



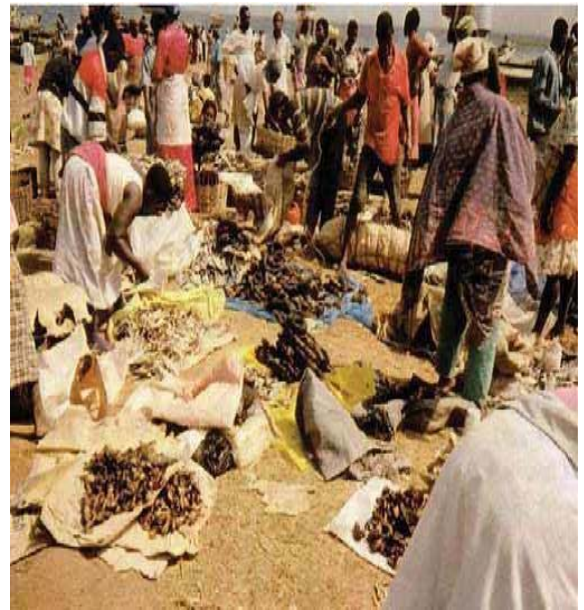
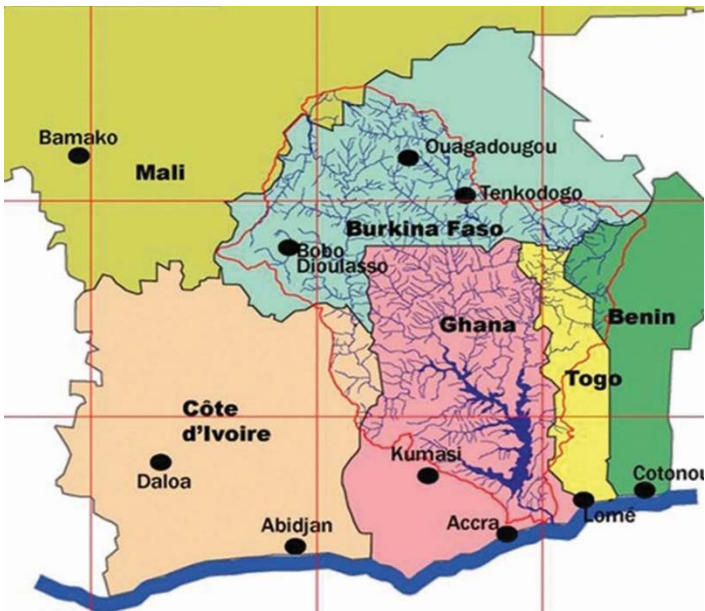
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A STRATEGY FOR SUSTAINABLE FISHERIES AND AQUACULTURE IN THE VOLTA BASIN RIPARIAN COUNTRIES' POST-HARVEST CHAINS AND REGIONAL TRADE



Cover photographs:

National post-harvest team, Ghana.

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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 Africa's 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, organized the regional workshop "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. The workshop was attended by: participants from public administrations 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 the informed "A Strategy for sustainable fisheries and aquaculture in the Volta Basin riparian countries' post-harvest chains and regional trade". The Strategy was developed during a consultative process led by the NPCA and FAO, through NFFP and with the support of the beneficiary countries. Following highly interactive deliberations, the Strategy was drafted by a core of experts from the workshop, reviewed during a final workshop held on 13 and 14 May 2015 in Grand Bassam, Côte d'Ivoire and is presented here.

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A Strategy for sustainable fisheries and aquaculture in the Volta Basin riparian countries' post-harvest chains and regional trade.

FAO Fisheries and Aquaculture Circular No. 1121. Rome, Italy.

ABSTRACT

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 including multifaceted issues, with inefficiencies at the upstream and downstream levels. 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 waterbody. The NFFP thus developed the capacity of fisheries officers and fishers in carrying out loss assessments 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-sharing gender analysis process, and generating 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 "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.

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FAO and NPCA would also like to thank the Volta Basin Authority for embracing the spirit of the work carried out and all those who, through their objective comments and recommendations, have contributed to consolidating this report.

