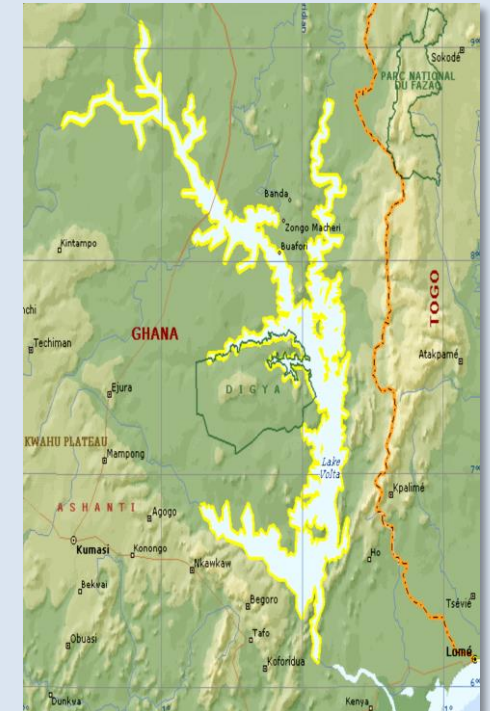


# A STRATEGY FOR SUSTAINABLE AND COMPETITIVE FISHERIES AND AQUACULTURE POST-HARVEST CHAINS AND REGIONAL TRADE IN RIPARIAN COUNTRIES OF THE VOLTA BASIN



## Table of Contents

Table of Contents .....	2
Acknowledgements.....	4
Abbreviations and Acronyms.....	5
Preparation of this document.....	6
<b>1 Purpose of the Strategy .....</b>	<b>7</b>
1.1 Objectives.....	8
1.2 Context.....	8
<b>2 Results of the NFFP assessments on Capture Fisheries and Aquaculture Post-Harvest Losses.....</b>	<b>11</b>
2.1 Common challenges in the six riparian countries of the Volta Basin.....	12
2.1.1 <i>Specific gender issues in fish handling, processing and trade .....</i>	<i>12</i>
2.1.2 <i>Critical strategic issues in the Fisheries and Aquaculture Post-Harvest Chains and Regional Trade (FAPHC &amp; RT) in the riparian countries of the Volta Basin</i>	<i>14</i>
2.1.3 <i>Assessment of cross-border trade .....</i>	<i>14</i>
2.2 National results .....	15
2.2.1 <i>Benin.....</i>	<i>15</i>
2.2.2 <i>Burkina Faso.....</i>	<i>15</i>
2.2.3 <i>Ghana .....</i>	<i>17</i>
2.2.4 <i>Côte d'Ivoire .....</i>	<i>20</i>
2.2.5 <i>Mali.....</i>	<i>20</i>
2.2.6 <i>Togo .....</i>	<i>20</i>
2.3 Determinants and drivers of post-harvest losses and trade barriers in the six riparian countries of the Volta Basin.....	21
<b>3 Strategic priority areas of intervention on Fisheries and Aquaculture Post-Harvest Chain and Regional Trade (FAPHC &amp; RT).....</b>	<b>30</b>
3.1 Prioritisation of key areas of intervention.....	30
3.2 Guidelines for a sub-regional programme and national action plans addressing priority areas of intervention.....	41

3.2.1	<i>The role of government</i> .....	42
3.2.2	<i>The role of the private sector</i> .....	42
3.2.3	<i>Overarching supporting umbrella: Coordination, collaboration, and partnership</i> .....	43
3.2.4	<i>First cross-cutting beam: Resilience and Social Protection</i> .....	45
3.2.5	<i>Second cross-cutting beam: Gender concerns</i> .....	45
3.2.6	<i>Priority Area 1: Capacity Development</i> .....	45
3.2.7	<i>Priority Area 2: Policy/Regulations</i> .....	46
3.2.8	<i>Priority Area 3: Infrastructure/ Services</i> .....	46
3.2.9	<i>Priority Area 4: Technology/Techniques</i> .....	47
3.2.10	<i>Priority Area 5: Market Access</i> .....	47
3.2.11	<i>Priority Area 6: Consumer level intervention</i> .....	47
3.3	<i>Coordinating and monitoring implementation</i> .....	49
	<b>References and Bibliography</b> .....	<b>50</b>

## Acknowledgements

FAO and NPCA thanks all those who contributed to the contents of this product, particularly Patience Adabadzi, Paul Anoh, Emmanuel Nii Aryee, Julienne Bado Kabore, Charles Biney, Donikpo Coulibaly, Séraphin Nadjé Dedi, Ousmane Diallo, Yvette Diei-Ouadi, Hamady Diop, Labla Jérémie Diomande, Micheline Somplehi Dion, Tanah Djankla Modjosso, Ali Domatani, Akande R. Gbola, Olivia Gnakalé, Katrien Holvoet, David Gbetogo Hougue, Jackson Kangethe, Madi Maténé Keita, Serge Kinhegede, Angèle Bokobosso Kisse, Allou Koffi, N'gandi Jean-Serge Kouadio, Kokou Koudouvor, Fatimata Maiga, Sakchai McDonough, A. Séraphin N'Dri, Frieda Adjoa Oduro, Yacouba Ouedraogo, Matilda Quist, Illia Rosenthal, Emmanuel Sanou, Kouassi Franck Eric Sehi, David Signa, Gnandi Tabe, Kennely Wongla, Henri Zerbo and Antoinette Ziehi. Thanks go especially to the various institutions responsible for fisheries in the Volta Basin riparian countries for their genuine cooperation. Their unwavering support in the process ranging from capacity development to field studies, pilot interventions and the development of a common strategy was decisive in the attainment of this result. FAO and NPCA hereby acknowledge the immense contribution and solicitude of the different country teams that were asked to participate in the NFFP for this purpose.

FAO and NPCA would also like to thank the Volta Basin Authority for adhering to the spirit of the work carried out and all those who, through their objective comments and recommendations, have led to consolidating this source of information made up by this report.

## Abbreviations and Acronyms

AFPF & RS	African Fisheries and Aquaculture Policy Framework and Reform Strategy
CAADP	Comprehensive Africa Agriculture Development Programme
CAMFA	Conference of African Ministers of Fisheries and Aquaculture
CCRF	FAO Code of Conduct for Responsible Fisheries
FAO	Food and Agriculture Organization of the United Nations
FAPHC&RT	Fisheries and Aquaculture Post-Harvest Chain and Regional Trade
FIPM	Products, Trade and Marketing Branch
GAP	Good Aquaculture Practice
GHP	Good Hygienic Practice
GMP	Good Manufacturing Practice
GWG	Governance Working Group
HACCP	Hazard Analysis Critical Control Point
MDGs	Millennium Development Goals
NEPAD	New Partnership for Africa's Development
NFFP	NEPAD-FAO Fish Programme
NGO	Non-Governmental Organization
NPCA	NEPAD Planning and Coordinating Agency
PAF	The International Partnership for African Fisheries Governance and Trade
PHLA	Post-Harvest Loss Assessment
VBA	Volta Basin Authority

## Preparation of this document

Following the completion of the Post-Harvest Loss Assessment (PHLA) activities by the participating countries of the Volta Basin, the New Partnership for African Development (NEPAD) Planning and Coordinating Agency (NPCA) and FAO, through the NEPAD-FAO Fish Programme (NFFP), with the support of the Directorate of Fisheries of Burkina Faso, organised a Regional Workshop on "Improvement of post-harvest chains and regional trade in countries bordering the Volta Basin" which took place from 18 to 20 February 2014, at the Joly Hotel in Ouagadougou. The workshop was attended by participants from public administration of Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mali and Togo, professional organizations, fisheries and post-harvest experts, NFFP and FAO experts and representatives of the authorities of the basins of the Volta and Lake Chad. The aim of the workshop was to draw lessons and key elements from the PHLA reports to then generate an informed ***Strategy for sustainable reduction of post-harvest losses and improved regional trade in fishery and aquaculture products of the Volta basin***. The Strategy was developed during a consultative process led by NPCA and FAO, through NFFP and with the support of the beneficiary countries. Following highly interactive deliberations, the drafting of the Strategy's elements was carried out by a core of experts from the workshop, reviewed during a final workshop held in Grand Bassam, Côte d'Ivoire to be presented in this document.

## 1 Purpose of the Strategy

Fisheries and aquaculture are essential for food and nutrition security, employment, income generation and improved livelihoods. The Volta Basin provides a significant number of fisheries and fisheries-related jobs. However, operations face significant challenges, with inefficiencies at the upstream and downstream levels that include multifaceted issues. In order to understand how to improve this situation sustainably, the NEPAD-FAO Fish Programme (NFFP) conducted pilot studies on post-harvest fisheries losses in the riparian countries of the Volta Basin. The main objective was to gauge the performance of the post-harvest chain by assessing the causes, nature, contextual patterns and extent of these losses within this shared water body. NFFP thus developed the capacity of fisheries officers and fishers in loss assessment and in designing sustainable loss-reduction cost-effective interventions. This comprised building a sound understanding of fish losses and their intricate dimensions, including a knowledge-imparting gender analysis process and generated lessons and elements for an informed strategy for sustainable reduction of post-harvest losses and greater regional trade in fishery products. This strategy was developed following the Regional Workshop on the “Improvement of post-harvest chains and regional trade in countries bordering the Volta Basin” which took place from 18 to 20 February 2014 in Ouagadougou, Burkina Faso, organized by the NEPAD Planning and Coordinating Agency (NPCA) and FAO, through the NFFP with the support of the Directorate of Fisheries of Burkina Faso. This consultative meeting of stakeholders identified drivers and determinants of post-harvest fish losses and trade barriers in the Volta region.

The elements that were mapped out as well as the priority areas for interventions partially informed the Meeting of senior officials of fisheries and aquaculture, held on 28 – 29 April 2014, in Addis Ababa, prior to the 2nd Conference of Ministers of Fisheries and Aquaculture in Africa (CAMFA II) during which the African Fisheries and Aquaculture Policy Framework and Reform Strategy (AFPF & RS) was endorsed. This Strategy is especially consistent, with its Section 4.4 on “*Responsible and equitable fish trade and marketing*”, as well as with other chapters regarding small-scale fisheries development, sustainable resource use, strengthening resilience, reducing vulnerabilities, and gender mainstreaming. It therefore also fits within the principles and objectives of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication endorsed by FAO member countries at the 31st Session of the Committee on Fisheries (COFI), held in Rome, Italy, from 9 to 13 June 2014.

## 1.1 Objectives

First and foremost, this strategy is aligned with the objectives of the Malabo Declaration in which the African Union Heads of State and Governments committed to reduce the existing level of post-harvest losses by at least 50% by 2025<sup>1</sup>, as it is part of the continental challenge in the fight against food and nutrition insecurity.

More precisely, this strategy aims to guide the actions that are to be undertaken at the level of the Volta Basin, in order to improve the performance of the fisheries and aquaculture post-harvest chain and regional trade based on the results of the post-harvest loss assessments conducted in the riparian countries, which allowed to gauge the causes, nature, contextual patterns and extent of these losses within this shared water body.

Finally, the strategy and the actions that may result from it, such a sub-regional program, action plans and / or national projects are intended as examples of good practice in reducing post-harvest losses to enable implementing the same type of process in other geographical contexts.

## 1.2 Context

In order to improve food security and livelihoods in the continent through proper management of African fish resources, NEPAD aims to strengthen Africa's capacity to consider, determine and implement responsive reforms in fisheries governance and trade through the NEPAD Fisheries and Aquaculture programme. In 2013, the Trade Working Group (TWG), under the PAF initiative, published studies and implementation plans on 'Updated data on cross-border and international trade', 'Identification of obstacles, (time and cost increase, trade governance, code of practices, hampering smooth imports and exports of fish, especially intra-regional trade)' and 'Loss reduction and value addition for better market access for fish and fisheries products', which were essential components of the PAF programme, which ended in 2014.

Securing post-harvest benefits through fish loss control has long been a concern of development practitioners committed to improving the livelihoods of fishers, processors and traders and the contribution of fish products to food security. Cost-effective loss reduction would improve income, contributing to poverty eradication and improved food security. The FAO Code of Conduct for Responsible Fisheries (CCRF) recognises the important problem of fish losses under Article 11.1 – Responsible fish utilization (FAO, 1998), which places an emphasis on loss reduction:

*Sub-article 11.1.5 States should give due consideration to the economic and social role of the post-harvest fisheries sector when formulating national policies for the sustainable development and utilisation of fishery resources.*

---

<sup>1</sup> African Union Heads of State and Governments of the African Union met in June 2014 in, Malabo, Equatorial Guinea. The AU Heads of State and Governments committed to reduce the existing level of post-harvest losses by at least 50% by 2025 in the Declaration of Malabo, adopted during the meeting.



