Uganda Country Report

STUDY OF DAGAA TRADE ON LAKE VICTORIA FOR IMPROVED NUTRITION, FOOD SECURITY AND INCOMES



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Acronyms

ARSO	African Organisation for Standardisation
DiFR	Directorate of Fisheries
DRC	Democratic Republic of Congo
EAC	East African Community
FAO	Food and Agriculture Organisation
ICEIDA	Icelandic International Development Agency
LVEMP	Lake Victoria Environmental Management Project
LVFO	Lake Victoria Fisheries Organisation
NaFIRRI	National Fisheries Resources Research Organisation
SACCO	Savings and Credit Co-operative Organisation
SOP	Standard Operating Procedures
UBOS	Uganda Bureau of Statistics
UNBS	Uganda National Bureau f Standards
UNDP	United Nations Development Programme
URA	Uganda Revenue Authority
USD	United States Dollar

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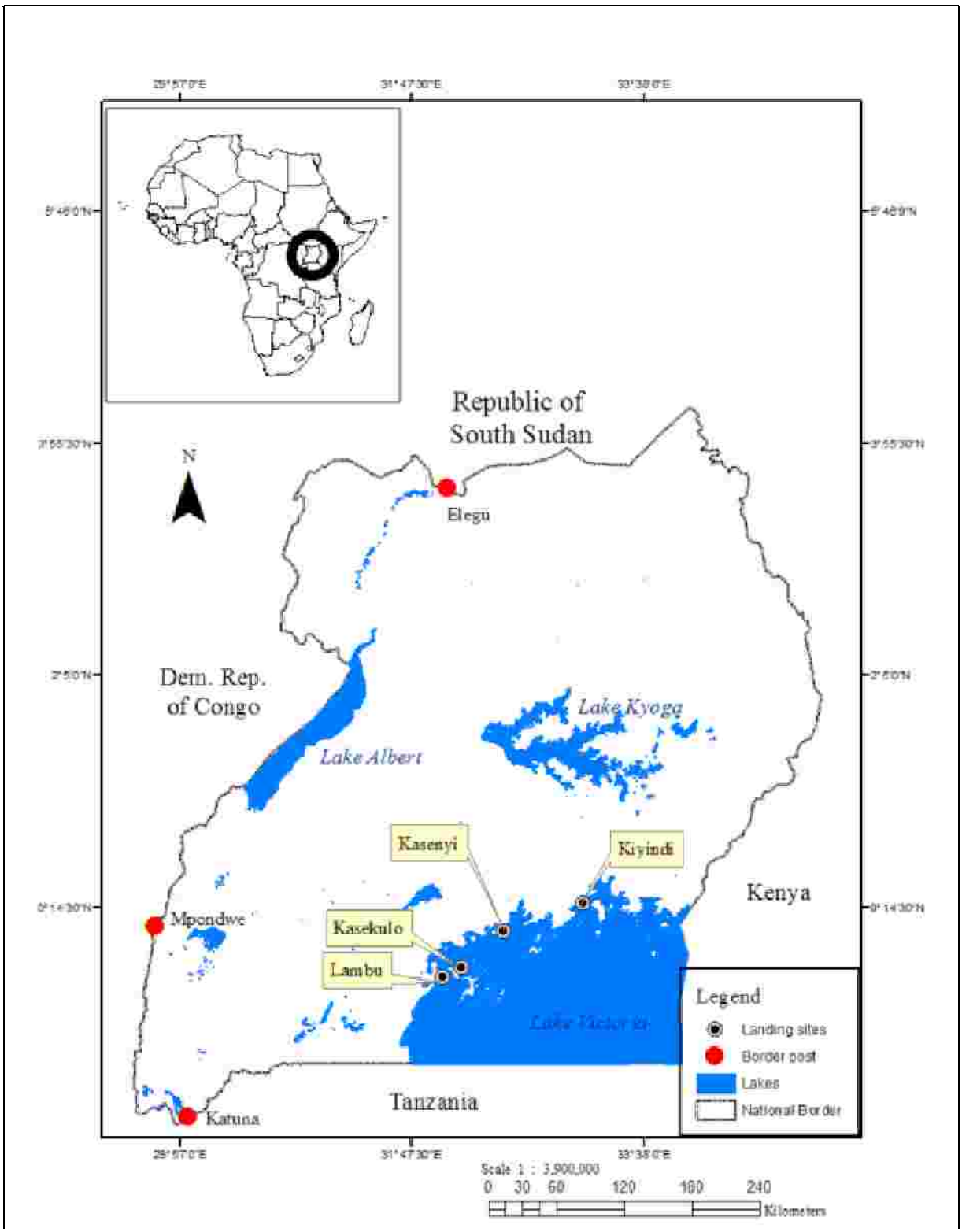

Figure 1: Location map of Uganda showing selected border posts and landing sites where the study was conducted

Executive summary

Introduction

In the recent times, dagaa production has surpassed that of the other commercial species of Lake Victoria, namely Nile perch and Tilapia, estimated at 509,598 tonnes and contributing 55% of the total annual fish production in 2014. However, its value was US$ 135 million, contributing only 16% to total value. The contribution of dagaa to Uganda was to the nutritional status of especially the children, for food security and incomes for fishers, processors and traders, profits for related businesses and foreign exchange earnings for the country. Trade was necessary in stimulating improved quality, facilitating accessibility and affordability to consumers and market access to operators. However, the main challenge in the dagaa sub-sector has been the low utilization of the resource for human consumption, estimated at only 20%, while the bulk of it went into animal feeds.

Objective

The overall objective was to generate data and information for developing mechanisms for improved utilization and trade networks for dagaa for enhanced food security and incomes. The study assessed trade volumes and values, facilities, economic returns, issues of post-harvest and trade challenges. Activities of industrial feed processors and supermarkets and the roles of relevant institutions for policies, standards and information collection were examined.

Results and discussion

At the macro-level, dagaa production for Uganda rose from 58,717 tonnes in 2010 to 165,907 in 2014 while the value rose from UShs 16,147 million to 92,706 during the same period. This was attributed to increases in dagaa stocks, attracting increases in boats, gear and fishers.

Dagaa export by volume rose from 545 tonnes in 2010 to 12,779 in 2015 while its va rose from US$ 598,000 to 2,106,000 during the same period. The main export destination countries, given by the average annual export between to 2015 in tonnes were DRC (15,015), Kenya (4,374) and South Sudan (4,069) and Rwanda (1,325).

Post harvest losses amounted to US$ 0.3 to 1.5 million annually, due to rotting, washing away by rain, contamination with sand or dust, predators and crumpling of product during packaging and transportation.

While most fishers shifted from other commercial species to dagaa but its production was constrained by unfavourable weather which affected fishing as well as drying of dagaa. Scarcity of dagaa often occurred, due to seasonal nature of the resource, causing fluctuations in supply and earnings for fishers. Unstable dagaa prices were also attributed to demand. Rampant theft of gear, engines and fish occurred among fishers. Fishers sold their catch fresh (42.9%), processed (50.0%) or both (7.1%), mostly at the beach. Their buyers were processors/ traders (42.9%) or traders not involved in processing (57.1%).

Processing of dagaa was carried out by processors/ traders (63.3%), fishers/ processors (30.0%) and processors only (6.7%). The majority dried dagaa on bare ground or sand (31.3%), or on raised racks (25.0%). Others dried on nets, salted before drying and in limited cases fried their dagaa. Raised drying racks or spreading on nets were improved drying methods for better quality but their adoption was yet to be fully embraced. Other measures included processing value added products, such as deep-fried dagaa ready for eating and dagaa powder. Processors purchased dagaa at an average price of UShs/ kg 1,050 and 600 during low and high catch seasons respectively and their selling prices were UShs/ kg 5,000 and 3,000 during the same seasons. Their main operational expenses in UShs/ month were raw dagaa (400,000) and labour (105,000). Others also used salt (451,500), frying oil

(931,000), firewood, storage and transport. Processing of dagaa was constrained by rain that washed away spread dagaa, bad weather that hindered proper drying of dagaa, resulting in spoilage or rotting of the product, unsuitable for human consumption. Other problems were fluctuating supplies and prices, predators such as birds, animals and chicken and theft of dagaa. Dagaa affected by post-harvest losses was sold mostly to poultry, piggery and fish farmers (66.7%) or to industrial feed manufacturers (33.3%). The requirements processors complied with were obtaining health/ hygiene certificate (26.5%), holding a trading licence (20.6%) and/ or fishing licence (20.6%).

Trading was carried out by different categories of operators, some of whom were also involved in fishing and processing. There were domestic market traders (87.8%) and exporters to the regional market, notably Rwanda, Kenya, DRC and South Sudan (12.3%). Majority of traders sold to industrial feed millers (34.7%). Average dagaa buying prices of traders were UShs/ kg 3,600 and 2,250 during low and high catch seasons respectively while the selling prices were UShs/ kg 4,400 and 2,800 for similar seasons. Monthly operational expenses in UShs were purchase of sun-dried dagaa (4,000,000), labour (236,000), transport (500,000) and storage (50,000). Traders were required to comply with essential food safety standards and fish trade regulations. However, the majority complied with only me of them. Supply and price fluctuations on the market were the main challenges in dagaa trading. Others included poor product quality and high taxes on consignments.

Industrial feed millers were also operators in the dagaa value chains. Although their number was small, they handled the bulk of dagaa produced. Their products included poultry feeds, animal feeds, fish feeds, pharmaceuticals and food sup which were for both the domestic and regional markets. Their main challenges were the poor quality of the dagaa received, taxation and cross-border restrictions on their trade.

Most supermarkets in the country stocked dagaa. The products were sun-dried, powder and deep fried, packed in units of different weights, supplied a few specific companies that could meet the food safety standards. However, given the high prices for the dagaa, supermarkets would only handle limited quantities of the product. They also had no guarantee that the packed products they received met the standards required.

Institutions to support dagaa trade in the country were the BMUs, Local Governments, DiFR, NaFIRRI, UNBS, URA, UBOS and trade associations, among others. Their functions included policies, management of dagaa stocks, sensitisation and training, inspection and issuing of certificates, data collection, implementation of intervention projects, colleting customs duties and enforcing standards on the products.

However, the data collection function was inadequately performed due to the informal nature of dagaa trade, lack of harmonisation of data collection tools, inadequate manpower and facilities and lack of feedback to data collectors from higher authorities.

Conclusions and recommendations

The main players along the dagaa value chains were identified, ir activities assessed and challenges identified. In order to respond to the challenges and promote huma consumption and value of dagaa through trade, recommendations have been made, addressing the informal business organisation among operators, improved management of dagaa resources, adoption of early landing and selling to minimise holding time before disposal to reduce post-harvest losses, promoting hygienic handling of dagaa for human consumption and adoption of improved processing, using raised drying racks and solar dryers for proper drying and avoiding contamination.

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CHAPTER ONE

INTRODUCTION

1.1. Background

Lake Victoria is a trans-boundary water body shared between three of the East African Community (EAC) Partner States, namely Kenya (6%), Uganda (46%) and Tanzania (49%). The Lake Victoria Fisheries Organisation (LVFO) is an institution of the East African Community (EAC) which came into being through a Convention signed in 1994 by the three EAC Partner States of Kenya, Uganda and Tanzania and has since been revised to accommodate all the Partner States of the EAC. Its mandate is to promote sustainable management and development of fisheries and aquaculture in the EAC for food security and wealth creation.

Dagaa (*Rastrineobola argentea*) is one of the three leading commercial species of Lake Victoria, together with the Nile perch (*Lates niloticus*) and Nile tilapia (*Oreochromis niloticus*). The stock of dagaa, given by its biomass, has increased in the last ten years making it become an important fishery in the lake. Lake-wide acoustic surveys conducted to monitor the amount of fish in the lake show an increase from a contribution of 20% (253,054 tonnes) in August 1999 to 42% (911,000 tonnes) in August 2011 and to 44% (1,289,757 tonnes) in August 2014. The harvested dagaa from Lake Victoria has significantly increased and contributed 55% (509,598 tonnes) of the total annual fish production in 2014. However, this large volume is yet to contribute significantly to wealth creation if compared with Nile perch. The Nile perch which contributed 27% to total annual production in 2014 contributed 65% to the total value while dagaa which contributed 55% in volume contributed only (USD 135 million) to total value.

Dagaa is dried using heat from the sun and mostly spread on the ground, nets and grass. During the rainy season when there is less sunshine, post-harvest losses can be as high as 40%. In small scale fisheries, quality losses account for more than 70% of total losses (FAO, 2014). The losses can be reduced through improved handling, processing and packaging and value can be enhanced with improved support to dagaa trade.

1.2. Importance of dagaa

Dagaa is an important Lake Victoria fishery resource for its potential in generating a number of benefits for the riparian communities notably in the areas of nutritional values, food security, incomes and foreign exchange earnings for the region (Figure 2).