ABBREVIATIONS AND ACRONYMS

AFPF & RS	African Fisheries and Aquaculture Policy Framework and Reform Strategy
CAMFA	Conference of African Ministers of Fisheries and Aquaculture
Code	FAO Code of Conduct for Responsible Fisheries
ECOWAS	Economic Community of West African States
FAO	Food and Agriculture Organization of the United Nations
FAPHC & RT	fisheries and aquaculture post-harvest chain and regional trade
FCWC	Fisheries Committee for the West Central Gulf of Guinea
GAP	good aquaculture practice
GHP	good hygiene practice
GMP	good manufacturing practice
HACCP	Hazard Analysis and Critical Control Points
IUU	Illegal, unreported and unregulated
NEPAD	New Partnership for Africa's Development
NFFP	NEPAD-FAO Fish Programme
NGO	non-governmental organization
NPCA	NEPAD Planning and Coordinating Agency
PAF	International Partnership for African Fisheries Governance and Trade
PHLA	post-harvest loss assessment
WAEMU	West African Economic and Monetary Union
VBA	Volta Basin Authority

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 waterbody. The NFFP thus developed the capacity of fisheries officers and fishers in carrying out 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-sharing gender analysis process, and generating 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 “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. The workshop was 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 fisheries and aquaculture officials, held on 28–29 April 2014, in Addis Ababa, Ethiopia, prior to the Second Conference of Africa Ministers of Fisheries and Aquaculture (CAMFA II), during which the African Fisheries and Aquaculture Policy Framework and Reform Strategy (AFPF & RS) was endorsed. This strategy is specifically 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 of resilience, vulnerability reduction and gender mainstreaming. It is therefore also in line with 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 Members at the Thirty-first Session of the Committee on Fisheries, held in Rome, Italy, from 9 to 13 June 2014.

1.1 Objectives

Above all, this strategy is aligned with the objectives of the Malabo Declaration, in which the African Union Heads of State and Governments committed to reducing the existing level of post-harvest losses by at least 50 percent by 2025¹ as part of the continental challenge in the fight against food and nutrition insecurity. More precisely, this strategy aims to guide the actions 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 (PHLAs) conducted in the riparian countries, which allowed the causes, nature, contextual patterns and extent of these losses within this shared waterbody to be gauged.

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

¹ The African Union Heads of State and Governments of the African Union met in June 2014 in Malabo, Equatorial Guinea.

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, under the International Partnership for African Fisheries Governance and Trade (PAF) initiative, published studies and implementation plans on: updated data on cross-border and international trade; the 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. These were the 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. Article 11.1 Responsible fish utilization of FAO's Code of Conduct for Responsible Fisheries (1998) (the "Code"), recognized the important problem of fish losses and 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 utilization of fishery resources.
- Sub-article 11.1.6. States and relevant organizations 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 currently caught. Yet, a rational use of already scarce development resources, together with planning and implementation of effective loss reduction strategies, requires 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 of small-scale operations requires a holistic approach. This entails first understanding their contextual occurrence in order 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, Uganda and the United Republic of Tanzania (Akande and Diei-Ouadi, 2010) as part of the validation process of the PHLA 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 centred on applying these validated loss assessment methods to take stock of mainstreaming important gender considerations, climate changes and any other eventual vulnerability factor in order 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 has provided capacity building and support to all the activities in the field. This work has been consistent with Section 4.4 *Responsible and equitable fish trade and marketing* of the African Fisheries and Aquaculture Policy Framework and Reform Strategy (AFPF & RS)² and other chapters regarding small-scale fisheries development, sustainable resource use, gender issues, strengthening of resilience and vulnerability reduction. 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 CAMFA II 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 implementing the AFPF & RS in the context of the Volta Basin.