*Sub-article 11.1.6 States and relevant organisations should sponsor research in fish technology and quality assurance and support projects to improve post-harvest handling of fish, taking into account the economic, social, environmental and nutritional impact of such projects.*

*Sub-article 11.1.7 States, noting the existence of different production methods, should through cooperation and by facilitating the development and transfer of appropriate technologies, ensure that processing, transporting and storage methods are environmentally sound.*

*Sub-article 11.1.8 States should encourage those involved in fish processing, distribution and marketing to:*

- a) reduce post-harvest losses and waste;*
- b) improve the use of by-catch to the extent that this is consistent with responsible fisheries management practices; and*
- c) use the resources, especially water and energy, in particular wood, in an environmentally sound manner.*

The most obvious means to increase fish supply, even without increased landings, is to reduce losses of what is presently caught. Yet, a rational use of already scarce development resources, along with planning and implementation of effective loss reduction strategies, require that losses be thoroughly assessed and due attention be given to reducing those that are significant (Akande and Diei-Ouadi, 2010).

Post-harvest losses pose not only a threat to food and nutrition security but also to the livelihoods of the value chain actors involved and to natural resources sustainability. Because of their structural limitations, small-scale fisheries are the most affected. Addressing the multifaceted dimensions of post-harvest losses compounded by the dispersed nature in small-scale operations requires a holistic approach, which entails first understanding their contextual occurrence to then set baselines including priority losses and establish milestones to gauge progress in loss reduction efforts.

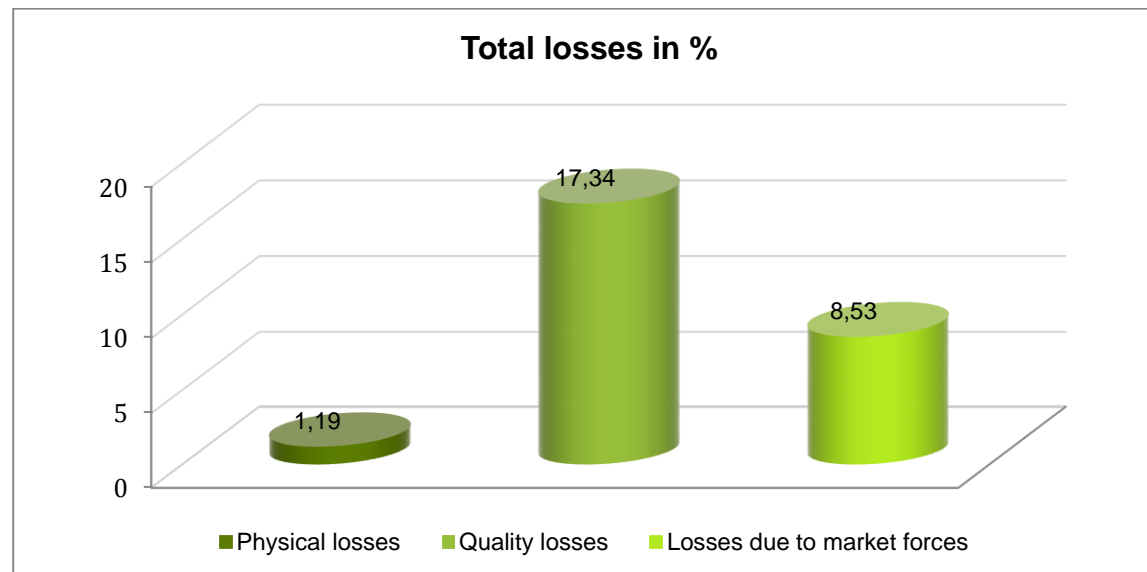
Between 2006 and 2008, under an FAO initiative, assessments were undertaken in five Sub-Saharan countries, Ghana, Kenya, Mali, Tanzania, and Uganda, (Akande and Diei-Ouadi, 2010) as part of the validation process of the post-harvest loss assessment methods and capacity building. This led to the publication of a manual for extension workers (Diei-Ouadi and Mgawe, 2011). The work of the NFFP in the Volta Basin has been centred on applying these validated loss assessment methods to take stock of mainstreaming important gender considerations, climate changes and any other eventual vulnerability factor to then identify the key drivers of losses that affect trade within the riparian countries. This has been a collaborative effort between fisheries institutions providing logistical support and the teams of fish loss assessors while NFFP provides capacity building and support to all the activities in the field. This work has been consistent with Section 4.4, on “*Responsible and equitable fish trade and marketing*” of the African Fisheries and Aquaculture Policy Framework and Reform Strategy (AFPF & RS), and other chapters regarding small-scale fisheries development, sustainable resource use, gender issues, strengthening resilience and reducing vulnerabilities. This strategy, which is one of NFFP’s final outputs, will help consolidate the efforts of the riparian countries of the Volta Basin in effectively implementing the reforms endorsed by the Conference of African Ministers of Fisheries and Aquaculture (CAMFA 2) that took place in Addis Ababa, on 1 and 2 May 2014. It reflects the buy-in of both high-level

officials and representatives of fishers, processors and traders during the assessment process, from the desk review to the field data collection and sharing. In addition, the involvement of the Volta Basin Authority (VBA) during the final workshop, where the elements of a common strategy were developed, is a clear indication of their level of ownership, which is essential to implement the AFPF & RS in the context of the Volta Basin.

## 2 Results of the NFFP assessments on Capture Fisheries and Aquaculture Post-Harvest Losses

Estimates of Volta Lake’s fishery potential range from 40,000 to 271,000 tonnes and there is no consensus as to what the most accurate figures may be within this broad range, (Béné and Russell, 2007). Fisheries related activities, however, provide a substantial contribution to the Volta Basin households’ livelihoods, and are the primary income generating activity for most families in the area, contributing over 70 percent of revenue on average. This figure, of course, reflects the fact that fishing is a major activity for communities along the shores of the basin. Fishing is mostly done by men and processing chiefly by women.

Post-harvest fisheries losses are of great concern because they equate to a loss of valuable animal protein and nutrients for consumers and lost income for fishers, processors and traders. Reducing losses is therefore an important development goal for the fisheries sector. Three types of losses have been identified in the supply chain of fresh wild *Tilapia* that are of importance according to the NFFP study conducted in 2013. It showed that quality losses and those due to market forces are significant while physical losses (fish removed from the supply chain) are generally very low. As shown in the figure here below, total cumulative losses over a year of production average 27 percent, with levels ranging from 13.5 percent to 45.5 percent depending on the country. However, these average figures mask significant discrepancies that exist between fishing sites, stakeholder groups and countries [Ref. to the PHLA report]



## **2.1 Common challenges in the six riparian countries of the Volta Basin**

### ***2.1.1 Specific gender issues in fish handling, processing and trade***

The countries studies showed that post harvest-operations conducted by women and member of vulnerable groups are hampered by a number of factors that lead to a significant difference between men and women as well as marginalized and well-off value chain actors. The figure here below illustrates these dimensions in terms of quality, quantity and/or due to market forces losses:



## MAIN GENDER ISSUES IN PROCESSING AND SALE



THE SOLE **BURDEN OF HOUSEHOLD CHORES** AND THE **LONG DISTANCE** FROM THE LAKESIDE CAN DELAY WOMEN FROM REACHING THE LAKESIDE EARLY ENOUGH TO PURCHASE THE FIRST SALE/AUCTION FISH. THIS PRECLUDES THEM FROM GETTING THE BEST QUALITY FISH FROM THEIR SUPPLIERS/FISHERMEN.



WITH A RAW MATERIAL, IN WHICH **QUALITY LOSS** IS ALREADY EMBEDDED (AS THEY PREVIOUSLY BOUGHT DETERIORATED FISH) WOMEN ARE LIKELY TO ACCUMULATE LOSS ESPECIALLY THAT THEY DO NOT USE ICE.



THE SHIFTS IN **SPECIES DISTRIBUTION** LED BY CLIMATE CHANGES AND MAN-MADE ACTIVITIES MAY REQUIRE CHANGES IN TECHNOLOGY, IMPLYING **ADDITIONAL COSTS**.



**COMBINING HOUSEHOLD CHORES WITH SMOKING** EXPOSES THE FISH TO PARTIAL OR COMPLETE BURNING ESPECIALLY WHEN THERE ARE NO HELPERS AND/OR CHILDCARE FACILITY.



HOUSEHOLD CHORES AND **CHILD CARE** WOULD PLAY A CRITICAL ROLE IN THEIR ABILITY TO ACCESS **LONGER DISTANCE MARKETS** THAT MAY BE MORE REMUNERATIVE. THIS IS ACUTE DURING BUMPER HARVESTS, REQUIRING TARGETING ALTERNATIVE MARKETS THAN THE OVERSUPPLIED LOCAL CHANNELS.



IN AREAS WHERE **SOCIO-CULTURAL BARRIERS** RESTRICT THEIR MOVEMENT (ESPECIALLY TO LONGER DISTANCE/BEYOND THEIR SITE OF OPERATION), ACCESS TO THE BEST/SUITABLE MARKETING OUTLET IS IMPOSSIBLE

### ***2.1.2 Critical strategic issues in the Fisheries and Aquaculture Post-Harvest Chains and Regional Trade (FAPHC & RT) in the riparian countries of the Volta Basin***

The pilot study identified three major types of losses in the region: physical losses, quality losses and losses due to market forces. A number of factors contributing to these losses were identified during the study:

- a) Basic amenities and infrastructures are almost non-existent and/or in poor condition in fishing, processing and marketing sites;
- b) Prevalence of high rates of illiteracy, poor group dynamics and individualism among the major actors; gender imbalance in fish trade, which is predominantly carried out by women who constitute 95 percent of fish processors and often combine running of household with fish smoking activities and trade. This results in losses incurred because of divided interest between processing activities and household tasks especially regarding child care;
- c) Marketing is mostly local but also takes place in major cities in the Basin this triggers losses that are incurred during transit due to armed robbery attacks, vehicle breakdowns due to poor road conditions and poor communication infrastructure.
- d) The lack of flexibility in the market structure/institutional set up within a context of difficult preservation and storage conditions of both fresh and processed fish also contributes to increasing eventual losses.
- e) Trade volumes are rarely documented.
- f) The three types of losses differ between countries and fishing sites in varying levels and have diverse degrees of impacts on livelihoods and food security.
- g) There is a relationship between the operators' precarious financial resources and their access to technology.
- h) There is a link between vulnerability to losses and coping strategies and the sustainability of natural resources.
- i) Climate/environment change affects not only the type and volume of landings but also downstream activities.
- j) Significant impacts of man-made activities (pollution of the river banks), and
- k) Regional trade dynamics and barriers.

### ***2.1.3 Assessment of cross-border trade***

Trade within the riparian countries has been informal with little documentation or no data recording the types of products, the volume of trade or the issues linked to hassles by authorities. Pittaluga et. al. (2003) estimated that 30 percent of fish caught is sold by local fish traders (middle women): 15 percent by the young and small scale fish traders at the beach, and another 15 percent sold by the wives of fishers directly to fish traders distant from markets. Wholesale fish traders purchase about 40 percent.

A large proportion of the fish is sold wholesale. Wholesale traders travel to fishing villages to purchase processed fish and return to the lakeside market within the next two-three days with the fish to prepare its transport to urban centres. At times, multiple intermediaries may be involved in handling the fish before it reaches markets.

The volume of fish bought by the distant fish traders (not the local middle women who can grant credit and other services) is a function of two dominant variables: financial and social assets. Successful experienced traders can benefit from the trust they have acquired during their long relationships with the fishers. This facilitates their purchase on credit, which is then paid on subsequent visits. Additionally, some wholesale fish traders own a number of fishing winch-net and gillnet fishing boats and hire these to fishers to work for them and take over the control of fish caught by these fishers.

## **2.2 National results**

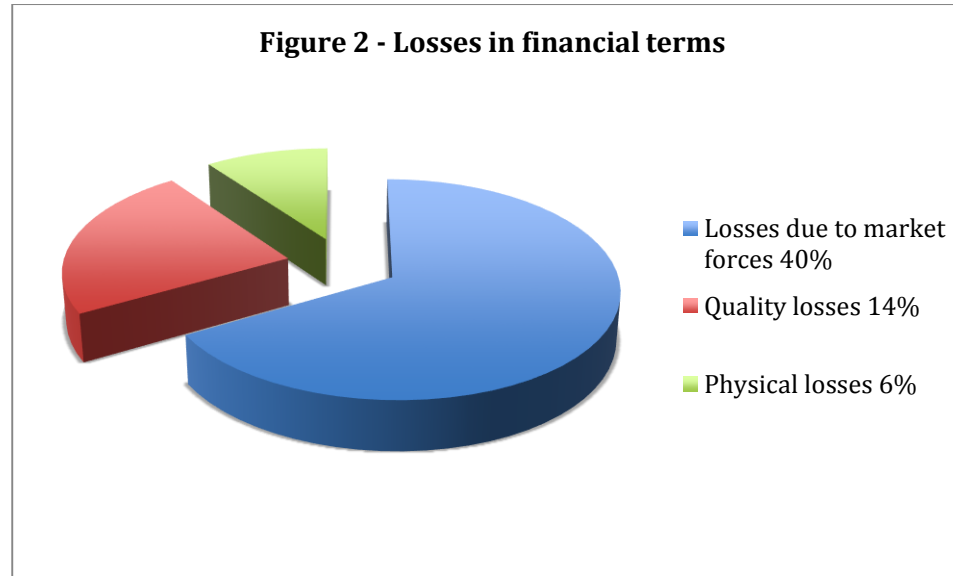
### **2.2.1 Benin**

Fisheries activities in the Volta Basin in Benin have not been studied adequately. However, fish production is seen as an important para-agricultural activity in the basin. Although fish are abundant in the Oti River in Benin, fisheries activities in this country are limited compared to those in Ghana and Burkina Faso.