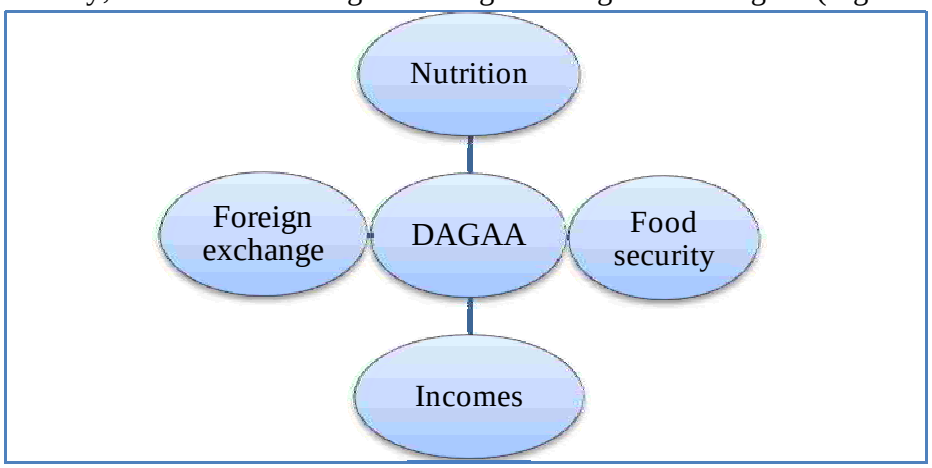


Figure 2: Types of benefits realised from dagaa

Dagaa has high crude protein content (47.9-58.8%) and is rich in iron (8.18-10.91mg/100g), zinc (4.07-10.25mg/100g) and calcium (1556.4-1866.5 mg/100g). Despite the high nutritive value, only up to 30% of the harvested dagaa is used for human consumption leaving the bulk (70%) for production of animal feeds. In 2013 as published by Society International Development, 42% of the 24 million under the age of 5 of the children in EAC were reported to be stunted due to malnutrition. The 509,59 tonnes of dagaa harvested from Lake Victoria can contribute significantly to nutrition food security if fed to the children in EAC. This however requires deliberated effort to sensitize public and the mothers as the majority of the people have a negative attitude towards dagaa and consider it to be food for the low income earners. Fortification can also be done to provide a variety of food stuffs to choose from.

1.3. Role of trade in dagaa economy

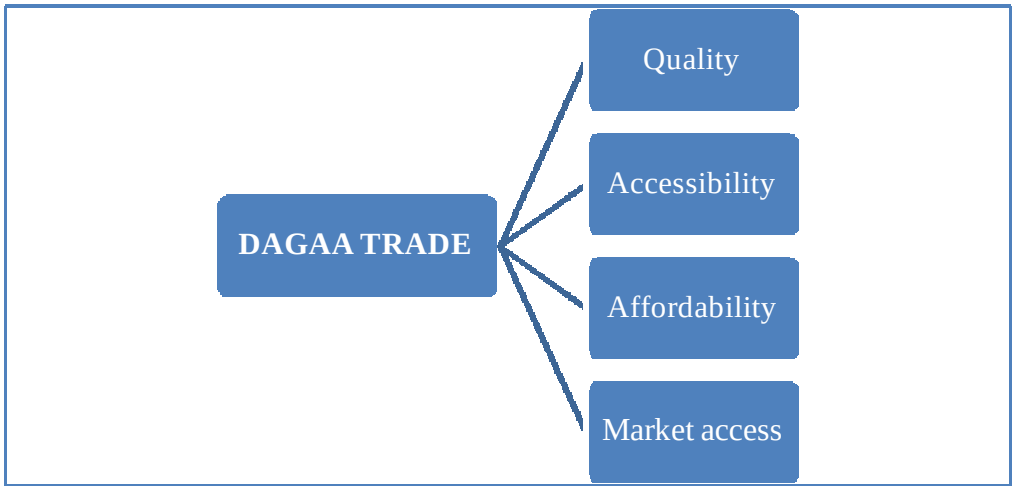


Figure 3: Market attributes triggered by improved dagaa trade

Development of trade in dagaa would stimulate improvements in quality of the c modity by fishers, processors and traders (Figure 3). It would also make the products more accessible to consumers. Efficiency in the trade would lower costs and make it more affordable while at the same time improve market access to the traders.

In order to address issues of quality and value addition for wealth creation and of acceptability to consumers for food security and nutritional health; it is important first to understand the trade and what challenges exist at local and intra-regional trade. Despite the large quantities of dagaa being harvested from Lake Victoria, and widely traded in the EAC region and across borders, little is documented and, therefore, its true value and its contribution to the region's food security and economy is not appreciated.

This is, therefore, a report of a rapid study carried out by Uganda together with the other Partner States of Kenya and Tanzania to improve the data and information base for developing networks for improved dagaa processing, utilisation and trade in the region.

1.4. Objective

The overall objective was to develop mechanisms for improved utilization and trade in dagaa through provision of information and trade networks for enhanced food security and income

The specific objectives were as follows:

i) Assess availability of information on dagaa production, utilization, industrial production, exports and existing data capture systems within the institutions.

ii) Determine the volumes of dagaa processed and stored, examine the current processing technologies and their adoption rates, facilities and challenges, with specia reference to the participation of women.

iii) Assess utilization of dagaa for human consumption and uses with a view to improving quality and value addition.

iv) Examine the trade practices including traded volumes, markets, facilities, exit points and destinations and effectiveness of the mechanisms to enhance livelihoods.

v) Assess the policies, regulations, standards, and institutions at the national and regional levels with a view to improving trade in dagaa, in collaboration with the African ARSO.

vi) Present the results at a forum for sharing information and developing networks for improved dagaa processing, value addition, utilization and trade in the region.

1.5. Expected outputs

i) Available information on dagaa production, utilisation, industrial production, exports and existing data capture systems within the relevant institutions assessed.

ii) Information on processing technology, volumes of dagaa processed and stored, technological adoption rates, facilities, and challenges, with special reference to the women group needs in up-scaling the dagaa products and accessing better markets Availed.

iii) Information on proportions of dagaa which go for human sumption and other uses like feeds and industrial food and non-food products generated.

iv) Trade practices, traded volumes, routes, markets, faci ies, exit points and destinations for dagaa identified and effectiveness of the mechanisms to deliver dagaa to enhance livelihood.

v) Policies, regulations, standards and institutions which supports trade in dagaa identified and assessed.

vi) Findings of the study compiled, presented for stakeholder feedback and a report prepared for sharing and discussion.

CHAPTER TWO

METHODOLOGIES

2.1. Data sources and methods

Data under the study was collected from a number of sources using different methods as summarized below;

i) Secondary data search was conducted on print and electronic sources from LVFO, Directorate of Fisheries Resources (DiFR), National Fisheries Resources Research Institute (NaFIRRI), Uganda Revenue Authority (URA), Uganda Trade Promotion Board, Uganda Investment Authority (UIA Uganda Bureau of Statistics (UBOS) , as well as the Food and Agriculture Organisation (FAO) to obtain macro-economic data on dagaa sub-sector in the region.

ii) Key Informant Interviews were conducted with beach leaders at four selected landing sites, namely Kiyindi, Kasenyi, Kasekulo and Lambu to obtain beach level information and data on production, processing, storage and trading in dagaa as well as the processing methods, types of buyers and trade destinations for dagaa products. Types and effects of post harvest losses, needs of women groups and main challenges to dagaa businesses were also captured.

iii) Sample surveys were carried out at the selected landing sites to collect data on fish production, processing and trading, including indutria feed producton and marketing through supermarkets, using a semi-structured questionnaire, covering 85 respondents (Figure 4). The questionnarie also, enlisted information on magnitudes and returns from dagaa businesses, post harvest management, compliance with trade requirements and challenges in dagaa businesses.

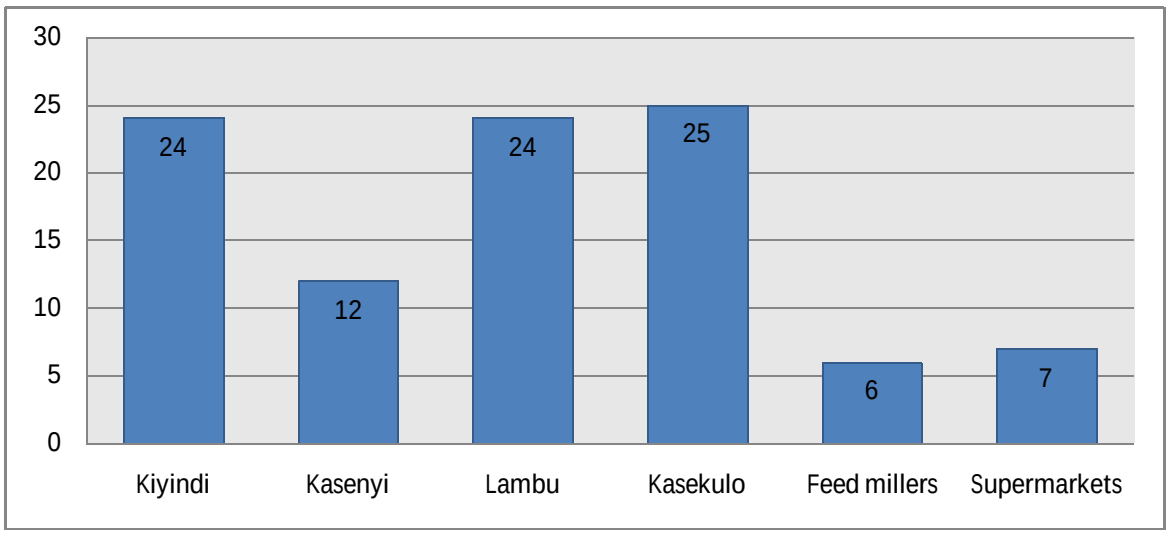


Figure 4: Interviews at sampled landing sites, feed processors and supermarkets

iv) Interviews and review of records were conducted at 3 Customs Border Posts and markets, namely Katuna, Mpondwe and Elegu on the borders with Rwanda, Democratic Republic of Congo (DRC) and South Sudan respectively. The interviews were held with Fisheries and Customs Officers to obtain information on export trade practices and magnitudes and countries of destinations.

v) Consultations were conducted at DiFR, URA and UBOS Headquarters to obtain information on policy, regulation and standard requirements for dagaa trade, data recording mechanisms and dagaa statistics recorded by the institutions.

vi) Field data collection was carried out at 6 selected industrial feed millers and 6 supermarkets to obtain information on the dagaa products dealt in, issues of post harvest losses, economics of operations and challenges met in dealing in dagaa.

2.2. Data collection

The data collection tools used included a secondary data review checklist, beach and market Key Informant Interview schedules, and a detailed household questionnaire. The data collected covered the following parameters:

i) National production of dagaa

ii) Export trade

iii) Beach level production, processing, storage and trade

iv) Processing methods and technological improvements

v) Economic returns to dagaa fishing, processing and trade

vi) Industrial feed manufacturers utilizing dagaa

vii) Dagaa for supermarket channels

viii) Types of buyers and trade destinations

ix) Types and effects of post harvest losses

x) Needs of women groups in up-scaling dagaa processing and marketing

xi) Main challenges to dagaa businesses

xii) Institutions relevant to dagaa trade

xiii) Existing data capture systems by institutions

xiv) Policies, regulations and standards for dagaa trade

2.3. Data analysis

The data was processed and analysed as follows:

i) It was entered using SPSS and Excel was also used for the analysis.

ii) Error tracking procedures were used for the data cleaning.

iii) Qualitative data was summarised using frequencies and cross-tabulations and presented as percentages or charts.

iv) Quantitative data was analysed using means and medians, depending on the data spread and possible outliers shown by the minimum and maximum values.

2.4. Report writing

i) The national team produced a draft report of the findings for discussion and feedback. A presentation was extracted and made at the stakeholder consultation workshop for their feedback.

ii) Based on the feedback, the final country report was produced on the research.

iii) The report would then be compiled with the others from the Partner States into a regional synthesis report by the technical co-ordinator and Chairman of the Socio-economics Regional Working Group.

2.5. Quality Assurance and Quality Control

To ensure quality of results, the study was formulated and carried out in accordance the LVFO Standard Operating Procedures (SOPs) for Socio-economics (LVFO, 2005). There was harmonisation in developing the proposal, data collection, analysis and preparation of the country reports for Uganda, Kenya and Tanzania, co-ordinated by the Chairman of the Regional Working Group for Socio-economics. Draft findings were presented to a forum of stakeholders for their input prior to finalisation of national reports and thereafter, the regional synthesis report.