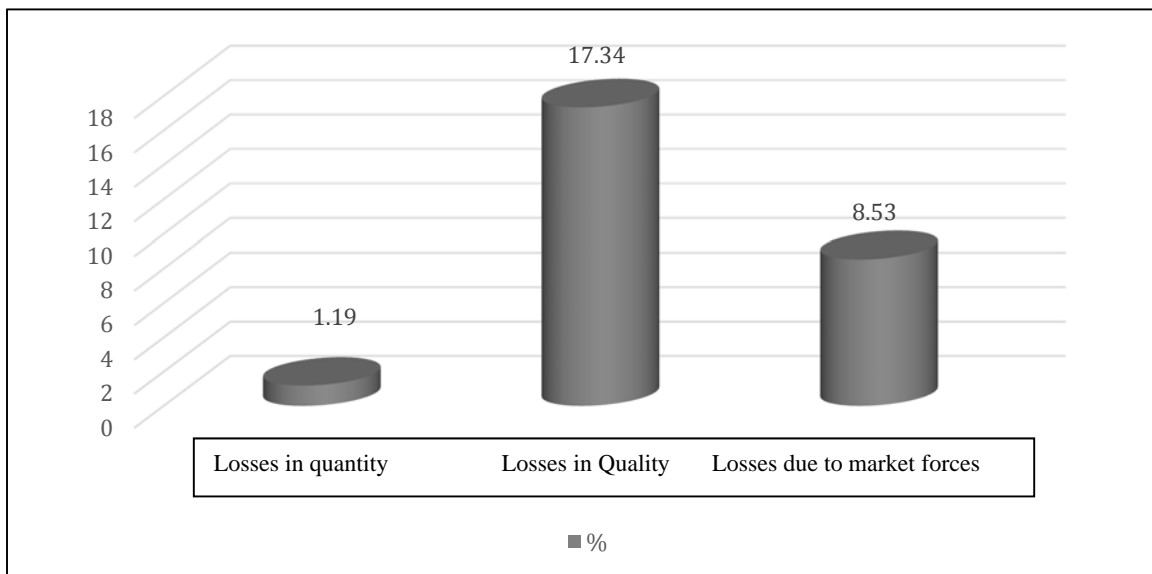
² www.au.int/en/sites/default/files/documents/30266-doc-au-ibar_-_fisheries_policy_framework_and_reform_strategy.pdf

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, but there is no consensus on what the most accurate figures may be within this broad range (Béné and Russell, 2007). However, fisheries-related activities make a substantial contribution to the livelihoods of Volta Basin households and are the primary income-generating activity for most families in the area, contributing more than 70 percent of revenue on average and reflecting that fishing is a major activity for communities along the shores of the basin. Fishing is mostly carried out by men, and the 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. Therefore, reducing losses is 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 (FAO, 2015). The study showed that losses in quality and those due to market forces are significant, while losses in quantity (fish removed from the supply chain, also known as physical losses) are generally very low. As shown in Figure 1, total cumulative losses over a year of production average 27 percent, with levels ranging from 13.5 to 45.5 percent depending on the country. However, these average figures mask significant differences that exist between fishing sites, stakeholder groups and countries (FAO, 2015).

Figure 1. Total post-harvest losses in Volta Basin fisheries (%)