### **2.2.2 Burkina Faso**

Causes of losses in Burkina Faso are essentially the inadequate cold chain, poor handling practices, the long-term fish collection time, inefficient smoking techniques and ill-timed and mismanaged imports of *Tilapia* during the local peak fishing season. The major losses incurred by dealers of fresh fish are due to inadequate preservation prior to marketing given the lack of sufficient icing or proper storage conditions (fish is improperly stowed in makeshift poorly insulated containers).

On average, the various losses are 60 percent of the total tonnage sold by wholesalers. Out of these 60 percent, losses due to market forces represent 40 percent, quality losses 14 percent and physical losses 6 percent, as shown in Figure 2.



This results in fishmongers losing roughly 23 percent of expected annual sales. The monetary impact of physical losses and those due to the market forces represent six and five percent respectively of the turnover of wholesalers. Quality losses drain wholesalers' financial gains by 12 percent. Losses due to market forces are more important in terms of tonnage but the financial impact is less compared to quality losses.

For fishermen, qualitative losses occur predominantly during the setting of gillnet gear, which is used on every site and during transport of fish ashore. The main causes of quality losses for fishers are poor water quality, capturing small size tilapia (constituting the average weight of catches), and unavailability of storage devices on board. Adverse weather conditions, especially during the months of March, April and May, also amplify the level of losses during this period.

Water pollution leading to poor water quality and the use of prohibited fishing gear and methods of fishing are telling examples of how regulations and proper fisheries governance are not enforced. Poor water quality during the months of October and November is the cause of 35 percent of the annual quality losses incurred by fishermen in Tounga.

In Gouran, 94 percent of respondents believe that the use of non-regulatory nets with small mesh sizes is responsible for the high number of small tilapia in fishermen's catches. This practice is responsible for 73 percent of quality losses on the Gouran and Di sites, where these types of nets are mostly used and fishermen in Tounga, Gouran and Di are most affected by these losses. The PHLA found that in Tounga, these losses represent 24.4



percent of the annual production for an amount of about 61 million USD/year and correspond to 86 percent of the total value of losses incurred by fishermen, whose livelihoods are heavily affected as women have little involvement in post-harvest activities. Annual quality losses of landings in the Gouran, Di and Bama sites are 24.2, 22.1 and 13.2 percent respectively.

In Bama, the use of cast nets instead of gillnets partially explains the relatively low occurrence of quality losses. Most of the fishermen affected by quality losses are over 50 years old, as they do not have enough physical strength to deploy cast nets that generate fewer losses than gillnets.

Losses due to market forces are significant in Gouran and Di where small tilapia production is between 73 percent and 80 percent. Losses due to market forces in Gouran and Di represent 24.9 percent – USD 9.5 million – and 25.4 percent – USD 11.5 million – of the annual production respectively.

In Gouran and Di, retailers recorded qualitative losses and losses due to market forces from the fish bought locally from wholesalers. In terms of consignments, quality losses are on average 8 percent and losses due to market forces can be as high as 72 percent. Quality losses are more recurrent throughout the year. For an annual supply of 3,600 kg per dealer, physical losses are estimated at 288 kg and 2,592 kg are sold under the impact of market forces. The annual monetary value of losses varies between 864,000 and 882,000 XOF for each retailer, which represents 14 percent of turnover. Losses due to market forces have a monetary impact of 10 percent on turnover and 4 percent may be attributed to quality losses.

Losses due to market forces may be attributed to low competitiveness of locally produced tilapia over imported ones. In Kompienga, this is exacerbated by fishermen increasing their prices because of incidental and operating expenses, and competition between different groups of fishmongers. The amount associated with losses incurred by fishmongers due to market forces is estimated at 25 percent of annual traded fish.

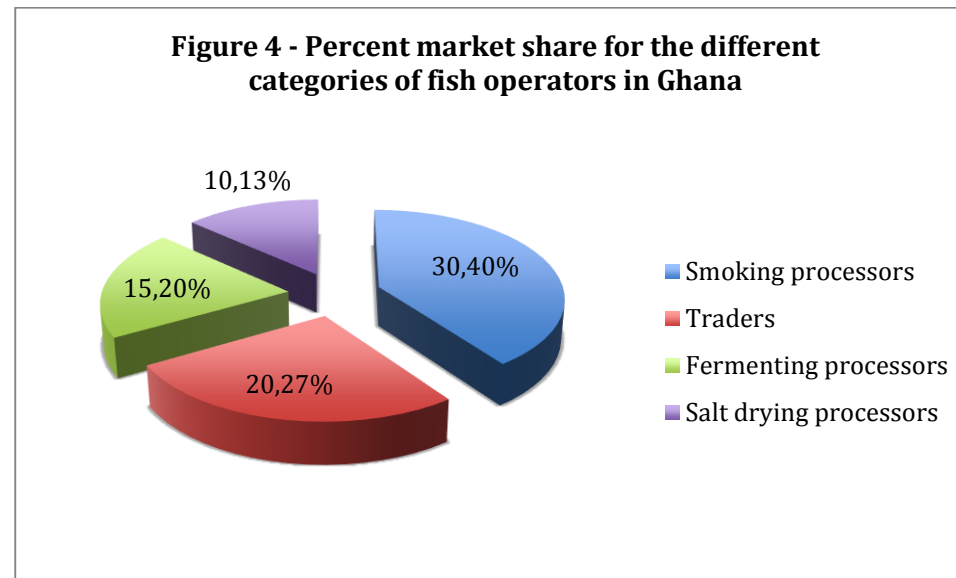
Qualitative losses are the most important for smoked fish processors and wholesalers. For smokers in Di, these are due to the low quality (freshness conditions, size) of raw materials and inefficient smoking techniques. As a result, qualitative losses are estimated at 12,220 kg of smoked fish, or 17 percent of annual production and valued at 10.3 million XOF, or 11.4 percent of the annual smoked fish turnover.

### **2.2.3 Ghana**

Most fishing villages do not have their own markets and depend on a few larger lakeside towns for the marketing of their catch. As a consequence a large number of fishing communities channel their products through market towns outside their administrative boundaries. While a few markets are accessible by paved roads (Asuogyaman, Jasikan and Kpando markets), most roads in rural areas are unpaved and in the rainy season their conditions make fish trading very difficult. The PHLA found that this, coupled with usually poor handling and processing operations, resulted in losses at the four study sites (Buipe, Yeji, Dzemeni and Tapa Abatoase) that can be traced back to fishing locations where the products originated and where losses are considered to be higher.

Processing methods comprise smoking, salting, sun-drying and fermentation. Fishers' wives and relatives, who predominantly do the processing, sell the processed fish on a weekly basis at a local market and give the sales revenues to their husbands.

Significant losses due to market forces occur at different stages by value chain actors, fish smokers, salt dryers and traders respectively, amounting up to 20 percent. The threat of armed robbers along major roads and highways has slowed down the pace of trading activities in all the visited markets which has led to “artificial glut” with subsequent high records of losses due to market forces. The markets observed are also in dire need of renovation given their rundown state. Quality losses and physical losses make up 5 percent and 4 percent of total fish supply respectively. According to the report, markets follow a schedule with a frequency of one to a maximum of two times per week, hence lacking flexibility because they are not set up according to fishing seasons or the expected volume of products and this contributes to quality losses and, at times, physical losses and is not conducive for regular fresh fish sales from fishing centres. Inadequate storage capacity and conditions have also been identified as factors influencing the level of losses. Women are incurring losses because they are distracted while processing fish as they have to combine this with running of household/child care tasks; they have less access to the best quality raw material, because of delays at home while the first auction or sale is taking place. The study focused on four categories of fish operators – traders, smokers, salt dryers and fermenters – in the four study sites. Figure 4 shows the percent market share of different categories of fish operators in Ghana.

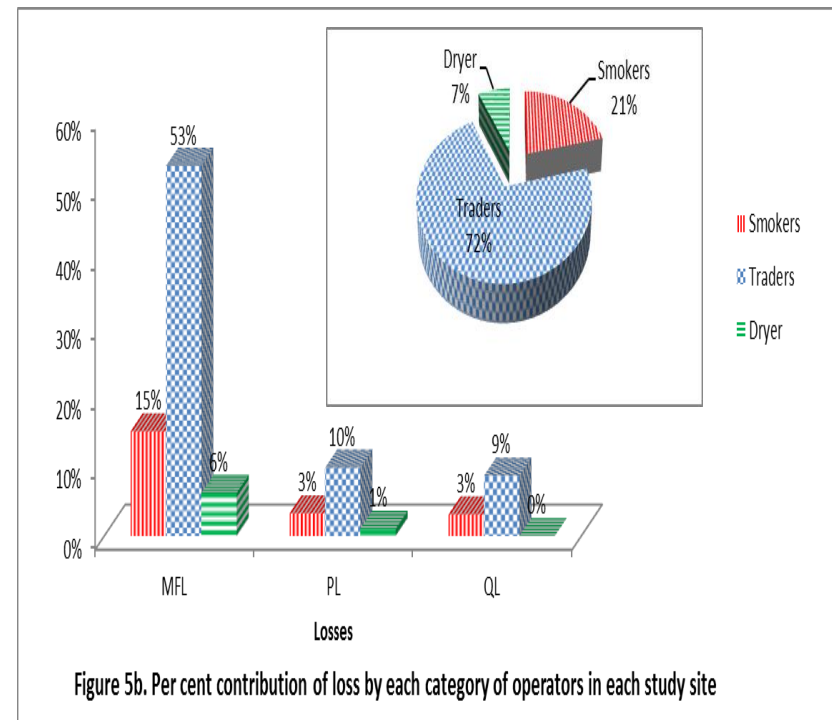
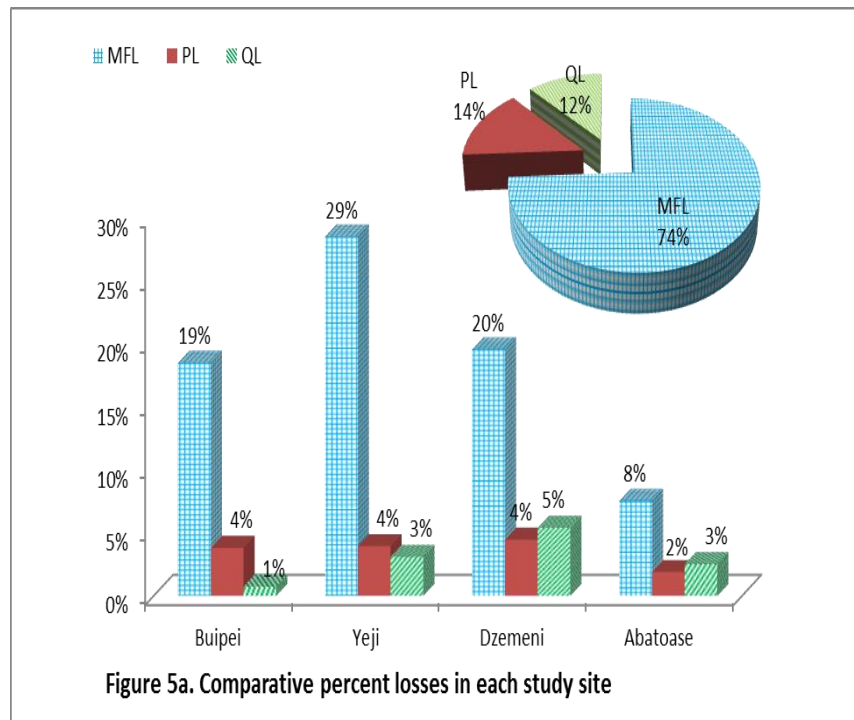


Figures 5a and b summarise different types of losses that occur for each category of operators in the study sites. Generally, losses due to market forces were the highest of total losses (74 percent) followed by physical ones (14 percent) while quality losses were minimal (12 percent) as shown in Figure

5a. The contribution of losses in percentage is presented in Figure 5b for each category of operators in the study sites. Traders recorded the highest losses due to market forces (53 percent) followed by smokers (15 percent). Traders had the highest physical losses – 10 percent – as opposed to smokers with 3 percent. This comparative analysis shows that smokers had higher physical losses (3 percent) and quality losses (3 percent) than salt dryers who had one percent physical losses but no quality loss due to the nature of the product.