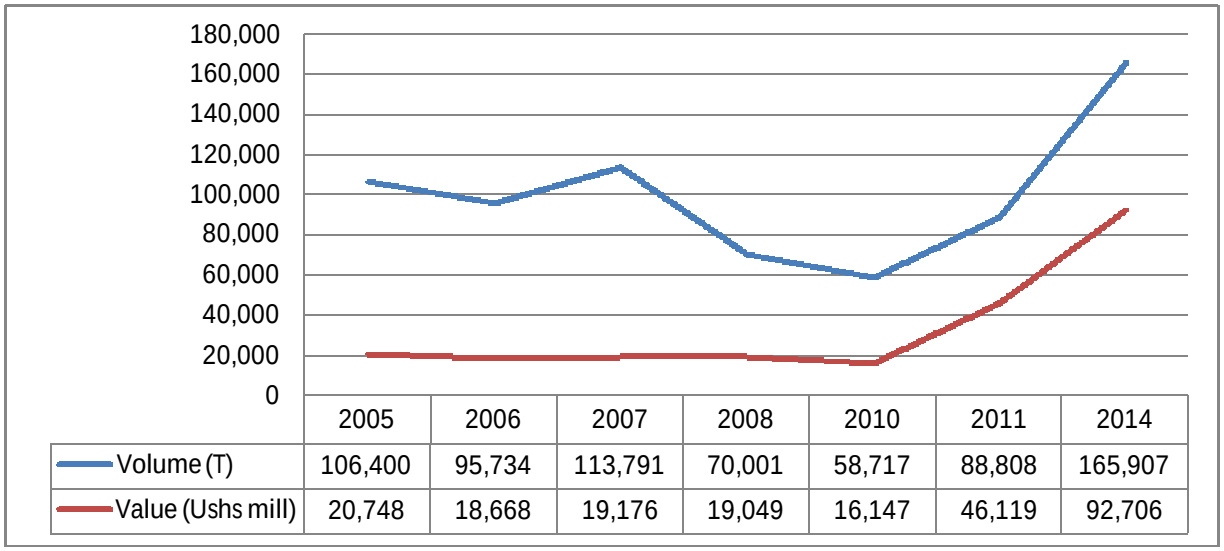
CHAPTER THREE

RESULTS AND DISCUSSION

3.1. Overview of the dagaa sub-sector

3.1.1. Production of dagaa

Dagaa production on Lake Victoria, Uganda showed a steady decline in volume from 106,400 tonnes in 2005 to 58,717 tonnes in 2010 and thereafter, rose to 88,808 in 2011 and continued to rise significantly to 2014 (Figure 5). The rise was attributed to increases in the stocks of dagaa, which attracted more effort in terms of boats, fishers and gear into the fishery. The value of production declined rather slightly from UShs 20,748 million in 2005 to 16,147 in 2010 and began to rise to 92,706 UShs million in 2014.



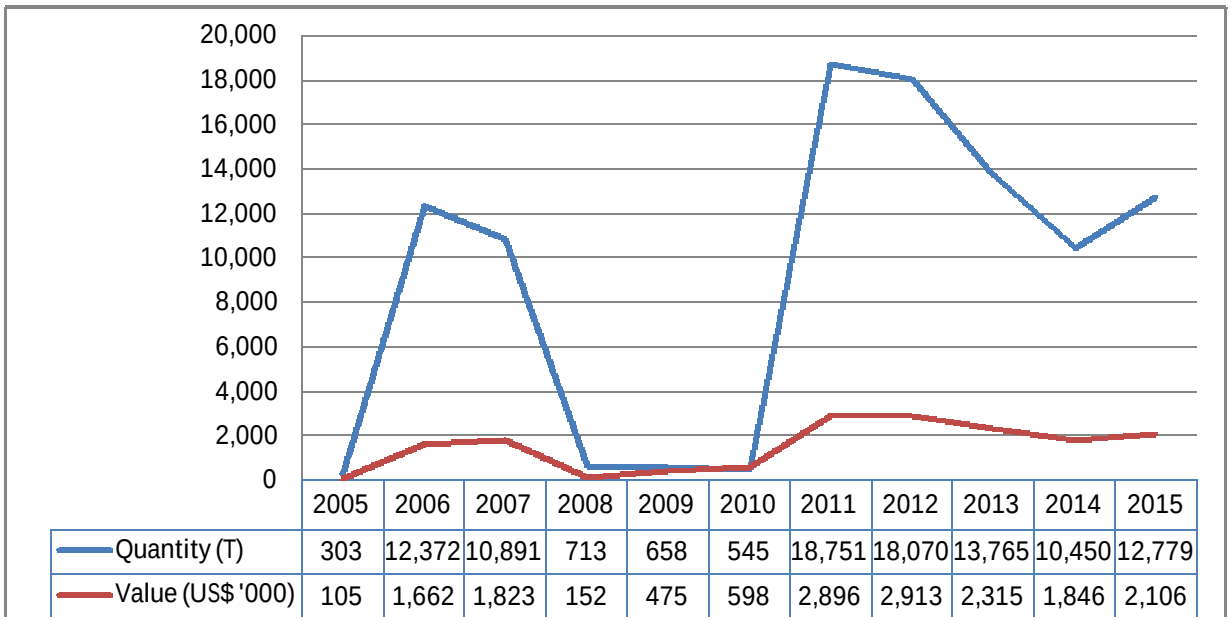
	2005	2006	2007	2008	2010	2011	2014
Volume (T)	106,400	95,734	113,791	70,001	58,717	88,808	165,907
Value (Ushs mill)	20,748	18,668	19,176	19,049	16,147	46,119	92,706

Figure 5: Annual production of dagaa by volume and value for the period 2005 to 2014

Source: DiFR, 2015

3.1.2. Dagaa export from Uganda

Dagaa export by volume rose from 303 tonnes in 2005 to 12,372 in 2006 and fell to 545 tonnes in 2010 and thereafter, rose to 18,751 in 2011 and continued to fluctuate until 2015 (Figure 6) (UBOS 2016). The changes were attributed to fluctuations in market demand and to increases in the stocks of dagaa, resulting in increased production. The value of export fluctuated less from US$ 103,000 in 2005 to 598,000 in 2010 and began to rise to US$2,160,000 in 2015.

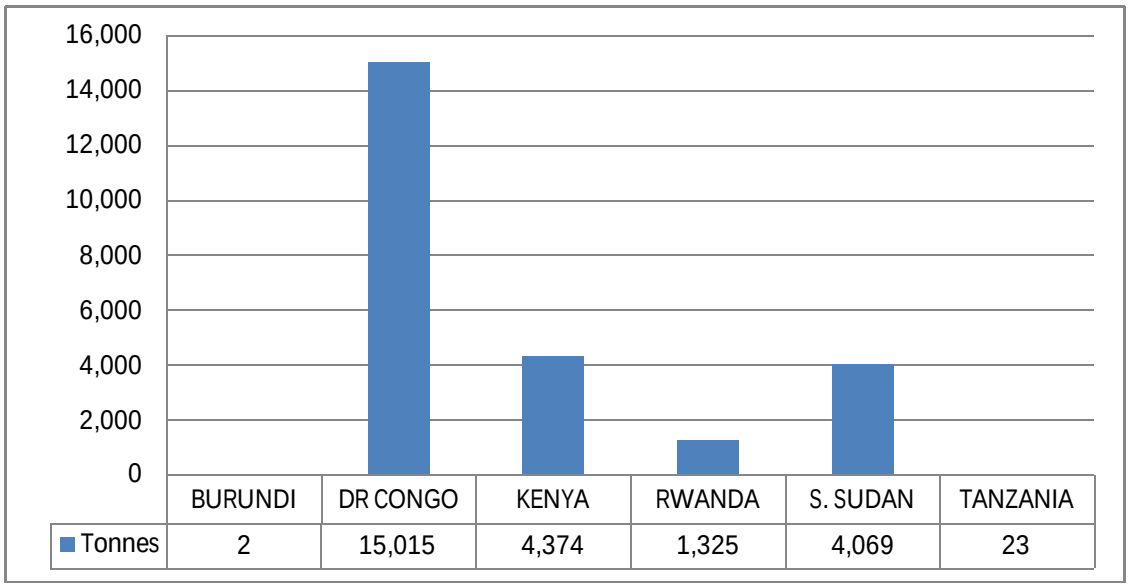


	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Quantity (T)	303	12,372	10,891	713	658	545	18,751	18,070	13,765	10,450	12,779
Value (US$ '000)	105	1,662	1,823	152	475	598	2,896	2,913	2,315	1,846	2,106

Figure 6: Annual export of dagaa by volume and value for the period 2005 to 2015

Source: UBOS dataset, 2016

The main export destination countries, given by the average annual export between 2010 to 2015 in tonnes were DRC (15,015), Kenya (4,374) and South Sudan (4,069 (Figure 7). Others included Rwanda, Tanzania and Burundi.



	BURUNDI	DR CONGO	KENYA	RWANDA	S. SUDAN	TANZANIA
Tonnes	2	15,015	4,374	1,325	4,069	23

Figure 7: Average annual export by country of destination, 2010-15 (T)

Source: UBOS dataset, 2016

3.1.3. Utilisation of dagaa

It was estimated that only 20% of Uganda's dagaa was processed for human consumption (Figure 8) (FAO, 2010). Part of this was consumed domestically while part was exported to neighbouring countries. The remaining 80% of catch was processed for feeds for poultry,

livestock, fish and other uses. These feeds were produced for both the domestic and export markets.

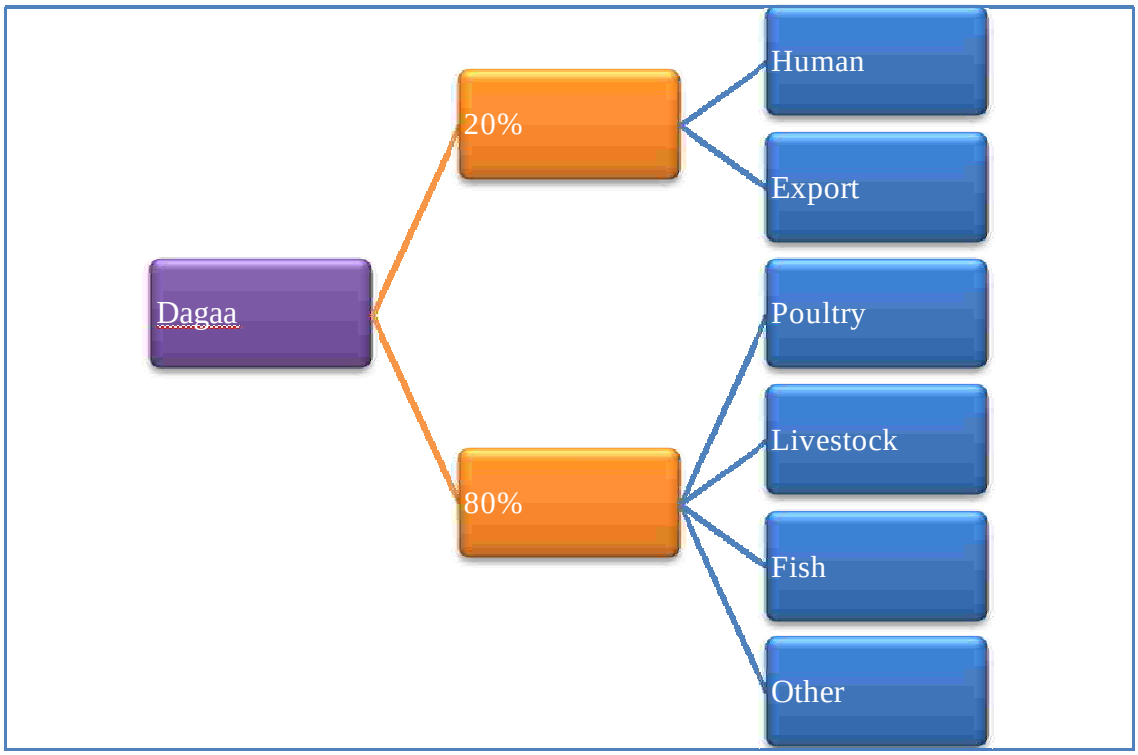


Figure 8: Proportions of dagaa processed for human consumption and other purposes.

Source, FAO 2010

3.1.4. Post-harvest losses

Post-harvest losses were categorised between those that resulted in physical losses and those that resulted in quality losses. Physical loss occurred when the product was removed from the users and examples included washing away of the dagaa by rain back into the lake, eating by birds, chicken and animals, theft and throwing away due to excessive spoilage. Quality loss occurred when the product lost quality but was still a ilable for some form of use, resulting in reduced value. This included rotting and contamination with sand or dust. Physical loss was estimated at 26-40% of production, equivalent to 3,400 – 11,000 tonnes per year while quality loss was about 2-5%, equivalent to 340 – 850 tonnes. (Table 1).