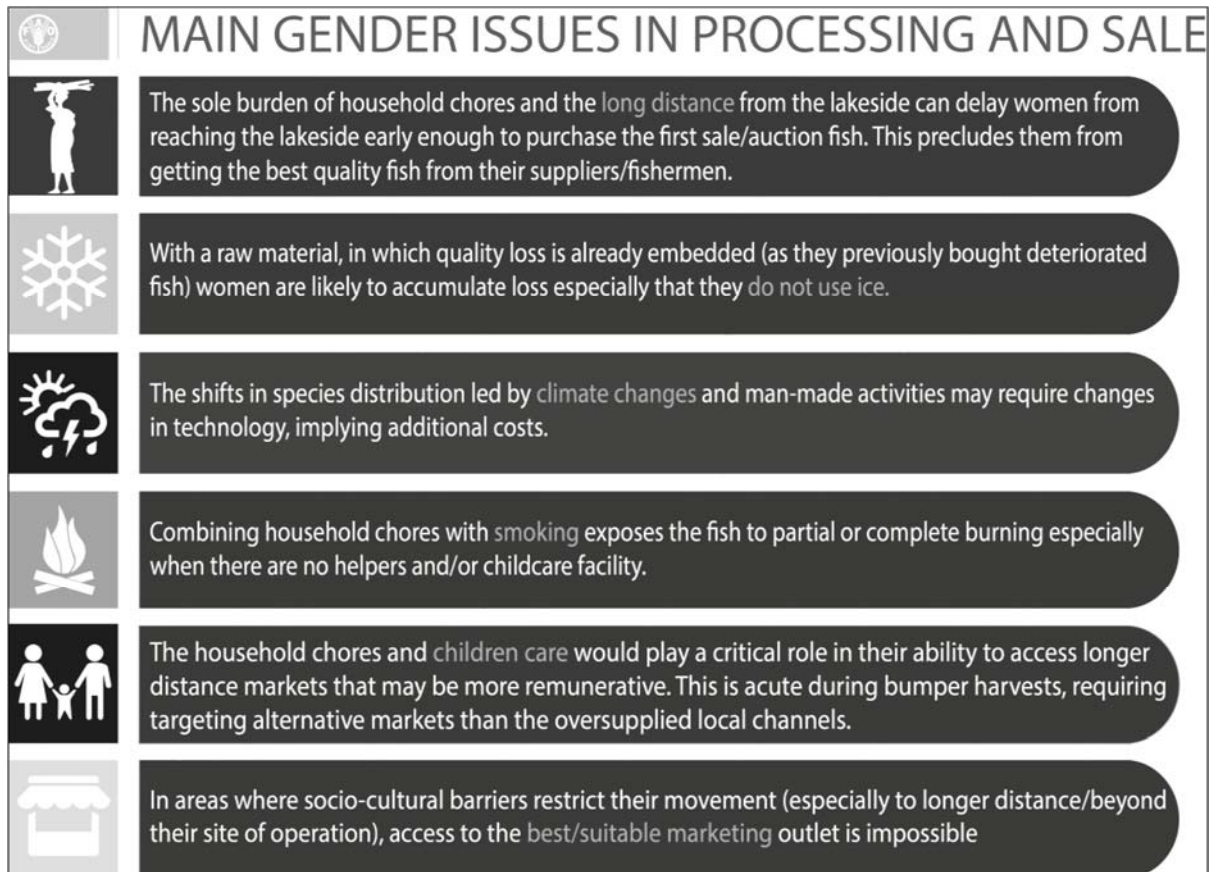


Source: FAO (2015) Fisheries and Aquaculture Circular C1105.

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 country studies showed that post-harvest operations conducted by women and members of vulnerable groups are hampered by a number of factors that lead to a significant differences between men and women, and between marginalized and well-off value chain actors. Figure 2 illustrates these dimensions of losses – losses in quality, losses in quantity and losses due to market forces.

Figure 2. Main gender issues in processing and sale

Source: FAO (2015) Fisheries and Aquaculture Circular C1105.

2.1.2 Critical strategic issues in the fisheries and aquaculture post-harvest chains and regional trade 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:

- Basic amenities and infrastructures are almost non-existent and/or in poor condition at fishing, processing and marketing sites.
- There is a prevalence of high rates of illiteracy, poor group dynamics and individualism among the major actors. There is also a gender imbalance in the fish trade, which is predominantly carried out by women, who constitute 95 percent of fish processors and often combine running the 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.
- Marketing is mostly local but also takes place in major cities in the basin which triggers losses incurred during transit due to armed robbery attacks, and vehicle breakdowns due to poor road conditions and poor communication infrastructure.
- 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.
- Trade volumes are rarely documented.
- The three types of losses differ between countries and fishing sites to varying levels and have different degrees of impacts on livelihoods and food security.
- There is a relationship between the operators' precarious financial resources and their access to technology.