In Dzemeni, the quality losses (4 percent) were higher than the physical losses (3 percent). Smokers incurred the highest quality losses; In Tapoa-Abatoase, quality losses (3 percent) was also higher than physical losses (2 percent); fermenters only faced losses due to market forces (7.4 percent).

In general, the level and probably also the nature of the losses reported on the Ghana side of the basin are lower than those of other countries. The main reason cited was that in this particular instance, the study looked in most instances at the markets where products are sold rather than the original fishing sites where handling and processing occur, and where losses would be higher (e.g. the losses would be higher at the camps and the villages where operations that supply markets are held, as usually a sorting stage takes place before the products are brought to the market).



#### **2.2.4 Côte d'Ivoire**

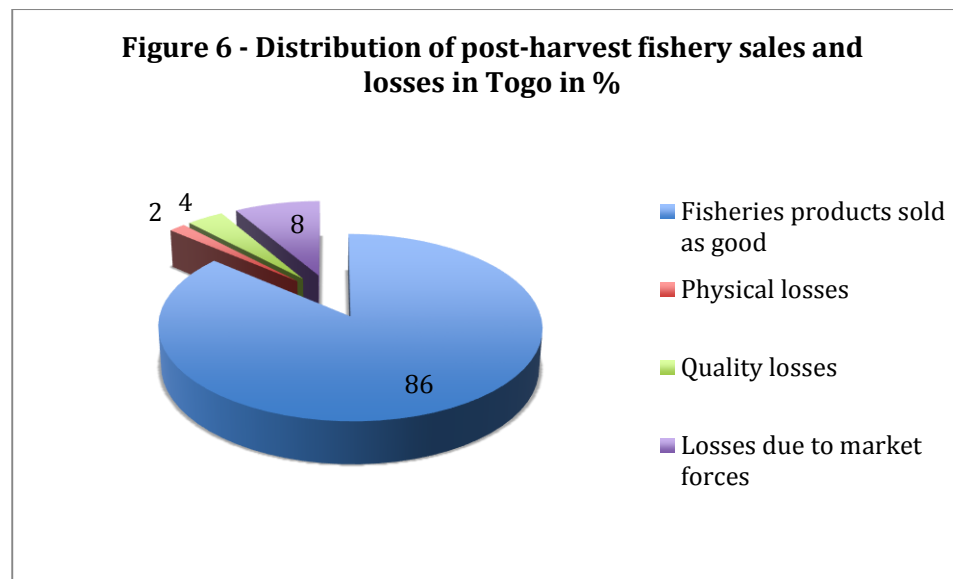
In Côte d'Ivoire, the contribution of fisheries is not optimized because of inefficiencies along the supply chain, including post-harvest losses. The contribution of the Volta Basin is very minimal but the result of the pilot study carried out by NFFP in 2013 in the Abobodoume processing centre, located in a suburb of Abidjan, showed that critical losses occurred at the handling stage of fresh fish and the storage of processed fish. The losses are due to microbial growth and survival because of the inability to maintain the cold chain. For dried products, these are also due to rancidity and attack by insects. Quality losses make up to one third (33.3%) of the average annual amount of fish purchased primarily during the good season and were identified as the major loss. Losses linked to market forces are significant because of missed market opportunities (supply and demand, lack of market information and lack of infrastructure). Products rejected by fishmongers are sold directly by fishermen to women processors who ferment and smoke them. This processing compensates for the physical loss. The average annual financial loss as a result of quality losses is approximately 47,997,000 XOF per fishmonger. The causes identified by the study are inadequate infrastructure (non-equipped landing sites), lack of equipment (cold rooms and ice plants) and lack of potable water.

#### **2.2.5 Mali**

Quality losses, market forces losses and physical losses were recorded for fresh fish and smoked fish during the NFFP study in 2013. The average quality and physical losses are 10.87 percent and 1.28 percent respectively. Fresh fish losses on the Konna site constitute 6.4 percent of overall catches. Identified causes of losses are generally vehicles breaking down, lack of ice, poor handling and weak management capacity during peak periods, poor preservation and storage conditions; they also include products prices being reduced for fear of poor sales due to the lack of infrastructure and equipment, weak knowledge of Good Hygiene Practices (GHP) and Good Manufacturing Practices (GMP), inadequate processing capability, robbery attacks and use of inappropriate fishing gear or set nets.

#### **2.2.6 Togo**

The three types of losses (due to market forces, qualitative, quantitative) were observed. The NFFP 2013 study sites comprised a total of 61,013kg in production; out of these, 86.25 percent (52,625kg) were sold in good quality while losses due to market forces accounted for 8.46 percent (5,162kg), quality losses for 3.65 percent (2,226kg) and physical losses for 1.64 percent (1000kg) summarized in Figure 6.



At the fishing stage, the main causes of losses include inadequate or dormant fishing gillnets, longlines and beach seine that bring in about 7 percent of total fish production. Losses during the peak harvest season were also due to poor storage facilities and the poor availability of ice to adequately preserve fresh catches. Losses due to improper processing for smoking and frying equipment also contributed to about 7 percent losses of total catches during peak harvest season. Poor packaging and poor infrastructural facilities such as poor road conditions, poor communication technology and inadequate market information singly or collectively contribute to quality losses, physical losses and losses due to market forces in Togo.

### **2.3 Determinants and drivers of post-harvest losses and trade barriers in the six riparian countries of the Volta Basin**

According to the results of the studies conducted during the NFFP, Table1 describes the identified specific and common determinants of post-harvest losses and trade barriers. They are categorized according to their level of relevance and their link to policy-related and developmental issues such as policy (P) and regulations (R), stakeholders’ capacity development (CD), infrastructure (I) and services, technology (T) and techniques, consumer level interventions (I) while integrating gender dimensions.

**Table 1. The categorization of the identified specific and common determinants of post-harvest fish losses and trade barriers, their level of relevance and their link to policy related and developmental issues**

Variables / factors that may influence post-harvest losses of fish	Questions / issues involved	Category * (P, R, CD, I, T, IM, G, CI)*	Gender concerns	Level of relevance / eligibility	
				Sub-Regional	Country-specific (name of country)
<p><b>1. Changes in species distribution and the link with the preservation and processing of fish</b></p>	<ul style="list-style-type: none"> <li>- The hydroelectric dam being constructed at the end of the Volta Basin has reduced the species that were prevalent; this has affected the market and utilization resulting in the need to change processing techniques from salting to smoking or vice versa. Therefore technology and markets as well as change in species distribution have an impact on community resilience: Migration may be necessary and may also occur in good fishing areas.</li> <li>- For men the competitive situation may change for some fishermen who migrate to this area</li> <li>- No change reported in other countries</li> </ul>	T, I, IM, CI, CD	<ul style="list-style-type: none"> <li>- Women and other vulnerable groups are capable of responding to the challenges of changing market and changing technology. Training required: Access to land for the construction of kilns (or drying facilities depending on the situation) and access to capital for investment can be a problem;</li> <li>- New marketing systems may require investment</li> <li>- Need to improve women and other vulnerable groups access to capacity building development and market information</li> <li>- Losses in terms of income and fish quality especially to fishermen impact on other household members</li> <li>- Risk of more competition and, at times, conflicts between migrant and non-migrant</li> <li>- Women and other vulnerable groups' health risks (lung disease and eyes) change in the case of smoking instead of drying if inappropriate technology is used or provided</li> </ul>		Ghana for the dam issue

<p><b>2. Pollution or degradation of the environment in the fishing zone</b></p>	<ul style="list-style-type: none"> <li>– Silting of fishing areas and also impact on spawning grounds</li> <li>– Water quality affected by several factors:</li> <li>– Riverbanks occupied by vegetable growers in Sourou (creating silting and polluting with fertilizers/manure and pesticides)</li> <li>– Pollution by women who wash dishes and clothes on the banks</li> <li>– In Burkina Faso, the grass that grows at certain times of the year on Lake Kompienga and seasonal flooding bring about rotten fish and more fish mortality in these fishing areas</li> <li>– In Togo: The water level has been affected by the Kompienga dam and previously flooded habitat plains are no longer getting enough water and therefore have lost their spawning function</li> <li>– As the fuel used (firewood) is scarce, there is a need to use technology that reduces its consumption such as improved ovens or other technology to preserve the fish</li> </ul>	<p>T, P, R</p>	<ul style="list-style-type: none"> <li>– Men and women are affected by the decline in harvest</li> <li>– Women and other vulnerable groups are more affected by the decline in profit margin because of increasing timber prices</li> <li>– If regulations prohibit washing practices on the riverbanks, water supply and filtering infrastructure must be provided.</li> </ul>	<p>Regional problem</p>	<p>Burkina Faso and Mali</p> <p>Togo, Burkina Faso</p> <p>Burkina Faso</p> <p>Togo</p>
<p><b>3. Fishing practices increase pressure on the resources as a coping strategy / vicious cycle of vulnerability, loss and fishing efforts</b></p>	<ul style="list-style-type: none"> <li>– Fishermen use strategies of changing fishing techniques such as finer mesh nets and illegal practices to cope with the decline in harvest but these are harmful to the resource</li> <li>– Longer periods of time before hauling the nets (resulting in altering the quality and also market losses due to quality/ fish size)</li> <li>– Poor fishing practices such as using dynamite leading to fish skin bruising and breaking; use of chemicals</li> </ul>	<p>P, R</p>	<ul style="list-style-type: none"> <li>– Work time for processing and marketing not rewarding for the size and the quality of the fish</li> <li>– More competition between women and other vulnerable groups and more migration</li> </ul>	<p>Regional problem</p>	

	<ul style="list-style-type: none"> <li>– Fish falls from the net back into the water during hauling back</li> <li>– Poor handling causes bruising</li> <li>– Fish spends too much time in nets and spoils</li> <li>– No chilling on board, fish is exposed to high ambient temperatures in the boat</li> <li>– Rare use of insulated boxes</li> <li>– Cold chain not ensured</li> </ul>				
<p><b>4. Adverse weather conditions/climate change</b></p>	<ul style="list-style-type: none"> <li>– Climate change affects seasonal variations making fishing difficult to plan</li> <li>– Fish habitat is being destroyed by all of these factors</li> </ul>	<p>P, T, MI, CD, CI</p>	<ul style="list-style-type: none"> <li>– Although every one is affected, specific adaptation strategies that take into account gender (e.g. women and other vulnerable groups affected in their work direct and indirect processing) are necessary</li> </ul>	<p>Regional</p>	
<p><b>5. Offloading and handling of fish</b></p>	<ul style="list-style-type: none"> <li>– Infrastructure is not consistent with GHP (e.g. use of baskets) (BF, Mali)</li> <li>– Huge losses due to poor handling and storage conditions (quality loss) <ul style="list-style-type: none"> <li>○ Fish drops from containers during unloading and transport on shore</li> <li>○ Spoilage occurs as fish is left on beach and no ice is used</li> <li>○ Delay returning to landing after fishing, and exposure of fish to high ambient temperatures</li> <li>○ Stepping on fish, causing physical damage</li> <li>○ Poor hygienic practices causing contamination</li> <li>○ Very long bargaining time at first point-of-sale, while fish is kept on the ground exposed to ambient temperature</li> </ul> </li> <li>– Theft at the landing site during offloading of fish</li> </ul>	<p>P, R, I, CD</p>	<ul style="list-style-type: none"> <li>– Infrastructure should be provided by local and central government institutions</li> <li>– Actors are not well organized and therefore lacks lobbying capacity to improve conditions for landing,</li> <li>– Community based fisheries management committees are not active, which affects every one due to the lack of management</li> </ul>	<p>Regional</p>	<p>Burkina Faso, Mali</p>



<b>6. Fresh fish sales</b>	<ul style="list-style-type: none"> <li>- Inadequate application of ice, makeshift insulated container is used</li> <li>- Limited preservation capacity during bumper catches</li> <li>- No access to or lack of marketing information, with oversupply of market</li> </ul>	DC, I, T	<ul style="list-style-type: none"> <li>- Women are more affected. In 90% of the cases, they are the ones who do the selling</li> </ul>		Ghana
	<b>7. Access to fish preservation and processing techniques or technologies</b>	<ul style="list-style-type: none"> <li>- More input in the processing</li> <li>- Training of processors takes time and is highly informal</li> <li>- Trainees start as apprentices and learn along through observation, instructions and self-mastery to then advance to the professional level.</li> <li>- Lack of access to capital for post training investments (i.e. new technologies are known, but lack of funds to make the necessary investment)</li> <li>- Lack of potable water in some sites (Togo)</li> <li>- Loss of quality due to the use of inadequate technologies</li> <li>- Poor hygiene practices – personal and in the workplace</li> <li>- Inadequate fish handling practices</li> <li>- No business planning</li> <li>- Inadequate capacity to absorb raw material landings, especially during glut season</li> <li>- Adverse weather conditions make drying difficult</li> <li>- Insect infestation</li> <li>- Technology adoption problem</li> <li>- Inefficient processing method,</li> <li>- Processing of already spoiled fish</li> </ul>	T, I, CD, R, P, CI., MI	<ul style="list-style-type: none"> <li>- Women and other vulnerable groups are more affected. The difference in literacy and school enrolment rates disadvantages women in management capacity</li> <li>- Villages are often difficult to access and women’s training needs are thus not taken into account</li> </ul>	Regional