Table 1: Estimated dagaa annual post-harvest losses

Types of loss	**Percentage of catch**	**Quantity** (T/year)	**Macro impact:** (US$, mill.)
Physical loss	26–40%	3,400–11,000	0.3 to1.5
Quality loss	2–5%	340–850	

FAO 2010

3.2. Social characteristics of dagaa operators

Gender distribution of operators in the dagaa trade showed more men but the participation of women was also high (43%) (Figure 9). This indicates that women also shared in the benefits and there was equitable distribution of opportunity and income from dagaa trade.

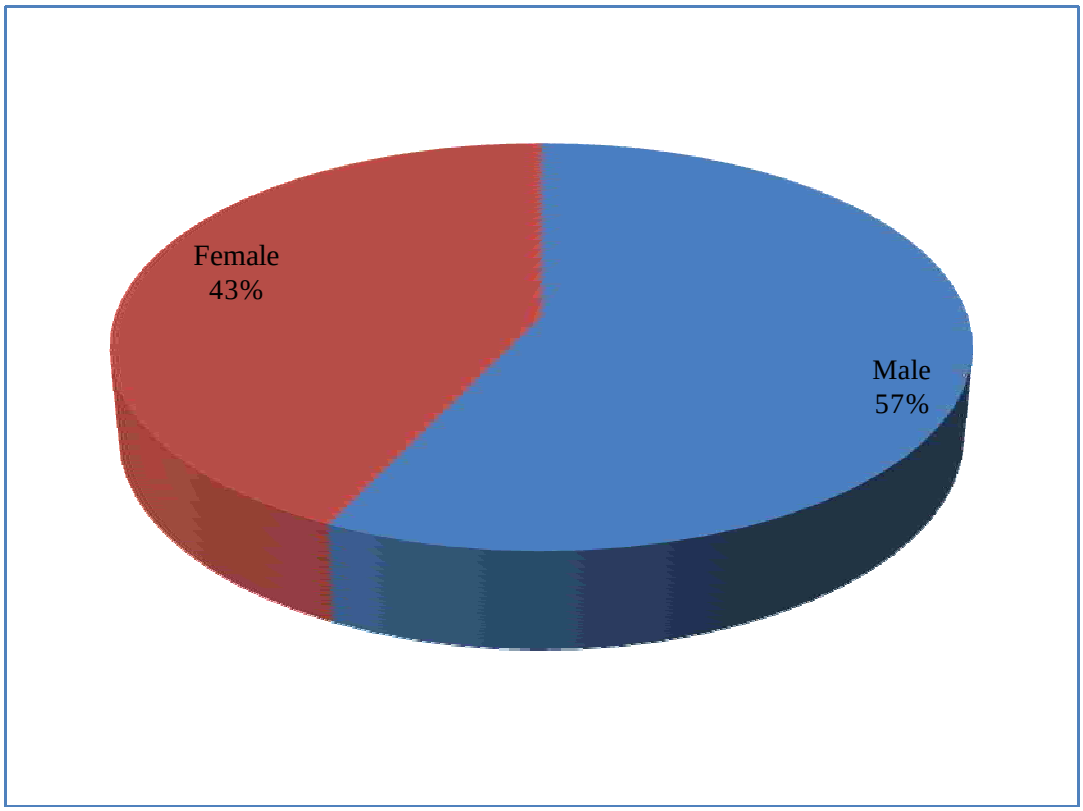


Figure 9: Gender distribution of sampled operators in dagaa trade along the value chain.

Educational achievements showed that majority of the operators were of incomplete primary education (38.5%), followed by those who completed Primary education (18.7%) (Table 2). There were also persons who had no education at all (6 . The little education was typical among fishing communities and was attributed to lack of motivation in parents, most of them uneducated themselves, to send children to school as fishing was perceived not to require education, lack of sensitisation on the importance of limited and low quality educational facilities and lack of money to pay for scholastic requirements. The danger with limited education was that the operators would not acquire essential knowledge like business, quality assurance or value addition skills. However, a few highly educated individuals were also reported in the sample, which was a positive step for development of the trade.

Majority of the operators belonged to groups (62.5%). The benefits of operators joining into groups were that they could purchase inputs collectively, be provided with training and sensitisation more easily as groups than as individuals, could engage in collective marketing and save and borrow from each other under a co-operative framework. Most respondents belonged to the dagaa traders' groups, followed by processors' groups. There were, however, also fishers' women's and Savings and Credit Co-operative Organisation (SACCO) groups, among others. A case study of Kiyindi Mukene Multipurpose Co-operative Society Ltd. revealed that their main objectives were to sensitise on hygiene and record keeping.

In Kiyindi Women Fish Processors Association, members pooled resources to produce value added dagaa products, namely deep fried and powdered dagaa, which fetched higher prices.

Table 2: Educational levels, membership and types of groups among dagaa operators

Variable	Parameters	%age
Educational levels	Incomplet Primary	38.5%
	Complete Primary	18.7%
	Incomplete Secondary "O" Level	6.6%
	Complete Secondery "O" Level	11.0%
	Incomplete secondary "A" Level	2.2%
	Complete secondary "A" Level	5.5%
	Tertiary	3.3%
	Universty	7.7%
	No Education	6.6%
Members of groups	Yes	62.5%
	No	37.5%
Types of group	Fishers'group	14.8%
	Dagaa processors' group	20.4%
	Womens' group	18.5%
	SACCO	14.8%
	Trader group	29.6%
	Others	1.9%

3.3. Production of dagaa

3.3.1. Fishers of dagaa



Plate 1: Fishers of dagaa

A large number of boats fished dagaa at the selected landing sites, ranging from 120 in Lambu to 300 in Kiyindi, most of them motorised. Daily catch ranged between 10 to 50 tonnes in low and high catch seasons. However, the catch was threatened with post-harvest losses arising from contamination with sand and dust, rotting or spoi e, rain that swept dagaa back to the lake and predators, among others.

Data on the operations of individual dagaa fishers revealed that there was little difference between the number of days fished in a month during low and high catch periods, indicating that dagaa was fished continuously. However significant differences existed between the average catch per fishing trip during low and high seasons. Although average gross revenues were low during low catch seasons, they were much higher, making fishing more attractive during high catch seasons (Table 3).

Table 3: Average number of fishing trips, catches, prices and revenues of dagaa fishers during low and high catch seasons

	Low season	High season
Number of fishing trips carried out in a month	16	18
Average fresh dagaa landed on a fishing trip (kg)	100	500
Current prices of fresh dagaa (UShs/kg)	1000	500
Average gross revenues per month (UShs)	1,600,000	4,500,000

Fishers were divided on what forms they sold their dagaa, with the slight majority (50.0%) drying it before selling (Table 4). However, there were also those who sold it both fresh and dry. The need for fishers to dry dagaa before selling driven by the low prices received for it fresh, making it impossible to break even or make profits.

Table 4: Forms, locations and to whom fishers sold dagaa

Forms of dagaa sold by fishers	Fresh	42.9%
	Dried	50.0%
	Both	7.1%
Where catch was sold	At beach	90.9%
	Away from beach but within the country	9.1%
To whom catch was sold	Processor/Traders	42.9%
	Traders not processing	57.1%

3.3.2. Fishers' post-harvest losses

At the production level, the main type of post harvest losses was rotting/ spoilage, reported by 85.7% of respondents. However, 14.3% did not report suffering post-harvest loss in dagaa fishing. The loss was experienced mostly during high catch seasons (91.7%) while only 8.3% experienced it during low catch seasons. This was attr to the large quantities of dagaa, relative to available space and drying facilities for fishers to handle during high catch seasons.

The average amounts of fish lost the last time fishers experienced post-harvest losses ranged from 50.0 kg at Lambu, to 255.0 kg at Kiyindi and 160.0 kg at Kasekulo. The average prices of catch affected by spoilage (UShs/kg) were 594 and 396 during low and high catch seasons. As part of their coping mechanisms, measures fishers took to preserve fresh dagaa quality were early landing (46.2%), salting (15.4%) and proper catch handling (7.7%). Respondents whod di not adopt any quality control measures were (30.8%).

3.3.3. Challenges in fishing dagaa

The main challenges experienced in fishing dagaa were theft of fishing equipment (50.0%) and low catches (12.5%) (Figure 10). Theft of fishing equipment was due to their supply difficulties and high costs. Low catches were attributed to amount of light associated to lunar cycles, environmental factors and overfishing.

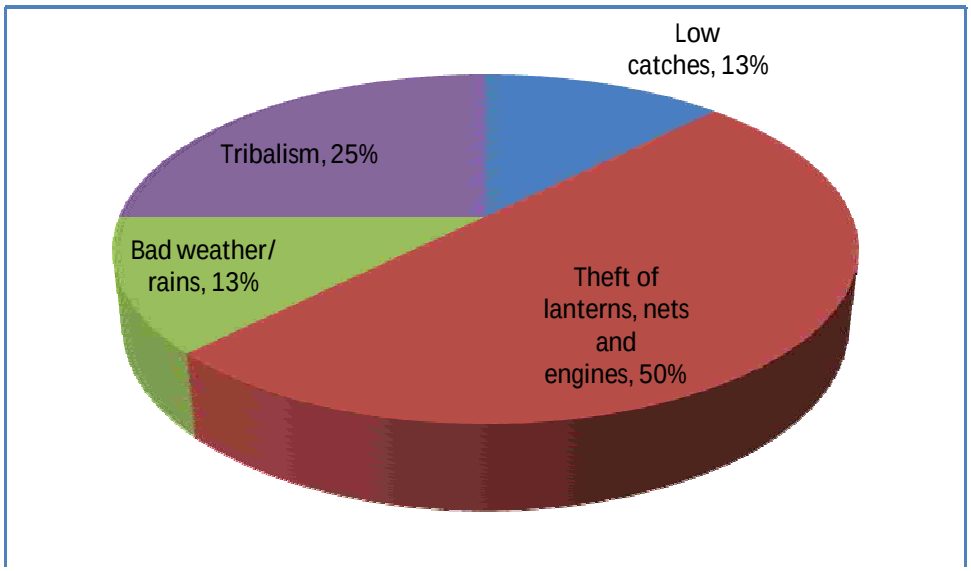


Figure 10: The main challenges in fishing dagaa

Fishers' coping mechanisms towards these challenges included identifying market with better price (16.7%), reducing nets and lanterns on the lake and shifting fishing lights from lanterns to solar. Other suggestions included use of legal mukene fishing gears, reducing taxes on fishing equipments, providing security on the lake and avoiding issues of tribalism in dagaa fishing.

3.4. Processing of dagaa

3.4.1. Methods of processing



Plate 2: Processors of dagaa

Processing of dagaa was carried out by mostly processors/ traders (63.3%) followed by fishers/ processors (30.0%) and then processors only (6.7%). Majority of respondents processed dagaa by drying on bare ground or sand (31.3%), followed by those who dried it on raised racks (25.0%) (Table 5). Others dried on nets, salted before drying and in limited cases fried their dagaa.

Table 5: Methods used most in dagaa processing by landing site

	Kiyindi	Kasenyi	Lambu	Kasekulo	All
Salting before drying	70.0%				21.9%
Drying on nets	20.0%	50.0%	33.3%		21.9%
Drying on raised racks	10.0%		58.3%		25.0%
Drying on bare ground		50.0%	8.3%	100.0%	31.3%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

On average, dagaa processors took 1 day to do one round of processing, accomplishing 3 rounds in a week during low catch season (Table 6). During high catch season, however, processors took 3 days to complete a round of processing and there were rounds in a week. This was because during low catch season, there was little dagaa to process (100 kg), compared to the average for high catch season (350 kg). Buying and selling prices were higher during low than high catch seasons. During high catch season, processors purchased wet dagaa for processing at an average price 42.0% lower than the average price during low catch season. Similarly, they sold processed dagaa at 40% lower that during low catch periods.

Table 6: Operations of dagaa processors

	Low catch season	High catch season
No. of days taken to do one round of processing	1	3
No. of processing rounds carried out in a week	3	7
Quantity of wet dagaa processed in one round in (kg)	100	350
Buying price of wet dagaa for processing (Shs/kg)	1,050	600
Selling price of processed dagaa (Shs/kg)	5,000	3,000

3.4.2. Equipment used in processing

Equipment used by dagaa processors were identified as raised racks, frying pans and basins (Table 7). Due to the limited availability of raised racks, much of dagaa was dried on the ground and a little on nets, which exposed it to sand and dust contamination, pests and predators. The quality was, therefore, unsuitable for human con mption and processors would try to find market for it among producers of feeds or poultry, livestock and fish farmers. There was also little capacity for frying, which explained the low quantities of fried dagaa on the market.

