: MAY 2021.

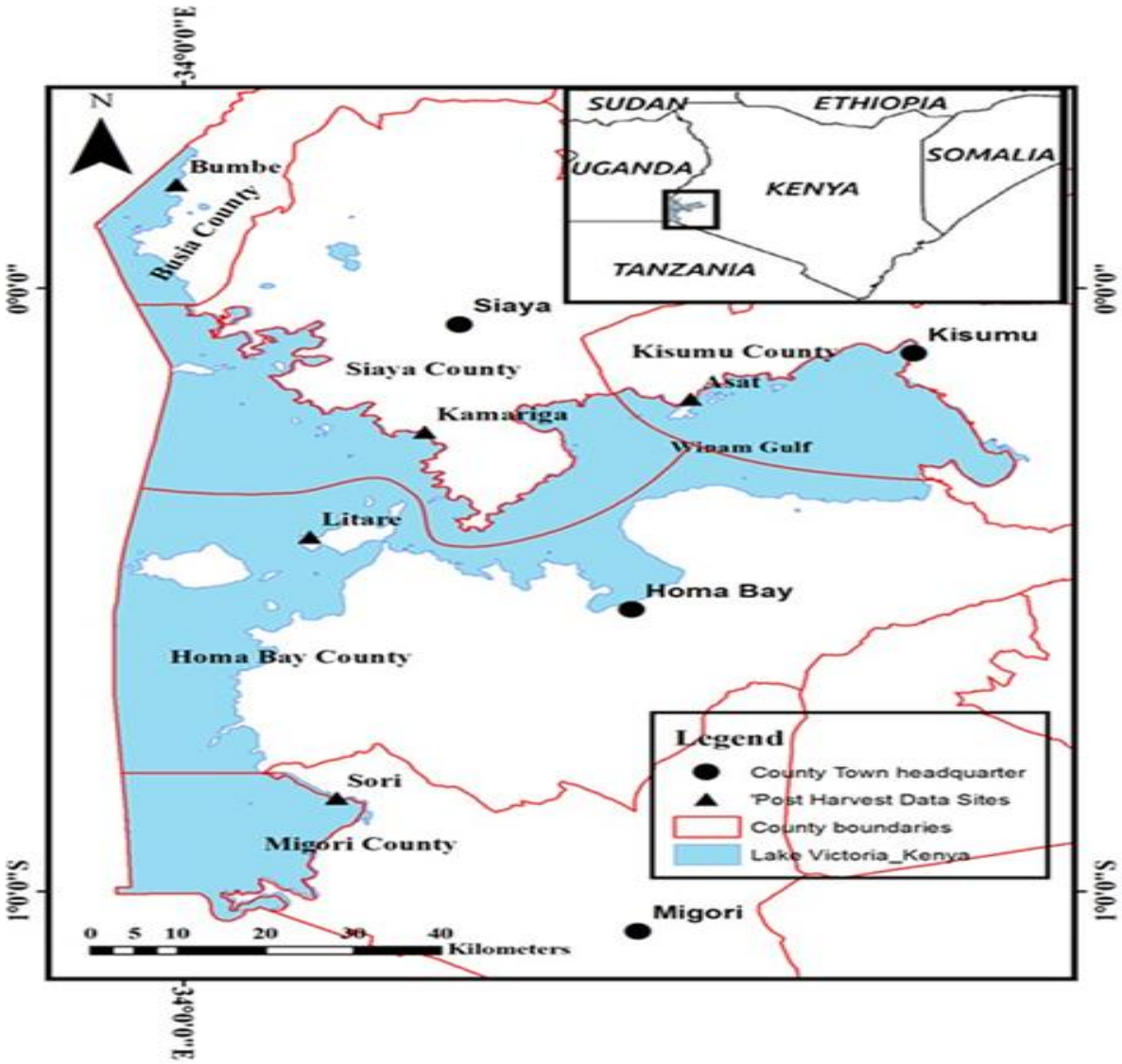
Prepared by : Peter Wawiye, Christopher M. Aura, Chrisphine Nyamweya, Erick Odari (and the socio-economic team members}
KMFRI, Kisumu.
Email : kmfrikisumucentre@yahoo.com
Tel. : +254770567443