<b>8. Waste of other natural resources (e.g. wood)</b>	<ul style="list-style-type: none"> <li>– Inadequate control of heat intensity during smoking leads to over-smoking of fish and possible burning</li> <li>– Drying on the ground or cooling of fish unsupervised, breakage or damage due to inadequate packaging method and materials</li> </ul>				
	<ul style="list-style-type: none"> <li>– Excessive use of wood during smoking operations</li> <li>– Lack of access to new technologies</li> <li>– Research outcomes not adaptable to women processors. For example, the research failed to consider their inputs at the planning stage</li> <li>– Lack of knowledge about the correct methods for different species such waste of salt when processing the fish</li> </ul>	T, CD, I, R, P	<ul style="list-style-type: none"> <li>- Affects women more as they do most of the smoking and other types of product processing</li> <li>- Low profits (economics)</li> </ul>	Regional	
<b>9. Packaging and storage of fish</b>	<ul style="list-style-type: none"> <li>– Inadequate quality and quantity of packaging and storage facilities leading to spoilage</li> <li>– Processors' lack of skills</li> <li>– •Growth of mould causes spoilage and makes the fish damp</li> <li>– Insect infestation. Insects consume fish during storage</li> <li>– Discoloration owing to chemical changes during long storage</li> <li>– Theft of fish leading to financial losses</li> </ul>	R, CD, I, T	Men and women	Regional	
<b>10. Resistance from fishermen (or post-harvest operators) to change to adopt good practices</b>	<ul style="list-style-type: none"> <li>– Unwillingness</li> <li>– Low level of regulations enforcement</li> <li>– Adjustment difficulties (lack of resources, skills, information, illiteracy, etc.).</li> <li>– Age (especially 50 years and older)</li> </ul>	R, CD, I, T	Men and women	Regional	

<b>11. Comprehensive knowledge on fish handling and skills of fishers</b>	– Lack of knowledge of good handling practices	CD, I, T	Men and women	Regional	
	– Lack of financial resources				
<b>12. No record keeping and ignorance of the reasons for loss</b>	– Illiteracy	P, CD	Men and women	Regional	
	– Lack of entrepreneurship				
	– Low level of organization				
	– Low level of technical support				
<b>13. Management capacity of fishermen during exceptional harvest (facilities and expertise, information)</b>	– Low quality awareness of consumers				
	– Problem of preservation, processing and storage equipment and infrastructure	CD, I, T, IM	Men and women	Regional	
<b>14. Question of "transfer of loss" (to downstream operator in the chain - gender perspective - or fraudulent mixture of different quality products or weight increase for the consumer / buyer)</b>	– Lack of market information				
	– Type of fishing gear/technique	P, R, CI	Women and other vulnerable groups	Sub-regional	Ghana / Togo / Burkina Faso
<b>15. Logistics infrastructure /communication (roads, trucks)</b>	– Use of prohibited methods (chemicals, dynamite)				
	– Mixture of fresh and altered fish				
<b>16. Insecurity, unreliable transport</b>	– Physical damage to fish	P, R, I, T	Women and other vulnerable groups	Regional	Burkina Faso/Togo
	– Delays owing to breakdown of inadequate and defective transport vehicles and inaccessibility of production areas				
<b>16. Insecurity, unreliable transport</b>	– Impassable roads				
	– Poor road conditions				
<b>16. Insecurity, unreliable transport</b>	– Ill-adapted vehicles resulting in longer transit times and spoilage				
	– Armed Robberies, (loss of supply capacity by fishmongers / artificial glut in supply sites with eventual losses)	P, I, T, R	Women and other vulnerable groups	Sub-regional	Ghana
<b>16. Insecurity, unreliable transport</b>	– Defective vehicles				

<b>17. Market demand (e.g. social status and demand for specific types of fishery products or portion sizes)</b>	<ul style="list-style-type: none"> <li>– Low awareness of quality</li> <li>– Weak purchasing power/poverty level leading to special requests, contributing to the use of prohibited means of harvest</li> </ul>	R, CD, I, T, P, CI	Men and women	Sub-regional	Burkina Faso
<b>18. Marketing</b>  <b>Market access (physical facilities, the available information and management, the local organization and arrangements for sales performance)</b>	<ul style="list-style-type: none"> <li>– Insect infestation</li> <li>– Inadequate/ inconsistent supply and demand</li> <li>– Inadequate cold-storage facilities and warehouses</li> <li>– Unwillingness</li> <li>– Low level of regulations enforcement</li> <li>– Age (50 years and older)</li> <li>– Lack of information on market and professionalization of actors</li> <li>– Supplying the market at the “wrong time”</li> <li>– Weak purchasing power of buyers/consumers</li> <li>– Market information availability and management</li> <li>– Same species import competitiveness poorly synchronized</li> <li>– Various harassments</li> </ul>	R, CD, I, T  I, P, R  CD, I, IM	Men and women  Women and other vulnerable groups more affected	Sub-regional	
<b>19. The matter of weekly or bi-weekly market day that are pre-established and do not change, even in times of exceptional harvest</b>	<ul style="list-style-type: none"> <li>– Capacity of local/central government to set up an informed or evidence based market management structure (adjusting the frequency to the production seasons)</li> <li>– Problem of regular removal of catches, especially for fresh fish or inadequate storage of products, yet required for weekly market days resulting in losses</li> </ul>	CD, I, T	Men and women  Sensitive to the kind of market regulation	Sub-regional	
<b>20. Barriers to regional trade</b>	<ul style="list-style-type: none"> <li>– Regional trade bottlenecks</li> <li>– Illiteracy</li> <li>– Lack of entrepreneurship</li> <li>– Low level of organization</li> </ul>	P, CD	Men and women	Sub-regional	

<b>21. Implementation and support / government institutions services (Weak upstream control along all of the value chains)</b>	<ul style="list-style-type: none"> <li>– Low level of technical support</li> <li>– Low quality awareness of consumers</li> <li>– Police harassment, inopportune or lengthy customs and health checks resulting in longer periods of transactions with impact on quality of perishable product such as fish. Sometimes mishandling of products and physical removal of some products from the chain</li> </ul>	P, R			
	<ul style="list-style-type: none"> <li>– Insufficient or not harmonized policy and regulatory framework regarding fishing practices</li> <li>– Lack of childcare facilities for women processors</li> <li>– Inadequate financing</li> <li>– Poor network for e-commerce or secured transactions</li> <li>– Fish import management during national artisanal fisheries glut period</li> </ul>	R, CD, I, T, IM	Men and women	Sub-regional	

\*P- Policy, R- Regulatory, CD- Capacity Development of Stakeholder, I- Infrastructure and services, T- Technology and information, CI- Consumer level intervention.

### 3 Strategic priority areas of intervention on Fisheries and Aquaculture Post-Harvest Chain and Regional Trade (FAPHC & RT)

#### 3.1 Prioritisation of key areas of intervention

Barriers to development will be removed by a series of activities and outcomes. The expected end results would consist in implementing new efficiencies and economic incentives, following improved regional trade and competitiveness of the FAPHC & RT in the Volta Basin.

Table 2 presents the most consequential elements linked to the losses identified during the PHLAs, the corresponding components in terms of potential loss reduction interventions along with the roles and responsibilities of the stakeholders along the chain and the challenges and opportunities that will bear upon the implementation.

**Table 2. Strategy elements to reduce losses and strengthen regional trade elements, roles and responsibilities of stakeholders, partnerships, challenges and opportunities of implementation**

RELEVANT ELEMENTS FOR A STRATEGY	REQUIRED INTERVENTION(S)		RESPONSIBILITIES	IMPLEMENTATION CHALLENGES AND OPPORTUNITIES	
	INTERVENTION (S)	GENDER SPECIFICITIES		CHALLENGES	OPPORTUNITIES
<b>1. INFRASTRUCTURE / SERVICES</b> <ul style="list-style-type: none"> <li>The infrastructure / equipment are not conducive to GHP</li> <li>Physical losses due to fish theft because of non-equipped landing sites</li> <li>Inadequate preservation, processing, packaging and storage equipment, both in terms of quantity and quality</li> <li>Poor road conditions</li> </ul>	<ul style="list-style-type: none"> <li>Identify priority docks to be constructed</li> <li>Construction and layout, security of wharfs</li> <li>Raising awareness on GHP during handling</li> <li>Focus on sanitation and drinking water supply</li> <li>Feasibility study for cold storage installation</li> <li>Strengthening organizational capacity</li> </ul>	<ul style="list-style-type: none"> <li>Involve women and other vulnerable groups in decision-making on the dock building process and the management of these docks</li> <li>Set up and run childcare</li> </ul>	<ul style="list-style-type: none"> <li>VBA State Technical Services</li> <li>State in regard of the construction</li> <li>Watchdog Committee for security</li> <li>NGOs, technical services in charge of these issues (hygiene, sanitation, capacity-building)</li> <li>Local authorities</li> </ul>		

RELEVANT ELEMENTS FOR A STRATEGY	REQUIRED INTERVENTION(S)		RESPONSIBILITIES	IMPLEMENTATION CHALLENGES AND OPPORTUNITIES	
	INTERVENTION (S)	GENDER SPECIFICITIES		CHALLENGES	OPPORTUNITIES
<ul style="list-style-type: none"> <li>Non operational quality assurance services</li> </ul>	<p>of all actors along the value chain</p> <ul style="list-style-type: none"> <li>- Training on managing community assets</li> <li>- Training of artisans that can manufacture insulated boxes</li> <li>- Advocacy with authorities responsible for road maintenance</li> <li>- Organise waste management (linked to human and fishing activities)</li> </ul>	<p>infrastructures and services</p> <p>Organise women and other vulnerable groups in recognized groups so that they may be agents of change</p> <p>Infrastructure management committees should have 50% of women as members</p>	<ul style="list-style-type: none"> <li>- NGOs, technical services in charge of these issues</li> <li>- Local authorities</li> <li>- The private sector for investment in technical installations at landings (cold rooms, refrigerated vehicles, etc.)</li> </ul>		

2. TECHNOLOGY/TECHNIQUES					
<ul style="list-style-type: none"> <li>• Disruption of the activity of fishers following the disappearance of some species due to the new dam or climate change effects</li> <li>• Large quantities of wood /fuel used due to rudimentary techniques</li> <li>• No use of GHP and GMP resulting in quality losses</li> <li>• Lack of knowledge about correct processing methods for different fish species</li> </ul>	<ul style="list-style-type: none"> <li>- Provide passages for fish when building dams</li> <li>- Research technology for adaptation</li> <li>- Educate and train on GHP and GMP</li> <li>- Research on dietary habits and preferences of operators and consumers</li> <li>- Community resilience action plans</li> </ul>	<p>Taking into account women and other vulnerable groups' issues such as access to land, credit, loans, access to working capital</p> <p>Women and other vulnerable groups need to receive literacy courses before other trainings to better assimilate</p> <p>Taking the issue of migration into consideration</p>	<ul style="list-style-type: none"> <li>- Line ministries</li> <li>- Line ministry and partners</li> <li>- Technical partners and partners</li> </ul>		
<p>3. CAPACITY DEVELOPMENT</p> <ul style="list-style-type: none"> <li>• Changing processing techniques</li> </ul>	<p>m)</p> <ul style="list-style-type: none"> <li>- Training of stakeholders</li> </ul>	<p>Ensure that women and other vulnerable groups have access to all the trainings</p> <p>Capacity-building for women and other vulnerable groups on value</p>	<ul style="list-style-type: none"> <li>- State</li> <li>- Local authorities</li> <li>- Technical and financial partners</li> <li>- NGOs</li> <li>- Civil society</li> </ul>	<p>Set up a transparent participative process to identify trainings and select actors</p> <p>Train key actors</p>	