Funding for raised racks were initially by Government (57.1%), through the Lake Victoria Environmental Management Programme (LVEMP), United Nations Development Programme (UNDP) and Local Government development budget but own savings have also been reported (42.9%), especially at Kiyindi Landing Site. Frying pans and basins have been exclusively acquired through processors' own savings.

Time of acquisition of the assets varied, with raised reported to have been obtained in 1999 (50.0%), 2012 (16.7%) and in 2016 (33.3%). Frying pans were obtained in 2012 (50.0%) and in 2016 (50.0%). Basins were not long lasting equipment and those in use had been acquired in 2015 (22.2%) and in 2016 (77.8%).

Table 7: Average quantities, lifetime and unit cost of equipment used in dagaa processing

	Quantity	Expected lifetime (Years)	Unit cost (UShs)
Raised racks	1.5	3.3	150,000
Frying pans	1.0	1.0	15,000
Basin	2.0	0.3	9,000

3.4.3. Operational expenses in processing

The basic operations of dagaa processors were to purchase and sun-dry the dagaa, with raw dagaa being the higher cost item (Table 8). In order to maintain quality or add value, salting or deep frying had been introduced. However, these processes have brought on board additional requirements, namely salt and cooking oil which were significantly costly, thus explaining why their adoption had been slow. Transport was another major cost item and others included firewood and storage costs.

Table 8: Summary operational expenses in dagaa processing

	Quantity purchased	Cost for last processing (UShs)	Cost per month (UShs)
Raw dagaa (kg)	150	40,000	400,000
Labour (No.)	2	7,000	105,000
Salt (kg)	2.5	21,000	451,500
Cooking oil (L.)	12	76,000	931,000
Firewood		5,500	35,500
Storage		2,000	50,000
Transport		73,000	237,500

Most processors sold their dagaa at the beach (86.7%) and only a few delivered it to buyers away from the beach but within Uganda (6.7%) or took it out of the country (6.7%). Buyers of dagaa from processors were mainly traders who sold within Uganda (80.0%) but there were some who took it out of the country (20.0%).

3.4.4. Post-harvest losses in dagaa processing



Plate 3: Sources of post-harvest losses in processing

The major types of post-harvest losses that affected dagaa procesors were rotting or spoilage (79.3%), followed by dagaa that was swept back to the lake by rain (10.3%) and loss of colour (3.4%). However, some 6.9% of the processors did not experience the problem of post-harvest losss, mainly becaue they had developed coping mechanisms to deal with it. To get indication of the magnitude of the losses, respondents were asked to estimate the amount of losses experienced. The results revealed that the losses were highest at Kasenyi (700 kg), where storage facilities were poor and lowest at Kiyindi, where considerable sensitisation had been given, improved drying using raised racks was adopted and good stores constructed (Table 9).

Table 9: Magnitude of post-harvest losses of dagaa processors

Landing sites	Kiyindi	Kasenyi	Lambu	Kasekulo	All
Amount of dagaa lost to spoilage last time it was experienced (kg)	200	700	238	400	285

With respect to the periodicity of spoilage, respondents reported that it was highest during rainy seasons (38.5%) and this came after every three but generally, post-harvest losses were regularly experienced. On average, processors sold processed dagaa affected b post-harvest losses at UShs 2,000 and 1,450 during low and high catch seasons. These prices were lowest in Kasenyi Landing Site, reported at UShs 450 and 325 during low and high catch sesons respectively, indicating the severity of the damage to the dagaa handled by the landing site.

The part of processed dagaa affected by post-harvest losses were sold mostly to poultry, piggery and fish farmers (66.7%) or to industrial feed manufacturers (33.3%).

Different coping mechanisms were adopted to respond to the problem of post-harvest losses among dagaa processors. They included improved drying methods (50.0%), which involved the use of raised drying racks or drying on nets, methods that were applied at most landing sites except at Kasekulo (Table 10). this was followed by covering of dagaa with polythene materials or tarpaulin (23.3%), a practice most common at Lambu. A few processors salted their dagaa before sun-drying (3.3%) and this was mostly at Kiyindi. Lastly processors ensured that they processed their dagaa early enough before spoilage set in (10.0%), mostly at Kasekulo. However, some processors did not adopt any coping mechanism (13.3%), especially at Kasekulo Landing Site.

Table 10: Measures processors adopted to maintain quality of dagaa processed

	Kiyindi	Kasenyi	Lambu	Kasekulo	All
Improved drying of dagaa	71.4%	100.0%	66.7%	.0%	50.0%
Covering with kavera/ tarpaulin	.0%	.0%	25.0%	16.7%	23.3%
Salting before drying	14.3%	.0%	.0%	.0%	3.3%
Early processing	.0%	.0%	8.3%	33.3%	10.0%
Nothing	14.3%	.0%	.0%	50.0%	13.3%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

3.4.5. Regulations in dagaa processing

In order to carry out dagaa processing, operators had o comply with certain regulatory requirements. These requirements related to fisheries management, quality standards and fish

trade. The requirements respondents complied with most were obtaining health/ hygiene certificate (26.5%), followed by holding a trading licence (20.6%) and/ or fishing licence (20.6%) (Table 11). Variations in compliance were attributed to lack of understanding due to limited sensitisation, low enforcement by the relevant agencies and limited facilities for meeting the requirements. Important regulations concerning quality assurance and packaging of the dagaa products were among the least complied with, hence the need to promote sensitisation and compliance to improve the dagaa trade (see Appendix 2).

Table 11: Regulations processors complied with in dagaa processing

	Kiyindi	Kasenyi	Lambu	Kasekulo	All
Registration of business	40.0%	.0%	.0%	.0%	11.8%
Trading licence	10.0%	50.0%	35.7%	.0%	20.6%
Health/ hygiene certificate	30.0%	.0%	28.6%	25.0%	26.5%
Proper packaging of dagaa	10.0%	.0%	21.4%	.0%	11.8%
Strict monitoring and supervision by FOs	.0%	50.0%	7.1%	.0%	5.9%
Quality assurance (sand free, use of racks)	.0%	.0%	7.1%	.0%	2.9%
Fishing licence	10.0%	.0%	.0%	75.0%	20.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

3.4.6. Challenges experienced in dagaa processing

As in all enterprises, processors of dagaa were faced with different challenges. Rain or bad weather was reported as the main challenges (42.9%), because of its negative effect on drying of dagaa, resulting in spoilage or complete rotting of the product (Table 12). Kasekulo and Lambu were the most affected and Kiyindi the least, because of the measures taken by processors there to cope with poor weather in drying their dagaa. The other significant challenge was trade related, namely price fluctuations, attributed to the low market demand for dagaa. This was attributed to the poor attitude of consumers to dagaa as fish for human consumption. The challenge was felt most at Kasenyi Landing Site. Other challenges included scarcity of dagaa supply and theft of dagaa.

Table 12: Main challenges experienced in dagaa processing

	Kiyindi	Kasenyi	Lambu	Kasekulo	All
Rain / bad weather	25.0%	.0%	50.0%	55.6%	42.9%
Price fluctuations/ low market	37.5%	50.0%	31.3%	11.1%	28.6%
Lack of capital	12.5%	.0%	.0%	.0%	2.9%
Predators	.0%	.0%	6.3%	.0%	2.9%
Weighing was only done when selling but not buying	.0%	.0%	6.3%	.0%	2.9%
Fish scarcity	.0%	.0%	6.3%	33.3%	11.4%
Theft	25.0%	50.0%	.0%	.0%	8.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

3.4.7. Suggested solutions to challenges

Several suggestions were fronted to address the challenges in dagaa processing, of which the majority considered improved handling and drying methods to be the most important (65.2%) (Table 13). This would involve the use of raised drying racks and dryers. This was particularly emphasized among processors of Kiyindi and Lambu Landing Sites but much less among Kasekulo processors. Market identification was the next most common suggestion (17.4%), aimed at addressing price fluctuations and limited demand for dagaa. It was most pronounced at Kasekulo. Planned interventions for dagaa needed to be in line with the demands of the processors.

Table 13: Solutions to challenges as suggested by processors

	Kiyindi	Kasenyi	Lambu	Kasekulo	All
Improve drying methods and handling	83.3%	50.0%	75.0%	42.9%	65.2%
Sensitise people involved in dagaa business/ fishery	.0%	50.0%	.0%	.0%	4.3%
Market searches	16.7%	.0%	12.5%	28.6%	17.4%
Government should provide soft loans	.0%	.0%	12.5%	.0%	4.3%
Ban use of bulbs but only lanterns for dagaa fishing	.0%	.0%	.0%	28.6%	8.7%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Trading in dagaa

3.5.1 Categories of dagaa traders



Plate 4: Trading in dagaa

Most of the traders in dagaa business operated within Uganda (87.8%) (Table 14). At Kasenyi and Kasekulo, all the respondents operated within Uganda. The focus of traders on domestic market denied them the opportunty to tap larger market with better prices and there was no incentive to improve quality and meet the standards. It was at Kiyindi, however, that a sizeable proportion of traders sold outside the country (35.7%). The external destinations included Rwanda, DRC, South Sudan and Kenya. Other exporting traders came from Lambu.

Most of the traders sold sun-dried dagaa (93.9%). This was the lowest category of dagaa product and the traders were, therefore, prone to quality lapses and post-harvest losses. Salted and sun-dried product was sold by Kiyindi traders (21.4%). This represented a step in product improvement, resulting in quality maintainance and prolonged shelf life of the product. More traders could be encouraged to trade in improved dagaa products for improved nutrition, food security and incomes.

Table 14: Categories of dagaa traders and processed dagaa products traded

	Kiyindi	Kasenyi	Lambu	Kasekulo	All
Traders who sold within Uganda	64.3%	100.0%	88.9%	100.0%	87.8%
Traders who sold outside the country	35.7%	--	11.1%	--	12.2%
Traders who sold sun-dried dagaa	78.6%	100.0%	100.0%	100.0%	93.9%
Traders who sold salted and sun-dried	21.4%	--	--	--	6.1%

3.5.2 Operations of dagaa traders

Trading operations varied significantly between low and high catch seasons. The average number of days taken to complete a round of trading, from purchase of product to sale, was twice during low catch than during high catch seasons le 15). This was due to the low supply and the need to take time to assemble sufficient supplies during low catch seasons and even then, traders still bulked less product during low catch seasons per round. There was an increase of 165.0% in quantity of product traded during high catch compared to low catch seasons.

Buying prices were higher during low than high catch seasons, with a decline of -37.5% from low to high catch season, attributed to increases in supply. In selling prices, there was a decline of -36.4% from low to high catch seasons, also due to increased supply. Within the low catch seasons, there was a difference of 22.2% between buying and selling prices while during high catch seasons, the difference was 24.4%.

Table 15: Average number of trading days, quantities and prices of processed dagaa

	Low season	High season
Number of days taken to do one round of trading	4	2
Rounds of trading carried out in a month	3	4
Quantity of processed dagaa handled in one round (kg)	1,000	2,650
Buying price of processed dagaa (Shs/kg)	3,600	2,250
Selling price of processed dagaa (Shs/kg)	4,400	2,800

3.5.3 Trading equipment

Dagaa traders made use of essential equipments in their operations, including the different means of transport namely bicycles, motorcycles or trucks and weighing scales for measurement (Table 16). Ownership of means of transport was important because it enabled traders to deliver consignments to destinations of choice and conveniently. Different traders owned an average of one unit of the equipment used. The equipment owned by most traders was the weighing scale. The item of highest cost was the truck; while that with the longest life time was the bicycle. Most respondents bought the bicycles in 2013 (50.0%), ighing scales in 2015 (50.0%) and truck in 2012. Own saving was the urce of capital for most traders, depicting poor access to financial services by dagaa traders.

Table 16: Average quantities, expected life and cost of assets used in dagaa trading

	Expected life (Years)	Cost (UShs)
Bicycle	6.5	150,000
Motorcycle	--	2,000,000
Weighing scale	2	79,500
Truck	5	50,000,000

3.5.4 Operational expenses

Examination of operational costs of traders revealed that the sun-dried dagaa commodity was the highest cost item in the trading costs, followed by transport and other cost items included labour and storage. (Figure 11). Traders used both owned and hired transport, including motorcycles, taxis, buses and trucks. Most transport used was for mixed goods, often including passengers and this often compromised the quality of the dagaa, as people sat on the bags, causing the product to crumple.

Labour was used for different functions. Where the trader processed dagaa as well, much of the labour was used for this purpose. It was also used for packaging dagaa into sacks, carrying into and out of stores, loading and unloading trucks, retailing and spreading out to keep it dry. Some traders or trading companies hired labour to carry out the trading operations on their behalf, including purchasing, transportation and selling.