- There is a link between vulnerability to losses and coping strategies and the sustainability of the natural resources.
- Climate/environment change affects not only the type and volume of landings, but also downstream activities.
- There are significant impacts of human activities such as pollution of the river banks.
- There are 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 difficulties with authorities. Pittaluga *et al.* (2003) estimated that 30 percent of fish caught are sold by local fish traders (female intermediaries): 15 percent by the young and small-scale fish traders on the beach, and 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 2–3 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 female intermediaries 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. In addition, some wholesale fish traders own a number of fishing winch-net and gillnet fishing boats, and hire them out to fishers to work for them and take over the control of fish caught by these fishers.

2.2 National results

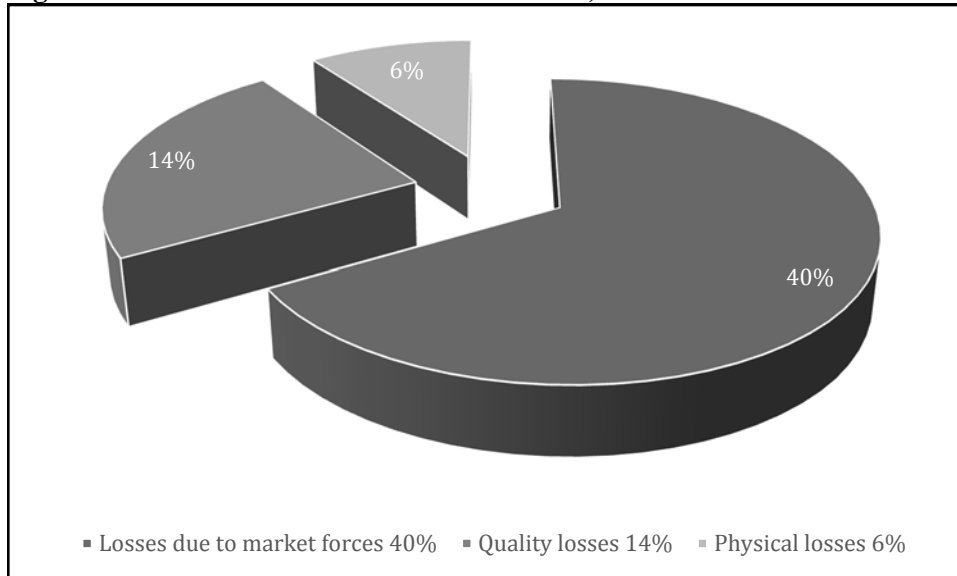
2.2.1 Benin

Fish production is 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 with those in Ghana and Burkina Faso. Further studies are needed on the fisheries activities in the Volta Basin in Benin.

2.2.2 Burkina Faso

Losses in Burkina Faso are essentially caused by: the inadequate cold chain; poor handling practices; the long 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 insufficient icing or the lack of 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, of which losses due to market forces represent 40 percent; quality losses, 14 percent; and physical losses, 6 percent, as shown in Figure 3.

Figure 3. Post-harvest losses in financial terms, Burkina Faso

Source: FAO (2015) Fisheries and Aquaculture Circular C1105.

As a result of the above, fishmongers lose about 23 percent of expected annual sales. The monetary impact of physical losses and those due to market forces represent 6 and 5 percent, respectively, of wholesalers' turnover. 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 fishers, 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 losses in quality for fishers are poor water quality, the capture of small-sized tilapia (constituting the average weight of catches), and unavailability of storage devices on board. Adverse weather conditions, especially in 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 are telling examples of how regulations and proper fisheries governance are not enforced. Poor water quality every year in October and November is the cause of 35 percent of the annual quality losses incurred by fishers in Tounga.