<ul style="list-style-type: none"> <li>• Strategy to adapt to change of technology</li> <li>• More input in the processing</li> <li>• Processors start as apprentices and come into the profession through observation, instructions and self-mastery</li> <li>• Loss of quality through the use of technologies that are not GHP/GMP compliant</li> <li>• Poor hygiene practices – personal and in the workplace</li> <li>• Bad handling practices</li> <li>• Poor business planning</li> <li>• Lack of knowledge of good handling practices</li> <li>• Lack of knowledge about correct handling and processing methods for different fish species; for example, fish wasted because of improper salting leading to fermentation</li> <li>• Operators lacking skills</li> </ul>		addition opportunities for their products			
	- Information and awareness		<ul style="list-style-type: none"> <li>- State</li> <li>- Local authorities</li> <li>- Technical and financial partners</li> <li>- NGOs</li> <li>- Civil society</li> </ul>	- Adopt GMP	<ul style="list-style-type: none"> <li>- Better resource conservation</li> <li>- Fish quality improved</li> </ul>
	- Training of stakeholders	Women and other vulnerable groups more concerned	<ul style="list-style-type: none"> <li>- State</li> <li>- Local authorities</li> <li>- Technical and financial partners</li> <li>- NGOs</li> <li>- Civil society</li> </ul>	- Improve the quality of fishery products	- Quality fish products are made available
	- Consulting support on GHP / GMP	Women and other vulnerable groups more concerned	<ul style="list-style-type: none"> <li>- State</li> <li>- Local authorities</li> <li>- Technical and financial partners</li> <li>- NGOs</li> <li>- Civil society</li> </ul>	- Ensure quality products	<ul style="list-style-type: none"> <li>- Losses reduced</li> <li>- Quality products are available on the market</li> </ul>
	- Information and awareness		<ul style="list-style-type: none"> <li>- State</li> <li>- Local authorities</li> <li>- Technical and financial partners</li> <li>- NGOs</li> <li>- Civil society</li> </ul>	<ul style="list-style-type: none"> <li>- Abandon inefficient practices</li> <li>- Plan activities</li> </ul>	- Quality fish products are made available
	- Training				
	- Information and awareness		<ul style="list-style-type: none"> <li>- State</li> <li>- Local authorities</li> <li>- Technical and financial partners</li> <li>- NGOs</li> <li>- Civil society</li> </ul>	- Improve knowledge	- Available resources are better managed
	- Training			- Improving the skills of operators	- New markets conquered

<ul style="list-style-type: none"> <li>• Low level of organization and technical leadership</li> </ul>					<ul style="list-style-type: none"> <li>- Easy flow of products</li> <li>- Increased income</li> </ul>
	<ul style="list-style-type: none"> <li>- Information and awareness</li> <li>- Training</li> </ul>		<ul style="list-style-type: none"> <li>- State</li> <li>- Local authorities</li> <li>- Technical and financial partners</li> <li>- NGOs</li> <li>- Civil society</li> </ul>	<ul style="list-style-type: none"> <li>- Good organization and better techniques</li> </ul>	<ul style="list-style-type: none"> <li>- New markets conquered</li> <li>- Easy flow of products</li> <li>- Increased income</li> </ul>
<ul style="list-style-type: none"> <li>• Illiteracy</li> </ul>	<ul style="list-style-type: none"> <li>- Training</li> </ul>	<p>Women and other vulnerable groups more concerned</p>	<ul style="list-style-type: none"> <li>- State</li> <li>- Local authorities</li> <li>- Technical and financial partners</li> <li>- NGOs</li> <li>- Civil society</li> </ul>	<ul style="list-style-type: none"> <li>- Improve the competency and group dynamics between actors</li> </ul>	<ul style="list-style-type: none"> <li>- Stewardship activities</li> </ul>
<b>4. MARKET INFORMATION</b>					
<ul style="list-style-type: none"> <li>• Lack of entrepreneurship</li> </ul>	<ul style="list-style-type: none"> <li>- Training</li> </ul>		<ul style="list-style-type: none"> <li>- State</li> <li>- Local authorities</li> <li>- Technical and financial partners</li> <li>- NGOs</li> <li>- Civil society</li> </ul>	<ul style="list-style-type: none"> <li>- Sustain these activities</li> </ul>	<ul style="list-style-type: none"> <li>- Profitable and sustainable activities</li> </ul>
<ul style="list-style-type: none"> <li>• Low quality awareness of consumers</li> </ul>	<ul style="list-style-type: none"> <li>- Information</li> </ul>		<ul style="list-style-type: none"> <li>- State</li> <li>- Local authorities</li> <li>- Technical and financial partners</li> <li>- NGOs</li> <li>- Civil society</li> <li>- Consumer associations</li> </ul>	<ul style="list-style-type: none"> <li>- Choosing quality products</li> </ul>	<ul style="list-style-type: none"> <li>- People's health is improved</li> </ul>
<ul style="list-style-type: none"> <li>• Lack of market information</li> </ul>	<ul style="list-style-type: none"> <li>- Collecting, processing and disseminating information</li> <li>- Awareness building</li> </ul>		<ul style="list-style-type: none"> <li>- State</li> <li>- Local authorities</li> <li>- Technical and financial partners</li> <li>- NGOs</li> <li>- Civil society</li> <li>- Consumer associations</li> </ul>	<ul style="list-style-type: none"> <li>- Better information dissemination</li> </ul>	<ul style="list-style-type: none"> <li>- INFO-PECHE exists</li> <li>- Products are known and available</li> <li>- Markets are accessible</li> <li>- Knowledge sharing thanks to new</li> </ul>

				communication technologies - E-commerce - ECOWAS regulations on free movement of goods and persons
<b>5. CONSUMER INTERVENTIONS</b>				
<ul style="list-style-type: none"> <li>• Demand for specific fishery products or portion size</li> </ul>	<ul style="list-style-type: none"> <li>- Develop a communication plan for a change in consumer behaviour</li> <li>- Targeted socio-economic measures towards vulnerable/weak purchasing power consumers</li> </ul>		<ul style="list-style-type: none"> <li>- State</li> <li>- Communities</li> <li>- NGOs</li> </ul>	<ul style="list-style-type: none"> <li>- Better utilization / Food security</li> </ul>
<ul style="list-style-type: none"> <li>• Quality blindness or unawareness</li> <li>• Purchasing power</li> </ul>	<ul style="list-style-type: none"> <li>- Educating consumers on product knowledge and quality</li> <li>- Social measures to address the purchasing or promotion of alternative protein source for poorer consumers</li> </ul>	<ul style="list-style-type: none"> <li>- Train homemakers on product quality</li> </ul>	<ul style="list-style-type: none"> <li>- State</li> <li>- Communities</li> <li>- NGOs</li> </ul>	<ul style="list-style-type: none"> <li>- Better utilization / Food security</li> </ul>
<b>6. RESILIENCE AND WELFARE</b>				
<ul style="list-style-type: none"> <li>• Fishermen migrating to areas of abundant fishing because of the disappearance of some species due to the construction of the dam</li> <li>• Fishermen migrating to other areas due to pollution and siltation of fishing sites</li> </ul>	<ul style="list-style-type: none"> <li>- Encourage fishermen to engage in other income generating activities</li> <li>- Build awareness in market gardeners and farmers to respect the easement strip</li> </ul>	<p>Particularly women and other vulnerable groups</p> <p>Impact on households</p>	<ul style="list-style-type: none"> <li>- Technical services and local authorities</li> </ul>	

<ul style="list-style-type: none"> <li>• Migration of fishing communities due to climate change effects</li> <li>• Seasons are no longer well defined and therefore fishery is difficult to plan</li> <li>• Destruction of habitat</li> <li>• Lack of access to capital for post-training investments (i.e. new technology to address changes in species has been developed, but no capital to use these)</li> <li>• Excessive use of wood for smoking</li> <li>• As the fuel (firewood) used is scarce, there is a need to use technology that reduces its consumption such as improved ovens to smoke the fish</li> <li>• Specific consumer demand, causing the use of prohibited means of harvest</li> <li>• Issue linked to catches needing to be transported from landing sites on a regular basis</li> </ul>					
	- Development of adaptation strategy (technology)		- State - Local authorities - Technical and financial partners - NGOs - Civil society	- Accommodation to climate change	- Activities rendered sustainable - Resource availability
	- Information and awareness		- State - Local authorities - Technical and financial partners - NGOs - Civil society	- Enforce regulations - Awareness of stakeholders	- Activities rendered sustainable - Resource availability
	- Implementing accompanying measures	Women and other vulnerable groups more concerned	- State - Local authorities - Technical and financial partners - NGOs - Civil society	- Access to financial services for all - Access to seed capital	- Jobs created - Competitive sector
	- Developing new “energy-efficient” processing techniques - Promoting other types of renewable energies and value addition methods	Women and other vulnerable groups more concerned	- Research/Academia - State - Technical partners for development	- Reduced consumption of firewood	- Environmental protection
	- Improve people’s livelihoods		- State - Local authorities - Technical and financial partners - NGOs	- Poverty reduction	- Bad fishing practices discontinued - Regeneration of resources
	- Organize sales channels	Women and other vulnerable groups more concerned	- State - Local and traditional authorities - Technical and financial partners - NGOs	-	- Improved income - Loss reduction

<ul style="list-style-type: none"> <li>• Silting of fishing areas</li> <li>• Impact on spawning grounds</li> <li>• In Burkina Faso, the grass that grows at certain times of the year on Lake Kompienga and seasonal flooding bring about rotten fish and more fish mortality in fishing areas</li> </ul>	<ul style="list-style-type: none"> <li>- Ensure dune fixation and bank protection</li> <li>- Ensure dredging of water body</li> <li>- Reconstitute canopy</li> <li>- Implement measures against invading aquatic plants</li> </ul>	Create income-generating activities	<ul style="list-style-type: none"> <li>- Civil society</li> <li>- State</li> <li>- Communities</li> <li>- Traditional leaders</li> </ul>	<ul style="list-style-type: none"> <li>- Protection of the aquatic ecosystem</li> </ul>	<ul style="list-style-type: none"> <li>- Creation of professional organizations and community groups</li> <li>- Recycling and selling of sand for construction works.</li> </ul>
	Strategy for resilience action plans	<ul style="list-style-type: none"> <li>- Suggest alternative income-generating activities to women and youth</li> <li>- Easy access to finance for women and youth</li> </ul>	- State	<ul style="list-style-type: none"> <li>- Securing household income</li> <li>- Number of beneficiaries</li> </ul>	<ul style="list-style-type: none"> <li>- Microfinance institutions</li> <li>- Ngos</li> <li>- Regional and international conventions and programmes</li> </ul>
<b>7. POLICY / REGULATORY</b>					
<ul style="list-style-type: none"> <li>• Riverbanks occupied by vegetable growers in Sourou (creating silting and polluting with fertilizers/manure and pesticides)</li> <li>• Pollution from women washing dishes and clothes on the riverbanks</li> </ul>	<ul style="list-style-type: none"> <li>- Regulate the use of riverbanks</li> <li>- Enforce existing regulations</li> <li>- Monitor and evaluate the implementation of regulations</li> <li>- Introduce Community-led total sanitation in programme</li> </ul>	<ul style="list-style-type: none"> <li>- Create water proximity points (drilling)</li> <li>- Create vegetable gardening areas for Women and other vulnerable groups with water from boreholes</li> </ul>	<ul style="list-style-type: none"> <li>- State</li> <li>- Communities</li> <li>- Beneficiaries</li> </ul>	<ul style="list-style-type: none"> <li>- Behaviour change</li> <li>- Protection of water bodies</li> </ul>	<ul style="list-style-type: none"> <li>- Decentralization</li> <li>- NGOs and traditional leaders</li> <li>- Existence of professional organizations</li> <li>- Technical development partners</li> </ul>
	<ul style="list-style-type: none"> <li>- Regulate IUU fishing</li> <li>- Enforce existing regulations</li> </ul>	<ul style="list-style-type: none"> <li>- Create income-generating activities for</li> </ul>	<ul style="list-style-type: none"> <li>- State</li> <li>- Communities</li> <li>- Beneficiaries</li> </ul>	<ul style="list-style-type: none"> <li>- Retraining fishermen in other income generating activities</li> </ul>	<ul style="list-style-type: none"> <li>- Existing national and international legal instruments</li> </ul>

<ul style="list-style-type: none"> <li>illegal practices but these are harmful to fisheries resources</li> <li>Longer fishing times, having an effect on quality and also resulting in loss of market due to poor quality / fish size</li> <li>Seasons are no longer well defined and therefore fishery is difficult to plan</li> <li>Infrastructures are not conducive to GHP</li> <li>Huge quality losses due to inadequate storage conditions</li> <li>Physical losses due to theft of the fish at landing site</li> <li>Excessive use of wood for smoking</li> <li>No access to new technologies</li> <li>Research findings are not adaptable to local conditions and women and other vulnerable groups' needs; for example, processors find them challenging as their needs/inputs were most probably not taken into consideration during design and planning stages</li> </ul>	<ul style="list-style-type: none"> <li>Monitor and evaluate the implementation of regulations</li> <li>Sub-regional cooperation for harmonized regulatory framework on fishing gears (Burkina-Faso and Mali)</li> </ul>	<ul style="list-style-type: none"> <li>women and youth</li> <li>Guarantee the protection of women and other vulnerable groups who report illegal practices</li> </ul>			<ul style="list-style-type: none"> <li>Existing sub-regional organizations</li> <li>Existing microfinance institutions</li> </ul>
	<ul style="list-style-type: none"> <li>Define and support implementation of mitigation and adaptation strategy inclusive of fisheries specific concerns</li> </ul>		-State	-Retraining fishermen in other income generating activities	<ul style="list-style-type: none"> <li>Existing national and international legal instruments</li> <li>Existing sub-regional organizations</li> <li>Existing national and international programmes on climate change</li> </ul>
	<ul style="list-style-type: none"> <li>Establish basic infrastructure and marketing (dock/pier, safe water, jetties, cold chain)</li> </ul>		-State -Technical and financial partners -Communities -Beneficiaries	-Food safety	<ul style="list-style-type: none"> <li>National budget</li> <li>Donations and aid</li> <li>Technical and financial partners</li> </ul>
	<ul style="list-style-type: none"> <li>Promote alternative energy sources</li> <li>Promote good research practices and technologies that are adapted to people's living conditions (demand-driven and socio-centred)</li> </ul>		-State -Technical and financial partners -Communities -Beneficiaries	-Forest and environment conservation	-Development of renewable energies (sun, water, air)