Introduction

The artisanal fisheries sector of Lake Victoria is faced with high post-harvest losses, especially in the omena (*Rastrineobola argentea)* fishery. Post-harvest fish losses can be defined as nutrient or economic losses that render the commodity unavailable or nutritionally deficient for human utilization, post-harvest losses in omena have been estimated to be between 20 to 40 percent of catch, which translates to approximately 32 million USD per annum; this clearly suggests that reduction of losses in this fishery is a potential area for addressing food security and poverty alleviation. A better understanding of the causes and status of fish post-harvest losses incurred by the artisanal fishers of Lake Victoria is useful for setting national and regional fisheries strategies. KMFRI undertook this study to establish the current causes and current status of fish post-harvest losses incurred by fishers and traders in the Kenyan sector of Lake Victoria areas to mitigate on issues related to post harvest loss.

Findings

The tabulated graphic and visual findings for January 2021 – June 2021 (Second half-year) were mainly extracted through a mixture of socio-economics techniques which included direct observation, key informant interviews and questionnaire survey.



Map of study sites

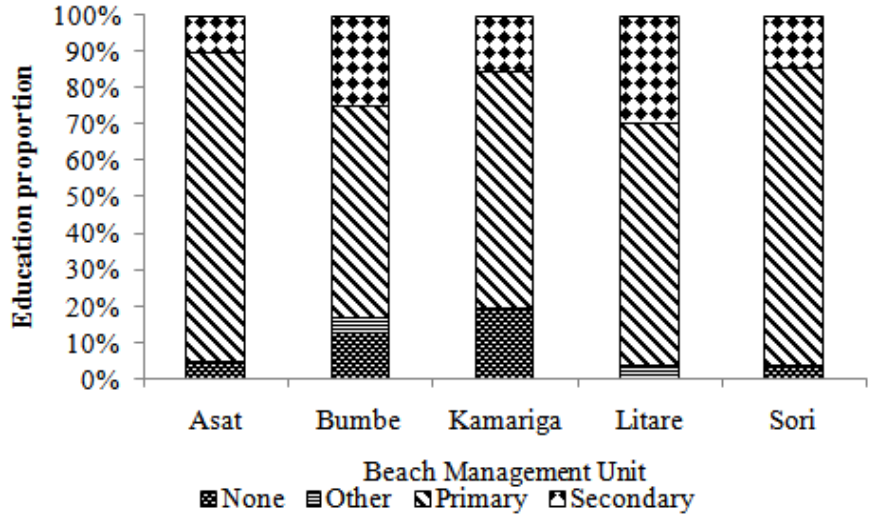
This study was conducted within five riparian Kenyan counties of Lake Victoria namely Migori, Homa bay, Siaya, Kisumu and Busia. In each county one beach/ landing site was picked for data collection depending on prominence, accessibility and severity of perceived fish post-harvest loss. The beaches/ landing sites studied were Sori (Migori),

Litare (Homa bay), Kamariga (Siaya), Asat (Kisumu) and Bumbe (Busia)

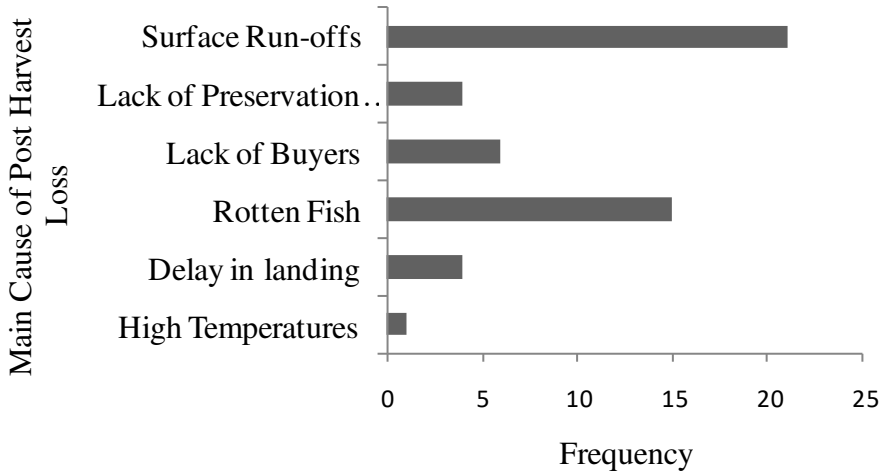
Statistics on respondent interviewed during the study