Storage was utilised both at the landing sites of supply, in transit and at market destinations. Some of them were proper stores constructed by Government and met the quality standards for storing fish for human consumption. Others were privately owned, ranging from buildings with cement floor, brick and cement walls and iron roofs, or those with earth floor or mud wall or roof with grass or polythene materials. Dagaa as also stored on sand and covered with tarpaulin. The stores were often infested with pests, rodents and other predators which compromised the quality of dagaa and caused physical loss as well.

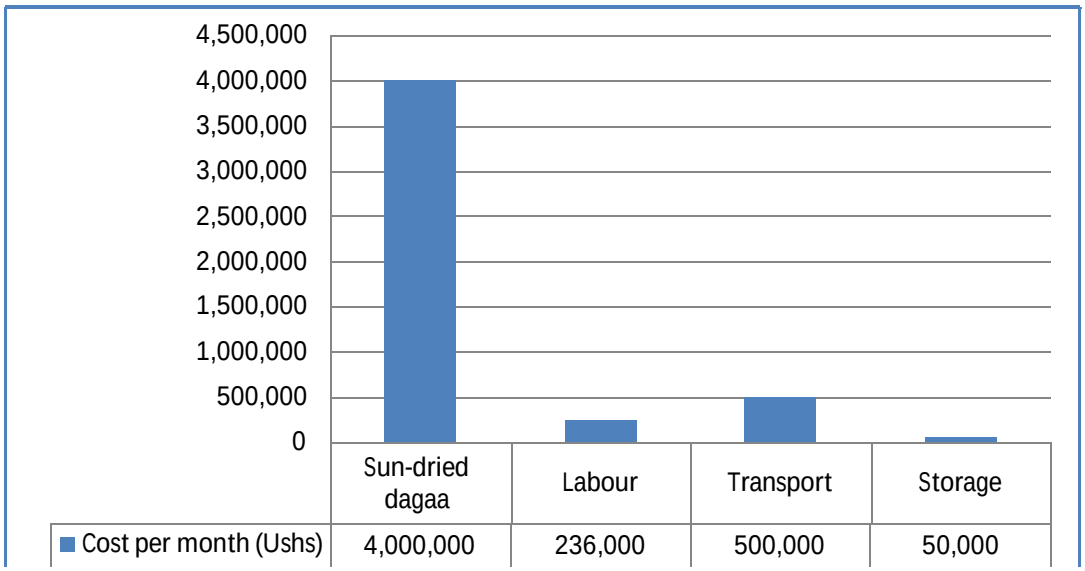


Figure 11: Average cost of operational items per month

3.5.5 Destinations and buyers from dagaa traders

Most traders sold processed dagaa either at the beaches (44.9%) or away from the beaches but within Uganda (44.9%) and only a few sold in other countries (Table 17). This revealed that dagaa trade was primarily a domestic activity. While this was good for nutrition and food security of the country, incomes were compromised because of the limited demand and low prices on the domestic market. Majority of traders who sold in other countries were from Kiyindi (28.6%), showing how better developed the trade was at the landing site.

Most traders sold to industrial feed millers (34.7%), especially traders from Kasekulo and Kasenyi. This reflected the low levels of quality management at these landing sites, so that their products were mostly suitable for anmal feeds. Traders who sold to consumers constituted 20.4% and the majority were from Kiyindi (57.1%), where considerable effort had been made to improve dagaa quality, suitable for human consumption.

Only 2.0% traded value added products and they were from Kiyindi, where they formed only 7.1% of the sample there and traded in deep-fried dagaa. This indicated the lack of value addition in the dgaa value chain and the need for intervention to improve it, for better marketing and utilisation of dagaa.

Table 17: Locations and buyers of from dagaa traders

	Kiyindi	Kasenyi	Lambu	Kasekulo	All
Traders who sold at beaches	64.3%	50.0%	22.2%	37.5%	44.9%
Traders who sold away from beach but within Uganda	7.1%	50.0%	66.7%	62.5%	44.9%
Traders who sold in another country	28.6%		11.1%		10.2%
Traders who sold to consumers	57.1%		11.1%	6.3%	20.4%
Traders who sold to traders within Uganda	21.4%	50.0%	22.2%	25.0%	28.6%
Traders who sold to traders operating outside Uganda	21.4%		44.4%		14.3%

Traders who sold to industrial feed millers		50.0%	22.2%	62.5%	34.7%
Traders who sold to poultry, piggery or fish farmers				6.3%	2.0%

3.5.6 Post-harvest losses of traders

The majority of traders reported that their main type of post-harvest loss was rotting of the dagaa (56.3%), with Lambu and Kasekulo traders suffering most (Table 18). This was followed by sand and dust contamination, due either to the poor methods of drying or deliberate adding of sand in the products to increase weight during selling. This problem was worst at Kasenyi but virtually non-existent at Kiyindi and Lambu, where operators have been sensitised and supported to improve their drying methods using raised racks or on nets. Other types of losses included loss of colour and broken dagaa during transportation, among others. A few traders did not report any post-harvt losses (8.3%), due to their levels of preparedness for it.

The frequency at which traders suffered post-harvest losses varried but the majority reported monthly (35.7%) followed by weekly (23.8%).

Table 18: The major types of post-harvest losses affecting dagaa traders

	Kiyindi	Kasenyi	Lambu	Kasekulo	All
Rotting	50.0%	30.0%	88.9%	60.0%	56.3%
Sand contamination		40.0%		6.7%	10.4%
Swept by rain	7.1%				2.1%
Loss of colour	35.7%	10.0%			12.5%
Broken during trasportation	7.1%		11.1%	6.7%	6.3%
Weight loss during storage				6.7%	2.1%
Mixing poorly dried with good dagaa				6.7%	2.1%
None		20.0%		13.3%	8.3%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Various coping mechanisms had been adopted by traders to respond to post-harvest losses, with the majority adopting quality assurance procedures with respect to handling, drying sufficiently and storage of dagaa (70.4%) (Table 19). Related to this was the practice of covering dagaa with tarpaulin. Other measures included early selling and sensitisation of people doing the processing of the dagaa.

Table 19: Measures taken by traders to control post-harvest losses

	Kiyindi	Kasenyi	Lambu	Kasekulo	All
Early selling	15.4%	9.1%	8.3%	.0%	7.4%
Quality assurance (handling, storage, sufficient drying)	61.5%	54.5%	66.7%	88.9%	70.4%
Sensitize processors	.0%	9.1%	.0%	.0%	1.9%

Cover with tarpaulins/ kavera	23.1%	27.3%	25.0%	5.6%	18.5%
Nothing	.0%	.0%	.0%	5.6%	1.9%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

3.5.7 Regulations and dagaa trading challenges

Essential food safety and trade regulations governing trade were in place. However, compliance with the regulations and standards varied. The majority of traders reported that they complied with quality assurance measures (50.0%), governing proper handling, processing and storage of dagaa (Table 20). However, less than half of the respondents complied with the regulations concerning trade licence (21.9%), health certificate after inspection (18.8%), fish movement permit after the fish management inspection, among others. Low compliance with trade regulations was attributed to inability of traders to meet the trade requirements and was an obstacle to improving dagaa trade.

Table 20: Respondents who complied with the regulations for dagaa traders

	Kiyindi	Kasenyi	Lambu	Kasekulo	All
Licence for business	22.2%	10.0%	21.4%	27.3%	21.9%
Fish Movement Permit	5.6%	.0%	7.1%	4.5%	4.7%
Quality assurance measures	44.4%	60.0%	50.0%	50.0%	50.0%
Registration fee	.0%	20.0%	.0%	4.5%	4.7%
Health certificate	27.8%	10.0%	21.4%	13.6%	18.8%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

3.5.8 Challenges in dagaa trading

The majority of traders considered price fluctuations on the market to be the worst challenge in dagaa trading (40.9%). During low catch seasons, the supply was low relative the number of traders which led to rising prices and vice versa during high catch seasons. Poor quality product followed (22.7%), attributed to rains poor weather, inadequate raised drying racks and poor storage. Over-taxation and asking for bribe by law enforcers (10.6%), which reduced the profit margins of traders. Several other challenges were cited as listed in Table 21.

Table 21: Challenges in dagaa trading

	Kiyindi	Kasenyi	Lambu	Kasekulo	All
Sub-standard weighing scales	5.3%	7.7%	.0%	4.2%	4.5%
Poor product quality	26.3%	30.8%	10.0%	20.8%	22.7%
Over taxation and bribe among enforcers	5.3%	15.4%	20.0%	8.3%	10.6%
Pouring water on processed dagaa	5.3%	.0%	.0%	.0%	1.5%
Tribalism	5.3%	.0%	.0%	.0%	1.5%

Untrustworthy dagaa suppliers	5.3%	15.4%	.0%	.0%	4.5%
Price fluctuations (high catch, few buyers)	26.3%	23.1%	50.0%	58.3%	40.9%
Theft	.0%	7.7%	10.0%	4.2%	4.5%
Buyers prefer to buy from processors	21.1%	.0%	.0%	.0%	6.1%
Traders buy on credit	.0%	.0%	10.0%	4.2%	3.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

To the respond to the challenges, traders had their suggestions, the most common being quality assurance (57.4%) (Table 22). In this respect, processors would be sensitised to dry dagaa properly. Use of raised drying racks should be promoted and adopted to minimise sand and dust contamination. Storage should be improved to avoid leakage when it rains and to eliminate pests. Traders from Kasenyi and Lambu needed the intervention most.

Table 22: Traders' solutions to the challenges in dagaa trading

	Kiyindi	Kasenyi	Lambu	Kasekulo	All
Quality assurance (sufficient drying, use of racks, improve storage)	55.6%	70.0%	58.3%	52.4%	57.4%
Reduce taxes	11.1%	10.0%	8.3%	.0%	6.6%
Have closed dagaa seasons	5.6%	.0%	.0%	.0%	1.6%
Improve roads	5.6%	.0%	8.3%	.0%	3.3%
Prices should be uniform	.0%	10.0%	8.3%	4.8%	4.9%
Provision of soft loans to increase business	.0%	.0%	16.7%	9.5%	6.6%
Market identification	.0%	.0%	.0%	19.0%	6.6%
To have an organisation for dagaa traders	11.1%	.0%	.0%	9.5%	6.6%
Strict law on traders to buy dagaa at the market	11.1%	.0%	.0%	4.8%	4.9%
Timely payments	.0%	10.0%	.0%	.0%	1.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

3.5.9 How to promote human consumption of dagaa

Respondents were also asked how they thought human consumption of dagaa could be promoted, vis-a-vis other uses of the resource. Again, the majority recommended that the quality of the product should be improved through complete drying and elimination of contaminants (78.2%) (Table 23). Sensitisation was also considered key in promoting dagaa for human consumption (12.7%).

Table 23: Suggestions to improve human consumption of dagaa

	Kiyindi	Kasenyi	Lambu	Kasekulo	All
Improve the dagaa product quality	81.8%	66.7%	66.7%	94.1%	78.2%
Value addition	9.1%	8.3%	.0%	.0%	3.6%
Sensitisation	9.1%	16.7%	20.0%	5.9%	12.7%
Need engines to fish mature mukene for consumption	.0%	.0%	6.7%	.0%	1.8%
Use of modern technology (Solar/ machine)	.0%	8.3%	6.7%	.0%	3.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

3.5. Industrial feed millers of dagaa

Interviews were conducted with 6 industrial feed millers, namely Lucy Millers, Kyaterekera Poultry and Animal Feeds, Takuwah Best Feeds, Mutima Feed Millers, Eram and Nalukolongo Animal and Poultry Feeds. The range of products produced was as given in Table 24. Feed millers mainly bought processed dagaa from Kiyindi, Lambu, Kasekulo and Kasenyi Landing Sites because they believed that their dagaa was of good quality. They also reported that they dealt directly with farm owners for their products in order to avoid being corrupted by farm mangers.

Table 24: Highlights of operations of industrial feed millers using dagaa raw material

PRODUCTS	CHALLENGES
• Poultry feeds • Animal feeds • Fish feeds • Pharmaceuticals • Food supplements	• Dagaa often not well dried • Dagaa eaten by mites and insects in storage • Sand and dust contamination • Contamination with *Salmonella typhii, E.coli, and Shigella* • V.A.T on finished feeds too high • Unclear quality control policy • Tax and non-tax barriers to regional markets for feeds. • Border entry restrictions

Other components used with dagaa in producing feeds included: cotton cake, sun flower, animal feed premix, salt, soya cake and shells. Dagaa percentage composition also varied from one feed miller to another and depended on the ty of animal feed produced. The selling price for processed feeds which comprised of dagaa and other components ranged from UShs 4,200 during low catch to 3,000 per kg during high catch seasons.

Most feed millers interviewed reported rotting of semi-dried dagaa as the major type of post harvest loss. They minimized losses through thorough cross checking of dagaa to ensure that it was fully dried and sand free. Where dagaa contained some sand, it was first sieved and consequently the feed miller would pay for the dagaa that was free of sand.