<ul style="list-style-type: none"> <li>• Lack of knowledge about correct handling and processing methods for different fish species</li> <li>• Illiteracy</li> <li>• Lack of entrepreneurship</li> <li>• Low level of organization</li> <li>• Low level of technical support</li> </ul>					
	– Create social and educational training centres	– Functional literacy for women and youth	-State -Technical and financial partners -Communities -Beneficiaries	– School enrolment and literacy	-NGOs -Technical and financial partners -Decentralized services -Ministries
	<ul style="list-style-type: none"> <li>• Regulate IUU fishing</li> <li>• Enforce existing regulations</li> <li>• Monitor and evaluate the implementation of regulations</li> </ul> <p>Sub-regional cooperation for harmonized regulatory framework on fishing gears (Burkina-Faso and Mali)</p>	Direct short-term impact of regulations on women and other vulnerable groups' post-harvest activities			
	<ul style="list-style-type: none"> <li>• Poor road conditions</li> <li>• Inadequate transport vehicles</li> </ul>	– Link up production areas		-State -Technical and financial partners -Communities -Beneficiaries	– Facilitating the movement of goods
<ul style="list-style-type: none"> <li>• Armed robberies affecting fishmongers ( Loss of supply capacity; fishmongers / artificial glut in supply sites with eventual losses)</li> </ul>	<ul style="list-style-type: none"> <li>– Enhance public safety</li> <li>– Promote marketing transactions with minimum cash carrying, e-commerce, mobile money transactions</li> </ul>	– Create money transfer instruments adapted to fishmongers	-State -Technical and financial partners -Communities -Beneficiaries	-Free movement of people and goods	-Money transfer companies

<ul style="list-style-type: none"> <li>• <b>Specific consumer demand, causing the use of prohibited means of harvest</b></li> </ul>	As above				
<ul style="list-style-type: none"> <li>• <b>Inadequate infrastructure and equipment causing physical and quality losses</b></li> </ul>	As above	– Gender sensitive infrastructures			
<ul style="list-style-type: none"> <li>• <b>Police, customs and health authorities harassment causing delays and longer transactions</b></li> </ul>	– Enforce national and regional conventions/ regulations		<ul style="list-style-type: none"> <li>-States</li> <li>-Sub-regional organizations</li> <li>-Civil society</li> </ul>	<ul style="list-style-type: none"> <li>-Good governance</li> <li>-Free movement of people and goods</li> </ul>	<ul style="list-style-type: none"> <li>-International conventions</li> <li>-Sub-regional and bilateral agreements</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Control institutions with insufficient capacity resulting in losses</b></li> </ul>	<ul style="list-style-type: none"> <li>– Establish or operationalize quality assurance infrastructures and services</li> <li>– Capacity development</li> <li>– Training of trainers programme development and support</li> </ul>		<ul style="list-style-type: none"> <li>-States</li> <li>-Sub-regional organizations</li> <li>-Technical development partners</li> <li>-Consumers</li> </ul>	<ul style="list-style-type: none"> <li>-Recovery and food security</li> </ul>	<ul style="list-style-type: none"> <li>-State</li> <li>-Decentralized communities</li> </ul>



### **3.2 Guidelines for a sub-regional programme and national action plans addressing priority areas of intervention**

Transforming the sub-region's fisheries and aquaculture post-harvest chains and regional trade into competitive contributors to sustainable food security, livelihoods and development rests on the overarching supporting umbrella of coordination, collaboration, and partnership. This umbrella supports six dynamically inter-related priority areas and includes two cross-cutting beams, which are resilience and social protection and specific gender concerns. The essential characteristics of each of these are described here below and the relationships and linkages dynamics between actors and drivers of improvement strategies are illustrated in Figure 9.

National action plans are to define the necessary government policies and interventions that are meant to improve productivity and competitiveness in the fisheries and aquaculture post-harvest chain as well as regional trade. This regards not only the fishing/farm and processing levels, effective marketing in the domestic, regional and international arenas but also financial investments, institutional support, linkages between the different actors along the value chain, and capacity building. Table 2 details the roles and responsibilities of the different stakeholders, partnerships, challenges and opportunities in order to implement these plans.

It is recommended that these national plans form part of a sub-regional program that will align common and cross-cutting activities between countries that are to be developed, particularly in terms of:

- Negotiations with technical and financial partners for the funding of post-harvest loss reduction action plans and programmes for the Volta Basin
- Gender concerns are to be taken into account throughout the value chain along with information on post-harvest losses in order to better design the activities to be implemented
- Climate change adaption and increased resilience in action plans and programmes regarding post-harvest loss reduction
- Implementation and monitoring and evaluation methodologies including the sustainable use of natural resources and waste reduction, and
- At the appropriate time, link the strategy, the regional programme and national action plans to the Sustainable Development Goals (SDGs)

It is also recommended that FAO and NPCA collaborate together and with all the stakeholders of the sub-regional programme and national projects to:

- Set up a sub-regional network of post-harvest loss control (assessment and reduction interventions) resource persons to help share experiences and communicate strengths and weaknesses among stakeholders; this in response to a need for a cross-fertilization of ideas amongst fish operators in order to share data and information generated and analysed for the purpose of improved post-harvest fish-loss management.
- Establish collection and analysis of lessons learned and innovations in the post-harvest loss reduction national action plans, programmes and projects to facilitate implementing a similar process of implementation in other geographical contexts.

### ***3.2.1 The role of government***

Government is to create an enabling and secure environment that favours post-harvest fish loss reduction; formulate policies and create regulatory frameworks for enhanced post-harvest fish loss reduction and improved domestic and cross border trade. Other government interventions include mobilizing financing, gender mainstreaming, capacity development at all levels and infrastructure development. Regulatory bodies and government agencies must ensure compliance to standards and participate in the capacity building of stakeholders in relevant areas (responsible fisheries, proper harvesting, proper handling, and best practices in processing and storage, marketing and market development) along the fishery value chain. Government also provides public safety and incentive measures, ensuring implementation of social measures for consumers with weak purchasing power, and supporting safe fish consumption and responsible supply's promotional programmes/initiatives. It must implement an Information Education Communication (IEC) or a Behaviour Change Communication (BCC) framework.

Given the importance of the capture fisheries and aquaculture sector in terms of food security and job creation in the West African sub-region, each government should look into the possibility of financing post-harvest loss assessments at country and basin level and work together with the various authorities of the Lake Basin through the African Agriculture Development Program (CAADP). It is also important that evaluations / research on post-harvest losses pay particular attention to nutrient losses, given the importance of the nutritional value of fish and the fact that certain handling, collection and transport practices are likely affect quality.

Each government should also ensure that the PHLA and national action plans information is consolidated and linked with the ECOWAS mechanism regarding the Agricultural Investment Bank.

The actors along the value chain are expected to be responsive to the various government policies and align their action plans, procedures and activities with these policies.

### ***3.2.2 The role of the private sector***

As indicated in the NEPAD Plan of Action of 2005, if trade of fish from Africa's marine and inland waters is to be increased, an efficient post-harvest sector needs to be developed. This will entail the development of improved infrastructures and equipment and investment in the sector. The private sector can play a crucial role along the PH value chain by:

1. Promoting and supporting technologies that can foster diversification and value addition along the value chain;
2. Improving infrastructures and technology development through appropriate investments schemes;
3. Providing support to processors and traders, in particular to women and youth entrepreneurs, to further develop their businesses;

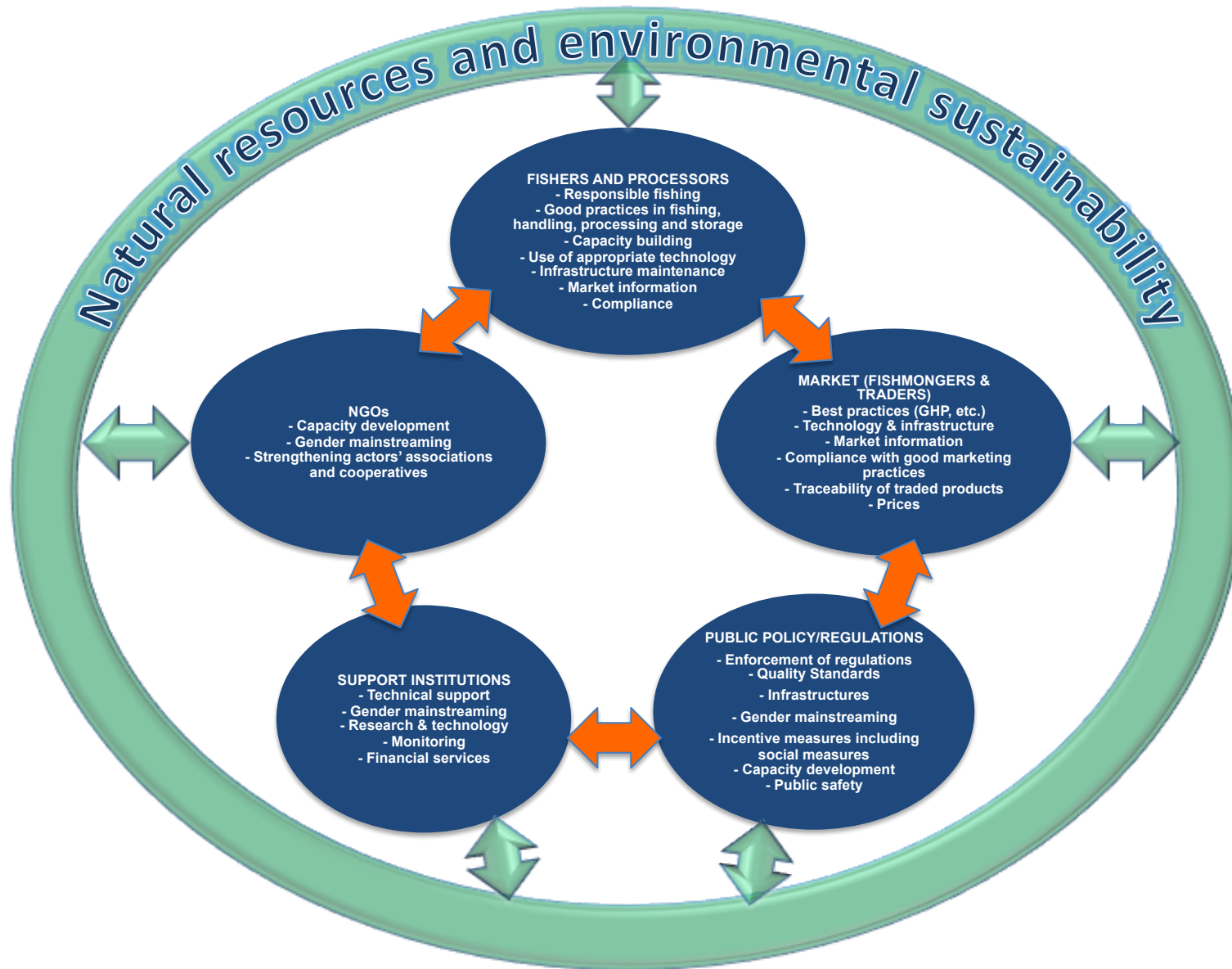
4. Strengthening financing mechanisms, in particular credits and micro-finance, with a particular attention to constraints faced by youths and women;

### ***3.2.3 Overarching supporting umbrella: Coordination, collaboration, and partnership***

Once each national action plan has been drafted, its successful implementation will call for a consensus from all stakeholders along the chain in terms of roles and responsibilities and effective delivery and implementation monitoring and evaluation mechanisms, encompassing the two cross-cutting beams, resilience and social protection as well as specific gender issues. The line ministry will obviously be responsible for ensuring coordination of the six priority areas through public-private partnerships, which include:

- Government staff, NGOs and donors (institutional or individuals) providing funding and/or technical support for capacity building on the action plan as well as research that generates improved technologies, infrastructural and market development while ensuring proper monitoring and evaluation of sponsored programmes and projects and the necessary capacity building on these specific areas;
- Professional organisations and groups as well as stakeholders working within the regulatory frameworks for compliance with various financial, environmental, health and safety, and market regulations;
- Financial and development institutions, NGOs, providing financial assistance and support to fishers, processors, traders and individuals' interests along the value chain;
- Research institutes and universities generating the required technology that meets real needs/genuine demands for development. They also engage in the capacity building of all stakeholders for dissemination/ease of transfer of these technologies;
- Coordination amongst the six riparian countries on sharing of new technologies, climate adaptation, good water use practices and trade issues, both at government level and through exchange visits and peer assist activities.
- The promotion of aquaculture as a means that allows to continue processing activities during the lean fishing seasons, thus preventing the temptation of illegal fishing practices with high post-harvest losses accompanied by a negative impact on the environment. This promotion must be done while taking into account a number of factors such as: regulating aquaculture production, the environmental and commercial impact, the impact on fishermen's livelihoods, regulations in terms of imports and exports, production and type of feed with the least environmental pollution, nutritional value depending on the type of feed to ensure the nutritional quality of farmed fish, regulating the arrival of the fish on the markets, etc.