County	BMU	No. of Resource Users	Actual Proportion	Expected Sample (n_1= *112*)	Realized Sample	Variation
BUSIA	*Bumbe*	350	4%	5	24	+19
HOMABAY	*Litare*	2063	25%	28	30	+2
KISUMU	*Asat*	730	9%	10	20	+10
MIGORI	*Sori*	4000	48%	54	28	-26
SIAYA	*Kamariga*	1200	14%	16	26	+10
TOTAL		8343	100%	112	128	+16

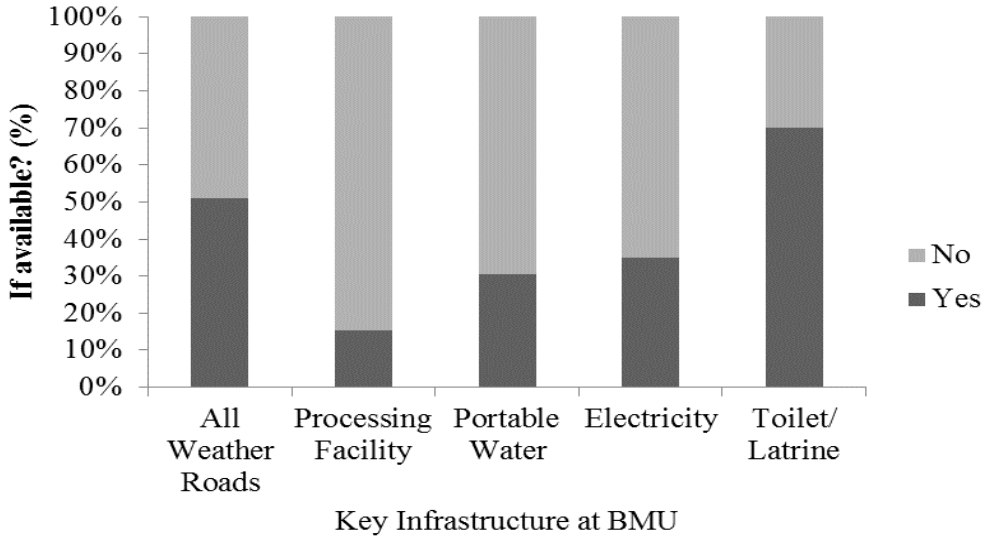
Statistics on respondent interviewed during the study



Educational Levels across the BMUs



Main causes of fish post-harvest losses



Availability of key infrastructure at the landing beaches

Meeting stakeholders at the landing sites

Conclusions

- There has been a steady growth in production of dagaa on Lake Victoria but its value has remained low, compared to other commercial species.
- High post-harvest losses characterise the dagaa sub-sector, consisting of physical and quality losses.
- The levels of education among operators are low leval of education among stakeholders hinders them from new acquiring skills, for quality control, value addition and business management.
- There is a high risk of post-harvest losses during high catch seasons that fishers need to cope with by sealing leaking boats and early landing of catch.
- Dagaa processing, largely done by drying on nets or on bare ground, still lacks equipment, and improved technologies leading to post harvest loss.

Recommendations

- Spatially map key areas where the problems lie and the driving forces that result in post harvest losses along a spatial scale.
- Desighn and evaluate techniques and institutional innovations tat can assist in problem solving

solutions on a priority problem domain.

- Design how the improvrnment of post harvest lossescan be coupled with environmental improvement.
- Introduce modelling and remote sensing techniques into post harvest control studies.
- Networks need to be developed to improve information and support among stakeholders in the industry while government and NGOs should strengthen their support for the industry through training, market identification, supervision, inspection and improved technology.
- Operators along the dagaa value chain should be sensitized and trained on the best processing methods to reduce post-harvest losses, which fetch high prices on both local and export markets.
- Dagaa operators, with support of Government, should provide suitable storage facilities for the products which may affect post harvest loss to avoid leakage when it rains and to eliminate pests.
- Operators along value chain should adopt coping strategies to avert post-harvest losses through early landing, observing bad weather, proper handling of dagaa, improved processing methods and storage and quick selling of dagaa products..

DESSIMINATION