It was indicated that sieving dagaa before processing was the main measure taken in order to maintain dagaa quality. However there were other measures taken to maintain quality as well, such as sticking on one landing site supplier whose reputation was known and encouraging Fisheries Officers to do continuous evaluation of quality controls of suppliers at landing sites.

Unlike some feed millers that did not comply with the fisheries rules and regulation, most of them possessed trading licenses for which they paid UShs 300,000 per year. Feed factories also complied with the poultry breeder policy (breeder bio-security) on raw materials to ensure that proper quality feeds were produced under UNBS standards.

3.6. Supermarket marketing of dagaa



Plate 5: Dagaa for supermarkets

Face to face interviews were conducted with 6 supermarket outlets belonging to Mega Standard, Shoprite, Standard, Capital Shoppers and Splendid Supermarkets. Dagaa was sold at relatively better prices in supermarkets, compared to the prices at which it was bought at landing sites (Table 25).

Table 25: Supermarket dagaa prices (UShs/kg)

Supermarket (code)	Sun-dried	Powder	Fried
SM1	15,100		30,000
SM2	11,600		
SM3	14,000		
SM4	18,200	25,000	
SM5	10,000		10,000
SM6	10,000	16,000	15,000

It was sold in quantities ranging from 200 grams to one kilogram. Prices ranged from 3,000 for 200 gram packets to 14,000/= for a kilogram packet (Table 26). The forms of dagaa packed were whole dried and deep fried fish and powder. Supermarket managers reported high demand for dagaa which was the reason they were continuing to deal in it.

The challenges of supermarkets were as follows:

i) It was not easy to enforce quality control as the dagaa products were delivered already packed.

ii) Stated weights labeled on the packages often did not match the actual weights of the products.

iii) Some dagaa was not well dried and when delivered to the supermarkets, it got spoiled after sometime in storage.

iv) Some dagaa was highly affected by *e-coli*, *shigella* and *ligula intestinali* so supermarkets were faced with these contaminations.

Table 26: Packets and prices of sun-dried, powder and fried dagaa in selected supermarkets

		Sundried		Powder		Fried	
Supermarket Code	Location of Supermarket	Packets (gm)	Price (UShs)	Packets (gm)	Price (UShs)	Packets (gm)	Price (UShs)
SM1	Kampala Central	500	7,200				
		80	2,000				
		800	9,500				
		500	7,200				
		150	1,500				
						50	2,100
						120	2,100
SM2	Kampala Central	1,000	8,900				
		500	5,400				
		100	1,500				
SM2	Nakawa Division						
		1,000	8,900				
		500	5,400				
		100	1,500				
SM3	Kampala Central	500	7,000				
SM4	Nakawa Division	500	7,200				
				200	6,000		
		100	2,200				
				100	2,000		
SM5	Kiira Division	500	5,000				
						500	5,000
SM6	Kiira Division			250	4,000		
						100	1,500
		500	5,000				
		1,000	10,000				

The supermarket outlets surveyed and suppliers of dagaa products to supermarkets identified were as given in Table 27.

Table 27: Sampled supermarket outlets and dagaa suppliers to supermarkets identified

SUPERMARKET OUTLETS	DAGAA SUPPLIERS
1. Mega Standard Supermarket 2. Shoprite Supermarket (Clock Tower) 3. Shoprite Supermarket (Lugogo) 4. Standard Supermarket 5. Capital Shoppers Supermarket 6. Splendid Supermarket (Kireke) 7. Bweyogere Supermarket	• Arrow Aquaculture Africa • CVIS Super Foods • J and M Family • Melchizcedec • Morgans Enterprises • Mutima Food Processors • Nabala Food Processors • Realm Foods • SOZO Uganda Limited • ZM General Traders

3.7. Institutions for dagaa trade

The study identified a number of institutions concerne with dagaa trade. The roles of the institutions ranged from policy formulation and implementation, sensitisation, fisheries management, quality assurance and market regulation and levying customs duties on dagaa export (Table 28).

DiFR was the main institution for daga trade in Uganda. It had set the recommended net mesh-size of 10mm although it was not commonly adopted by fishers of dagaa. Fish management laws were being drafted, stipulating that no fish including dagaa would be exported without being processed. Species management plans were also being drafted. The National Fisheries Policy in which dagaa regulations were also expected to change was under review. Projects funded under the Icelandic International Deve Agency (ICEIDA), Lake Victoria Environmental Management Project (LVEMP) 11 and SMART Fish had made interventions at selected landing sites in order to improve post-harvest handling. These resulted into good quality dagaa that was ending up in supermarkets and export markets especially to Rwanda. However, DiFR recognized that animal feeds still used a larger proportion of dagaa compared to that for human consumption, an issue they were working on.

Table 28: Institutions for dagaa trade and their roles

INSTITUTUTION	ROLES
Local Government (Fisheries Officers)	• Training • Resource management • Inspection
Directorate of Fisheries Resources	• Policy • Resource management • Inspection

	• Intervention projects
Uganda Revenue Authority	• Customs duty
Uganda National Bureau of Standards	• Standards for processed and value added dagaa products

The study examined the status of data recording at the different levels. The main actors were NaFIRRI, which had the mandate for fisheries research UBOS, which was the Government institution for statistics. The other dagaa data collectors were as give in Table 29.

Table 29: Main data recorders in the dagaa value chain

DATA COLLECTORS	TYPES OF DAGAA DATA COLLECTED
BMs	• Number of dagaa boats and fishers • Catch data • Number of processors and processing units • Fish movement records
Traders	• Volumes and values of transactions • Records of buyers • Number of transport boats and vehicles • Origins and destinations of consignments
Market masters	• Marketing data
Fisheries Officers	• Monthly, quarterly and annual data summaries
DiFR	• Annual data summaries
NaFIRRI	• Fish stock assessments • Frame surveys • Catch assessment • Market research
Uganda Bureau of Statistics	• Fishing statistics • Processing statistics • Trade statistics
Uganda Revenue Authority	• Formal export records

The study examined the status of data systems for dagaa and it was noted that the institutions for data recording were in place but there were challenges as follows:

- Dagaa trade was highly informal, so the standard business records were not being kept by the operators as would have been the case with formal businesses.
- Data recording systems by the different players were not harmonised or co-ordinated.
- The data function was poorly staffed and funded in some of the institutions.
- There was lack of feedback given to the data collectors from higher authorities to whom they were submitted, which was a disincentive to collect quality data.
- Frequently, the data collected was not used for any planning and decision making.

CHAPTER FOUR

CONCLUSIONS AND RECOMMENDATIONS

4.1. Conclusions

The importance of dagaa from Lake Victoria to Uganda was recognized for its contribution to the nutritional status of especially the children, for food security for the population, incomes for fishers, processors and traders, profits for related businesses and foreign exchange earnings for the country. The role of trade in enabling the realization of these benefits was recognized, as it stimulated improved quality without which dagaa would not be successfully marketed. It also facilitated accessibility and affordability to consumers as well as market access to fishers, processors and traders. However, the main challenge in the dagaa sub-sector has been the low utilization of the resource for human consumption, estimated at only 20%, while the bulk of it went into animal feeds.

Production of dagaa rose in the last five years in both quantities and values, attributed to increases in the fish stocks, which attracted increased effort in terms of boats, gear and fishers. However, fishing of dagaa has been constrained by rain or bad weather which affected dagaa fishing as well as drying. Scarcity of dagaa was frequently reported, due to seasonal nature of the resource, causing fluctuations in supply and earnings for fishers. Fluctuations were also experienced in dagaa prices, attributed to demand and supply situations. The problem was compounded by the rampant theft of gear, engines and fish among fishers.

Processing of dagaa was largely using a traditional method, whereby the fish was spread out on sand or rock to dry under the sun. However, the increased magnitude of the fish, together with the changed requirements of consumers and the market has necessitated adoption of improved processing. The use of raised drying racks or spreading on nets have been two improved drying methods but their adoption is yet to be fully embraced. Other measures have included processing value added products, such as deep-fried dagaa ready for eating and dagaa powder. However, processing of dagaa has been constrained by rain that washed away spread dagaa, bad weather that hindered drying of dagaa, resulting in spoilage or rotting of the product, unsuitable for human consumption. Like fishers, processors also faced the problems of fluctuating supplies and prices, predators such as birds, animals and chicken and theft of dagaa.

Trading was carried out by different categories of operators, some of whom were also involved in fishing and processing. Distinction was made between domestic market traders and exporters to the regional market, notably Rwanda, DRC and South Sudan. Most traders sold to industrial feed millers. Traders were required to comply with eessential food safety and fish trade standards and regulations. However, the majority complied with only some of the quality assurance measures and few others observed requirements for health inspection, trading licence or fish movement permits. Supply and price fluctuations on the market were considered to be the worst challenges in dagaa trading. Other challenges included poor product quality and high taxes on the consignments.

Other operators in the dagaa value chain included industrial feed millers. Although their number was small, they handled the bulk of dagaa produced. The products included poultry feeds, animal feeds, fish feeds, pharmaceuticals and food supplements, which were for both the domestic and regional markets. Their main challenges were with the quality of the dagaa received, taxation and cross-border restrictions on their trade.

Most supermarkets in Kampala City stocked dagaa. The products were sun-dried, powder and deep fried, packed in units of different weights, supplied by a few specific companies that could meet the food safety standards. However, given the high prices for the dagaa, supermarkets would only handle limited quantities of the product. They also had no guarantee that the packed products they received met the standards required.

A number of institutions were in place to support dagaa trade, including BMUs, Local Governments, DiFR, NaFIRRI, UNBS, URA, UBOS and trade ssociations, among others. Functions carried out by the institutions included formulation of policies, management of the dagaa stocks, sensitisation and training, inspection and issuing of rtificates, data collection, implementation of intervention projects, colleting customs duties and enforcing standards on the products.

However, the data collection function was inadequately performed due to the informal nature of dagaa trade, lack of harmonisation of data collection tools, inadequate manpower and facilities and lack of feedback to data collectors from higher authorities.

4.2. Recommendations

In order to respond to the challenges identified under the study and promote human consumption and value through the dagaa trade, the following recommendations have been made:

i) Government and NGOs should sensitise and support formation of formal business organisation among dagaa operators to improve compliance with standards and keeping.

ii) Government should improve management of dagaa resource in accordance with the 10 mm fishing regulation for dagaa and provide security for fishers on the lake.

iii) Fishers should adopt early landing and traders early selling of dagaa to minimise the time they hold the product before disposal to reduce post-harvest losses.

iv) Fishers, processors and traders should promote hygienic handling of dagaa for human consumption.

v) Government should promote adoption of improved dagaa processing, using raised drying racks and solar dryers to dry dagaa properly and avoid contamination.

vi) Traders' associations should carry out identification markets for dagaa with better prices, aimed at addressing price fluctuations and limited demand for dagaa..

vii) Government should consider reducing taxes on import of fishing equipment and export of dagaa products.

viii) Dagaa operators, with support of Government, should provide suitable storage facilities for the products along the value chains to avoid leakage when it rains and to eliminate pests.

ix) UNBS should enforce compliance with standards among dagaa processors and traders.

x) Industrial feed millers should sieve contaminated dagaa before processing in order to maintain dagaa quality.

xi) Industrial feed millers should stick on one landing site supplier whose reputation is known for traceability.

xii) Fisheries Officers should carry out continuous sensitization, training and evaluation on quality controls of suppliers at landing sites.

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Appendix 1: Key persons consulted

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Appendix 1: Extracts from the EAC Standards for Dagaa

Dried fish — Silver cyprinid (*Rastrineobola argentea*) — Specification

1 Scope

This Final Draft East African Standard specifies the r ments and methods of sampling and test for dried silver cyprinid (*Rastrineobola argentea*).

3 Terms and definitions

For the purposes of this standard, the following terms and definitions shall apply.

3.1 dried silver cyprinid

whole product presented as a dried fresh water fish which has not been gutted, beheaded or split and subsequently washed and dried

3.2 food grade material

packaging material, made of substances which are safe and suitable for their intended use and which will not impart any toxic substance or undesirable odour, colour or flavour to the product

3.3 sound

free from physiological deterioration or adulteration/contamination, that appreciably affects their appearance, edibility and the keeping quality of the dried fish

3.4 foreign matter

any material which is not of fish origin such as sand, stones, metallic chips, plant parts

4 Requirements

4.1 General requirements

4.1.1 Raw material

4.1.1.1 Dried silver cyprinid shall be prepared from fresh, sound *Rastrineobola argentea* which is of an acceptable quality and fit for human consumption.

4.1.1.2 Water used during fish processing shall be potable complying with EAS 12.

4.1.1.3 After washing, the fish shall be dried either in the sun or in artificial dryers until a satisfactory product is obtained.