**Figure 9: Actors' responsibilities, linkages and drivers of improvement strategies**



### ***3.2.4 First cross-cutting beam: Resilience and Social Protection***

Fresh water resources are natural ecosystems that possess the ability to regulate themselves and regenerate from shocks. This is extremely challenging to replicate in artificial contexts in a cost-effective manner. Therefore, these natural settings will always remain the basic reservoirs of the fisheries genetic resources and sources of food and income. Nevertheless, in the Volta Lake, the resilience of these resources is fast approaching its penultimate level. Thus, interventions that greatly reduce, if not stop, overfishing, habitat degradation due to anthropogenic activities such as dam construction, nutrient overloading, eutrophication and pollution are urgently needed. Climate variability and the resultant effects on water levels is an added dimension of significant importance when designing strategic interventions and resilience action plans.

Alternative sources of income-generating activities should be explored in a participatory manner with fishers and processors so that they may be more resilient to climate variability and market forces. This may also call for collateral solidarity groups.

### ***3.2.5 Second cross-cutting beam: Gender concerns***

Gender is a leading indicator of sustainable development and livelihoods. Future post harvest loss assessments, strategies and programmes addressing post harvest losses reduction will greatly benefit from addition information on gender relation issues within the value chain. Value chain analysis and identified upgrading strategies (product, function, process and system) will provide information on relationships between male and female actors and the gender concerns herein. Taking into account these gender relational issues can contribute to optimisation or sustainability of actions on technology and on infrastructure and services. The identified relational gender concerns will also influence capacity building needs specific for male and female actors or actions to improve dialogue and collaboration between different actors in the chain.

This calls for supplementary gender analysis of PHLA combined with Value Chain Analysis information and will lead amongst others to gender sensitive technologies and innovations. Services that are specific to facilitating better working conditions and livelihoods such as access to child care facilities, health centres, nutrition and social protection services, primary schools and literacy and accounting courses need to be part of the interventions to contribute to increased well being. Specific needs of youth, employment conditions of youth, specific trainings for women in order to make them equal participants in management and decision making processes are key issues.

In terms of policy and regulations the "post harvest actors " should be actively involved in the planning and formulation processes as well in the reinforcement of the policies and application of the regulations as they will be stakeholders.

### ***3.2.6 Priority Area 1: Capacity Development***

Stakeholders' capacity development is a crucial factor in improving FAPHC & RT in the riparian countries of the Volta Basin and needs to be done by investing at all stages of the value chain. The areas requiring intervention are training on responsiveness and adaptation to evolving techniques and

technology, current best practices on responsible fisheries, Good Aquaculture Practices (GAP), Good Hygienic Practices (GHP), Good Manufacturing Practices (GMP), Hazard Analysis Critical Control Point (HACCP) for food safety management systems in relation to processing and handling, packaging and storage, developing market information systems, management and entrepreneurship and should be underpinned by functional literacy and basic accounting skills depending on the needs of operators, especially those of post-capture actors.

Moreover, when fisher folks organise themselves in an association/group, they can generate a significant proportion of seed capital for private infrastructure development (such as storage facilities and equipment) and transportation for improved post-harvest handling thus lowering risks of losses linked to marketing activities. As associations, they are also able to marshal stronger bargaining power in the input and output markets, take actions that enable economies of scale. Based on best practices identified and analysed in particular by FAO, existing organizations are to be strengthened and, when pertinent, new groups/cooperatives should be set up for fisher and processors.

### ***3.2.7 Priority Area 2: Policy/Regulations***

The Role of the Government should primarily involve the provision of an enabling environment in infrastructure, especially accessible electricity and other energy sources, good roads and good storage facilities. It also is to ensure good fishing and processing practices through effective regulations; enforcement of fisheries regulation/laws in the areas of net mesh sizes, gear type and prohibited physical or chemical fishing methods that will enhance production and sustain the stock of the various fish species in the Volta Basin. Government is also responsible for guaranteeing a favourable climate for investment and producer and trade organisations, protecting the rights, privacy, safety and property of its citizens as well as enforcing policies that support the development of a viable competitive FAPHC & RT in the Region. This is to be implemented in cooperation and effective partnership among the neighbouring countries, and more particularly in the areas of preserving the Volta Basin ecosystem and cross-border trade.

Furthermore, participatory implementation and monitoring should be promoted and accompanied by a Monitoring, Control and Surveillance (MCS) plan.

### ***3.2.8 Priority Area 3: Infrastructure/ Services***

Important post-harvest losses contribute to low returns on investments in fisheries by diminishing the quantity and quality of fish available for sale and human consumption. The underlying causes of these high losses are related to poor infrastructure, limited access and use of processing innovations, value addition to the original product and poor input/output markets. Key features and services that foster adequate market access are policies and regulations governing domestic and international trade, availability of market-related information, short or long distances, operational market infrastructures, adequate means of transport and good road networks, handling and post-harvest processes that prolong shelf life, value addition in the market, and institutional frameworks that support the efficiency of input supply chains and output delivery processes.

### ***3.2.9 Priority Area 4: Technology/Techniques***

Through partnerships and funding by donor agencies, NGOs, government and research institutions will be responsible for providing improved species of tilapia fish or other fish of economic value to the Volta Basin and/or developing adaptable and cost effective technologies for handling, processing and storage of fish. This will lead to higher and more sustainable yields, increased catches, more efficient processing and, ultimately, self-sovereignty in the Region in production and local supply of high-quality fish with reduced losses. More appropriate technical, institutional and policy innovations are essential to strengthen market opportunities. This includes first-rate science-based information on technology options and effective market demand that influence the dynamics of economically viable innovation systems. Small-scale fishers and processors first need access to sustainable technologies that increase shelf life and add value to fish and fishery products. Cash transfer options through mobile phones should be set up which can contribute to their as well as that of the general population public safety.

The substantial improvements offered, in particular by the newly developed FTT Thiaroye smoking and mechanical drying system, can contribute considerably to reduce health hazards while enabling greater post-harvest benefits for the sector and should therefore be promoted on a wider scale.

### ***3.2.10 Priority Area 5: Market Access***

Fishers and fish farmers, processors and traders are to receive cash payments at competitive prices and/or rewarding bartered outputs in exchange of their products along with existing outlets/markets for small- to medium-scale enterprises with the necessary market quality attributes. They also must be in a position to take advantage of markets that offer quality inputs needed in their production processes.

As elaborated in the previous areas of priority, good market access and marketing are inter-related with adequate infrastructure and services, market information, good financial and insurance services, public safety. Moreover an enabling policy and regulation environment is essential to facilitate adequate market access.

Regional trade and opportunities to improve access to fish as food providing better nutrition security should be addressed within the framework of ECOWAS' free movement of goods and people.

### ***3.2.11 Priority Area 6: Consumer level intervention***

Consumers should be sensitised on the “value” of legal size and local fish, the nutritional status of a good quality fish and sustainable supply. Promotional activities and well-targeted socio-economic measures towards population stratum with weak purchasing power to ease their access to needful nutrients and provide sustainable incentives for loss reduction should also be set up.

Meanwhile, fishermen's awareness should be raised on the benefits of responsible fishing including the legal size of fished species.



# TWO CROSS-CUTTING BEAMS AND SIX PRIORITIES TO REDUCE POST-HARVEST LOSSES



## 1. CAPACITY DEVELOPMENT

- Current best practices on responsible fisheries
- Good hygiene and manufacturing Practices, risk-based food safety management system
- Market information systems development
  - Empowerment in collective actions
- Women's role in securing sustainable value chains
  - Responsiveness and adaptation to evolving techniques and technology
- Competencies of food safety and border authorities
  - Entrepreneurship: accounting, management, good governance and record keeping



## 2. POLICY / REGULATIONS

- Effective and favourable policy and regulations that ensure good fishing and processing practices, public safety
  - Enforcement of regulations
- The right to fish for livelihoods goes with the duty to do it in a responsible manner
  - Well-targeted socio-economic measures towards population stratum with low purchasing power
- Enabling favourable investment climate



## 3. INFRASTRUCTURE & SERVICES

- Gender sensitivity – childcare facilities
  - Landing jetties
- Operational market infrastructure
- Adequate means of transport and good road networks, public safety on roads
  - Institutional support in efficient input supply chains and output delivery processes



**GENDER CONCERNS**



**RESILIENCE SOCIAL PROTECTION**

**IMPACT**



## 4. TECHNOLOGY/TECHNIQUES

- Adaptable, flexible, and cost effective technologies for handling, processing, storage and transport of fish that increase shelf-life
  - Appropriate technical, institutional and policy innovations
- Science-based information on technology options and effective market demand



## 5. MARKET ACCESS

- Domestic market supply consistency
- Institutional arrangements of existing outlets/markets for small to medium scale enterprises
  - Adequate infrastructure and services
- E-market information and services, including e-banking
  - Market information



## 6. CONSUMER LEVEL INTERVENTIONS

- Sensitize consumers on "value" of legal size fish and sustainable supply
  - Promoting the nutritional value status of fish, good quality fish
- Willingness to pay a rewarding purchasing price for loss reduction efforts

**Efficient and equitable post-harvest fisheries development**



### **3.3 Coordinating and monitoring implementation**

The responsibility for the coordination of the strategy and the implementation of the corresponding action plans lies with the relevant Ministries of the six riparian countries in the Volta basin. An important intergovernmental body will act as repository for providing market and technical information, and will assist ministries in developing effective private-public sector collaboration. The concerned governments will ensure issues on political stability, transparent investment procedures, regulations, security guarantees (personal and investment) and improvement in infrastructures. Participatory monitoring and evaluation mechanisms with due consideration of ultimate beneficiaries are fundamental.

## References and Bibliography

- Akande, G. R. and Diei-Ouadi, Y. (2010). Post-harvest losses in small-scale fisheries. Case studies in five sub FAO Post-Harvest Loss Assessment Programme. Post-Harvest Losses in Artisanal Fisheries: Case Studies From Five Sub-Saharan African Countries. FAO Fisheries and Aquaculture Technical Paper No. 550, Rome, FAO. 72 pp.
- Béné C. (2007). Diagnostic study of the Volta Basin fisheries Part 1 - overview of the Volta Basin fisheries resources. Report commissioned by the Focal Basin Project - Volta. Cairo Egypt: WorldFish Center Regional Offices for Africa and West Asia, 31 pp.
- Béné C., and Russell, A.J.M., (2007).- *Diagnostic study of the Volta Basin fisheries. Part 1 - Livelihoods and poverty analysis, current trends and projections*. Volta Basin Focal Project Report No 7. WorldFish Center Regional Offices for Africa and West Asia, Cairo Egypt, and CPWF, Colombo, Sri Lanka, 67 pp.
- Diei-Ouadi, Y. ; Mgawe, Y. I. (2011). Post-harvest fish loss assessment in small-scale fisheries: A guide for the extension officer *FAO Fisheries and Aquaculture Technical Paper*. No. 559. Rome, FAO. 2011. 93 pp.
- FAO (1998). FAO Fish Utilization and Marketing Service. Responsible fish utilization. FAO Technical Guidelines for Responsible Fisheries. No. 7. Rome. 33 pp.
- NEPAD (2005). The NEPAD Action Plan for the development of African Fisheries and Aquaculture. NEPAD-Fish for all Summit, Abuja, Nigeria, 30 pp.
- Pittaluga, F., Braimah L.I., Bortey A., Wadzah N., Cromwell A., Dacosta M., Seghieri C. & Salvati N. (2003). Poverty profile of riverine communities of southern Lake Volta. SFLP/FR/18, Cotonou, Benin: Sustainable Fisheries Livelihoods Programme (SFLP), Food and Agriculture Organization, 70 pp.