In Gouran, 94 percent of respondents to the survey believe that the use of non-regulatory nets with small mesh sizes is responsible for the high number of small tilapia in fishers' catches. This practice is responsible for 73 percent of quality losses at the Gouran and Di sites, where these types of nets are mostly used, and fishers 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, amount to about US\$61 million/year, and correspond to 86 percent of the total value of losses incurred by fishers, whose livelihoods are affected given the little involvement of women in post-harvest activities. Annual quality losses of landings at 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 fishers affected by quality losses are over 50 years old, since they lack the physical strength needed 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 and 80 percent. Losses due to market forces in Gouran and Di represent 24.9 percent (US\$9.5 million) and 25.4 percent (US\$11.5 million) of 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 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 US\$1 762.56 and US\$1 799.28 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 over imported tilapia. In Kompienga, this is exacerbated by fishers 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 losses 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 US\$21 012, or 11.4 percent, of the annual smoked fish turnover.

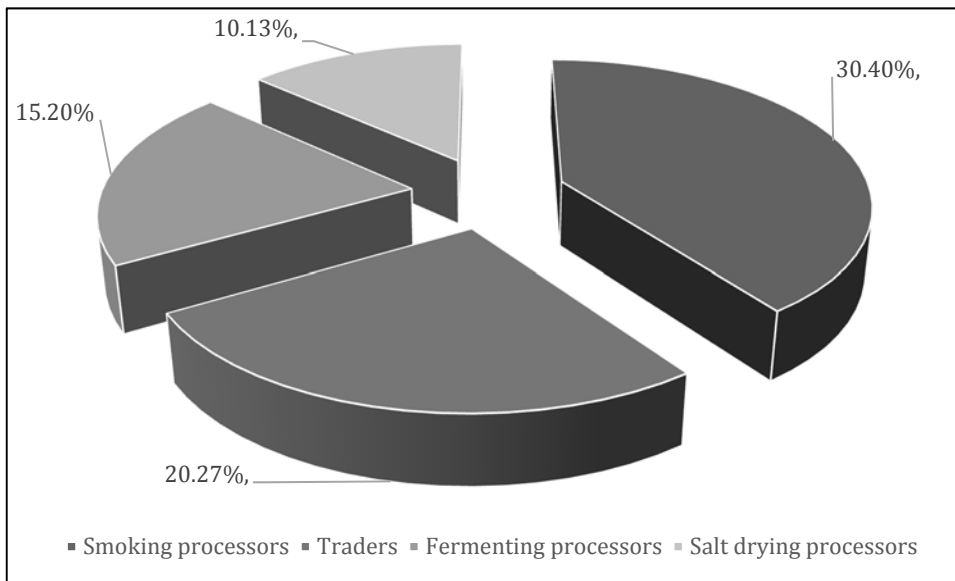
2.2.3 Ghana

Most fishing villages do not have their own markets and depend on a few larger lakeside towns for marketing 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), most roads in rural areas are unpaved, and in the rainy season, their conditions make fish trading very difficult. The PHLA found that this, combined 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 process the fish, sell it weekly at a local market and hand over 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 to up to 20 percent. The threat of armed robbers along major roads and highways has slowed the pace of trading activities in all the visited markets, which has led to an "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 and 4 percent of total fish supply, respectively. According to the post-harvest loss assessment report (FAO, 2015), markets operated one to a maximum of twice a week; hence, they lack flexibility because they are not coordinated with fishing seasons nor with the expected volume of products. 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 incur losses while processing fish because they have to combine this task with household and 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 post-harvest loss assessment case study focused on four categories of fish operators – traders, smokers, salt dryers and fermenters – in the four study sites (ibid.). Figure 4 shows the market share of different categories of fish operators in Ghana.