4.1.1.4 The fish, while drying, shall be protected against contamination such as dirt, sand, birds, vermin and insects.

4.1.2 Finished product

Dried silver cyprinid shall:

a) have the characteristic silvery skin colour and dri odour;
b) be free from any indication of spoilage such as mouldiness, colour change; and
c) be free from foreign matter.

4.2 Specific requirements

4.2.1 Dried silver cyprinid shall comply with the specific requirements given in Table 1.

Table 1 – Specific requirements for dried silver cyprinid

S/N	Parameter	Requirement	Test method
i.	Moisture, %, max.	12	Annex A
ii.	Total ash, % max.	15	Annex B
iii.	Acid insoluble ash, % max.	0.5	ISO 5985

4.2.2 Dried silver cyprinid shall be presented not less than 90 % whole.

5 Food additives

Food additives may be used in the preparation of dried silver cyprinid in accordance with CODEX STAN 192.

6 Hygiene

6.1 The product shall be prepared and handled in accordance with EAS 39 and CAC/RCP 52 and shall comply with microbiological limits given in Table 2.

Table 2 — Microbiological limits for *Rastrineobola argentea*

S/No.	Type of microorganism	Maximum limit	Method of test
1	*Salmonella* in 25 g	Absent	ISO 6579
2	*Escherichia coli*, MPN/g	Absent	ISO 7251
3	*Staphylococcus aureus*, CFU/g	2 × 103	ISO 6888
4	Total viable count, CFU/g	105	ISO 4833-1
5	*Clostridium perfrigens,* CFU/g	Absent	ISO 7937
6	Yeast and moulds, CFU/g	103	ISO 21527-1
7	*Vibrio spp.*	Absent	ISO/TS 21872

6.2 The product shall be free from any parasites.

7 Contaminants

7.1 Heavy metals

Dried silver cyprinid shall comply with the heavy metal limits given in Table 3.

Table 3 — Heavy metal limits for *Rastrineobola argentea*

S/No.	Heavy metal	Maximum limit, mg/kg	Test method
(i)	Arsenic	0.1	AOAC 952.13
(ii)	Lead	0.3	AOAC 972.23
(iii)	Cadmium	0.3	AOAC 973.34
(iv)	Methyl mercury	0.5	AOAC 983.20

7.2 Aflatoxins

When tested in accordance with ISO 16050, the level of total aflatoxin in dried silver cyprinid shall not exceed 10 µg/kg.

7.3 Pesticide residues

Dried silver cyprinid shall comply with those maximum pesticides residue limits established by the Codex Alimentarius Commission for similar commodities.

8 Weights and measures

The fill and the weight of the product shall comply with Weights and Measures regulations of the importing Partner State.

9 Packaging

Dried silver cyprinid (*Rastrineobola argentea*) shall be packaged in food grade containers which will safeguard the hygienic, nutritional, and organoleptic qualities of the product.

10 Labelling

10.1 In addition to the requirements in EAS 38, the following specific labelling requirements shall apply and shall be legibly and indelibly marked:

a) name of the product as "Dried silver cyprinid" and/or local name (*Omena/Dagaa/Mukene/Indagala* and *Isambaza);*
b) name and physical address of processor/packer;
c) net weight in grams or kilograms;
d) date of packaging;
e) batch number;
f) expiry date;
g) storage conditions; and
h) country of origin.

10.2 Nutritional labelling, nutrition and health claims may b e in accordance with EAS 803 and EAS 805.

11 Sampling Sampling shall be done in accordance with CAC/GL 50-2004.

Appendix 2: Questionnaire for Fishers, Processors and Traders of Dagaa

Date: _____

Name of interviewer _____

District _____

Sub-county _____

Landing site _____

Global position Longitude _____ Latitude _____

Name of respondent _____

Mob. No. _____

Position _____

A. Social characteristics

1. Gender [1] Male [2] Female

2. Educational level [1] Incomplete Primary [2] complete Primary
   [3] Incomplete Secondary "O" Level [4] Complete Secondary "O" Level
   [5] Incomplete Secondary "A" Level [6] Complete Secondary "A" Level [7] Tertiary
   [8] University

3. Are you a member of a group? [1] Yes [2] No

4. Type of group:
   [1]Fishers' group [2] Dagaa processors' group [3] Women's group
   [4] SACCO [5] Other (specify) _____

5. What main category of dagaa operator are you?
   [1] Fisher *(go to Section A)*
   [2] Processor *(go to Section B)*
   [3] Trader *(go to Section C)*
   [4] Supermarket *(go to Section C)*
   [5] Industrial feed processor *(go to Section C)*
   [6] Other (specify) _____ _____

B. Production *(for dagaa fishers)*

6. On average, how much fresh dagaa do you land on a fishing trip (kg, basin)	Low season _____ High season _____
7. How many fishing trips do you carry out in a month?	
8. What type(s) of post harvest losses affect(s) your catch?	[1] Rotting [2] Sand contamination [3] Swept by rain [4] Predators [5] Others (specify) _____
9. What amount of fish did you lose the last time you experienced post harvest losses? (volume) *(range)*	
10. How frequently do you experience post harvest losses?	[1] Every week [2] Every two weeks [3] Every month [4] Every three months [5] Others (specify) _____

11. What measures do you take to maintain the quality of you dagaa catch?	[1] Early landing [2] Boat doesn't leak [3] Proper catch handling [4] Other (specify) _____
12. What are the main challenges you experience in fishing dagaa?	
13. Do you sell your dagaa fresh or do you process it before selling?	[1] Fresh [2] Dried (*go to Processing section*)
14. If you sell fresh, what average price do you sell (UShs/ kg, basin)	Low season _____ High season _____
15. Where do you sell your catch?	[1] At the beach [2] Away from beach but within the country [3] In another country
16. To whom do you mostly sell your catch?	[1] Processor/Trader [2] Trader who does not process [3] Industrial feed millers [4] Poultry, piggery or fish farmer [4] Other (specify) _____
17. What price do you sell the part of catch affected by post harvest loss? (UShs/kg, basin, bag)	Low season _____ High season _____

C. Processing *(for dagaa processors)*

18. What category of dagaa processor are you?	[1] Fisher/processor [2] Processor only [3] Processor/ trader [4] Other (specify) _____
19. What method of dagaa processing do you carry out most?	[1] Salting before drying [2] Drying on net [3] Drying on raised racks [4] Frying [5] Other specify) _____
20. How many days do you take to do one round of processing?	Favourable weather _____ Unfavourable weather _____
21. How many rounds of processing do you carry out in a month? *(range)*	
22. On average, what volume of wet dagaa is processed in one round?	Low season _____ High season _____
23. At what price do you sell the processed dagaa (UShs/kg, basin, bag, tin)	Low season _____ High season _____
24. Which improved dagaa processing method/s are you informed about?	[1] Salting before drying [2] Drying on net [3] Drying on raised racks [4] Other specify) _____ [5] None
25. Do you produce value addition products from the dagaa?	[1] Yes [2] No
26. If Yes, mention them	

27. Give information on the capital equipment you use (Capital costs)

Item	Quantity	Year & month	Expected	Cost (Ushs)	Source of capital

		of purchase	lifetime (years)		[1] Government [2] Own savings [3]Private sector [4] Other (specify
Raised racks					
Frying pans					
Basins/ buckets					

28. Give information on your operating expenses (Operational costs)

Item	Quantity	Cost for current processing (Ushs)	Cost for last processing (Ushs)	Cost per month
Raw dagaa purchased)				
Labour				
Salt				
Fryiing oil				
Firewood				
Storage				
Transport				

29. Give information on your sales and earnings (Revenues)

Dagaa product	Quantity	Price/unit (Shs/ ka, basin. bag)	Revenue from current processing		Revenue from last processing		Total revenue for month	
			(volume)	(Value)	(volume)	(Value)	(volume)	(Value)
Sun-dried								
Salted & sun-dried								
Fried								
Smoked								

30. How much do you pay in storage per round of processing? (UShs)	
31. How much do you pay in other expenses per round of processing? (UShs) (*specify*)	
32. Where do you sell your processed dagaa?	[1] At the beach

	[2] Away from beach but within the country [3] In another country (specify) _____ [4] Other (specify) _____
33. To whom do you mostly sell your processed dagaa?	[1] Trader who sells within the country [2] Trader who sells outside the country [3] Supermarket [4] Restaurant [5] Industrial feed millers [6] Poultry, piggery or fish farmer [7] Other (specify) _____
34. What type(s) of post harvest losses affect(s) your processed dagaa?	[1] Rotting [2] Sand contamination [3] Swept by rain [4] Predators [5] Others (specify) _____
35. What amount of dagaa did you lose the last time you experienced post harvest losses? (kg, basin))	
36. How frequently do you experience post harvest losses?	[1] Every week [2] Every two weeks [3] Every month [4] Every three months [5] Others (specify) _____
37. What price do you sell the part of processed dagaa affected by post harvest losses? (UShs/kg, basin, bag)	Low season _____ High season _____
38. To whom do you sell the part of processed dagaa affected by post harvest losses?	[1] Trader who sells within the country [2] Trader who sells outside the country [3] Industrial feed millers [4] Poultry, piggery or fish farmer [5] Other (specify) _____
39. What measures do you take to maintain the quality of dagaa you process?	
40. What regulations do you have to comply with in dagaa processing?	
41. What are the main challenges you experience in dagaa processing?	

D. Trading (*for dagaa traders)*

42. What category of dagaa trader are you?	[1] Fisher/ processor/ trader [2] Processor/ trader [3] Trader who sells within the country [4] Trader who sells outside the country [5] Supermarket [6] Industrial feed miller [7] Other (specify) _____
43. What processed dagaa product do you trade in most?	[1] Sun-dried [2] Salted and sun-dried [3] Fried [4] Other (specify) _____

44. How many days do you take to do one round of trading?	Low season _____ High season _____
45. How many rounds of trading do you carry out in a month?	Low season _____ High season _____
46. On average, what volume of processed dagaa do you handle in one round?	Low season _____ High season _____
47. If you buy the processed dagaa for trading, what price do you pay? (UShs/kg, basin, bag)	Low season _____ High season _____
48. At what price do you sell the processed dagaa (UShs/kg, basin ...)	Low season _____ High season _____
49. Do you trade in value added products from dagaa?	[1] Yes [2] No
50. If Yes, mention them	
51. To whom do you trade value added products from dagaa?	[1] Supermarket [2] Local market [3] Distributors who sells outside country [4] Other (specify) ____
52. What regulations do you have to comply with in your dagaa trading?	

1. Give information on the capital equipment you use (Capital costs)

Item	Quantity	Year & month of purchase	Expected lifetime (years)	Cost (Ushs)	Source of capital [1] Government [2] Own savings [3]Private sector [4] Other (specify
Bycicle					
Motorcycle					
Weighing scale					

2. Give information on your operating expenses (Operational costs)

Item	Quantity purchased	Cost for current transaction (Ushs)	Cost for last transaction (Ushs)	Cost per month (Ushs)
Sun-dried dagaa				
Salted & sun-dried				
Fried dagaa				
Smoked dagaa				
Labour				
Transport				
Storage				

3. Give information on your sales and earnings (Revenues)

Dagaa product	Quantity	Price/unit (Shs/ ka, basin. bag)	Revenue from current transaction		Revenue from last transaction		Total revenue for month	
			(volume)	(Value)	(volume)	(Value)	(volume)	(Value)
Sun-dried								
Salted & sun-dried								
Fried								
Smoked								

53. Where do you mostly sell your processed fish?	[1] At the beach [2] Away from beach but within country [3] In another country [4] Other (specify) _____
54. To whom do you mostly sell your processed fish?	[1] Consumers [2] Trader within country [3] Trader selling outside country (specify) [4] Industrial feed millers [5] Supermarket [6] Poultry, piggery or fish farmer [7] Other (specify) _____
55. What type(s) of post harvest losses affect(s) your processed dagaa?	[1] Rotting [2] Sand contamination [3] Swept away by rain [4] Predators [5] Others (specify) _____
56. What amount of fish did you lose the last time you experienced post harvest losses? (volume) *(range)*	
57. How frequently do you experience post harvest losses?	[1] Every week [2] Every two weeks [3] Every month [4] Every three months [5] Others (specify) _____
58. What price do you sell the part of processed dagaa affected by post harvest losses? (UShs/kg, basin, bag)	
59. What measures do you take to maintain quality of your dagaa traded?	
60. What are the main challenges you experience in dagaa trading?	

61. What can be done to achieve the following?

a) Reduce post harvest losses at production level? _____

_____

b) Improve processing? _____

_____

c) Improve trading?

_____

_____

d) Improve human consumption of dagaa? _____

_____

Thank you for your time and information