Figure 4. Market share for the different categories of fish operators in Ghana



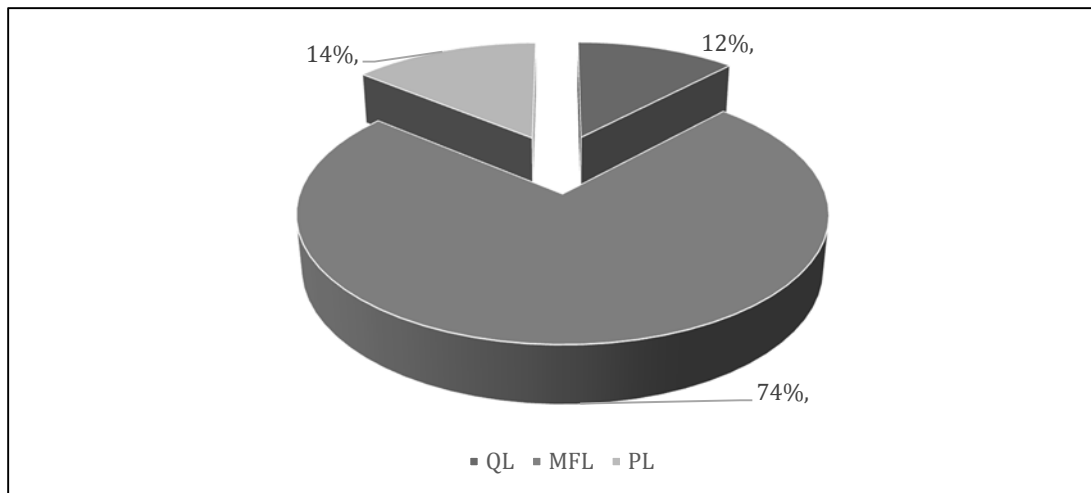
Source: FAO (2015) Fisheries and Aquaculture Circular C1105.

Different types of losses that occur for each category of operator at the study sites are summarized in Figures 5–8. Generally, losses due to market forces were the highest of total losses (74 percent), followed by physical losses (14 percent), while quality losses were minimal (12 percent), as shown in Figure 5. The contribution of losses in percentage terms is presented in Figure 7 and 8 for each category of operator at 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) in contrast 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 1 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 Tapa Abotoase, quality losses (3 percent) were also higher than physical losses (2 percent); fermenters only faced losses due to market forces (7.4 percent).

In general, the level and 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 the assessment focused mainly on the markets where products are sold, rather than the original fishing sites where handling and processing occur. It did not cover areas where losses would be higher such as in the camps and in the villages where operations that supply markets are carried out, because this is usually where the products are sorted just before they are brought to the market.

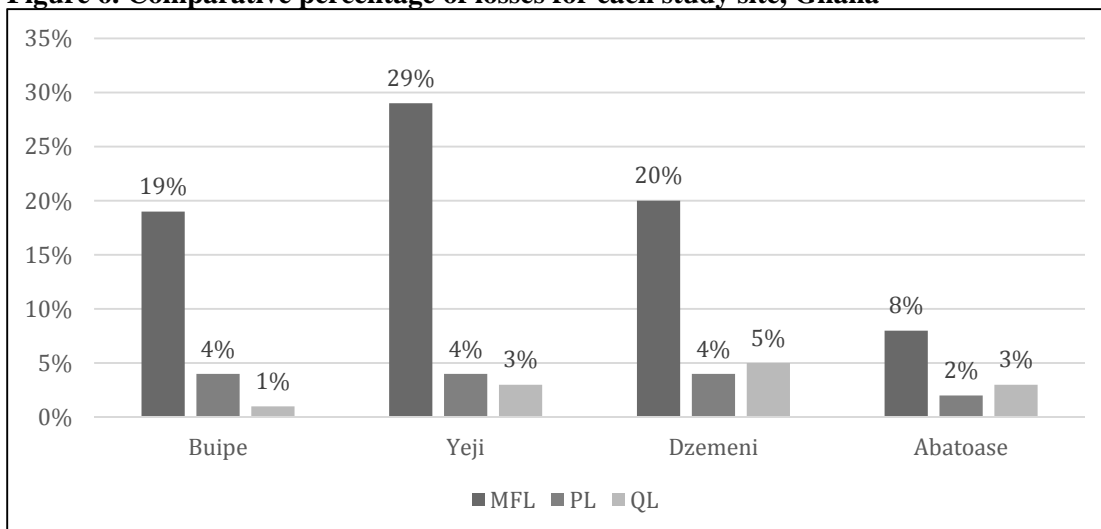
Figure 5. Total percentages of losses for all study sites, Ghana



Note: QL = quality losses; MFL = market forces losses; PL = physical losses.

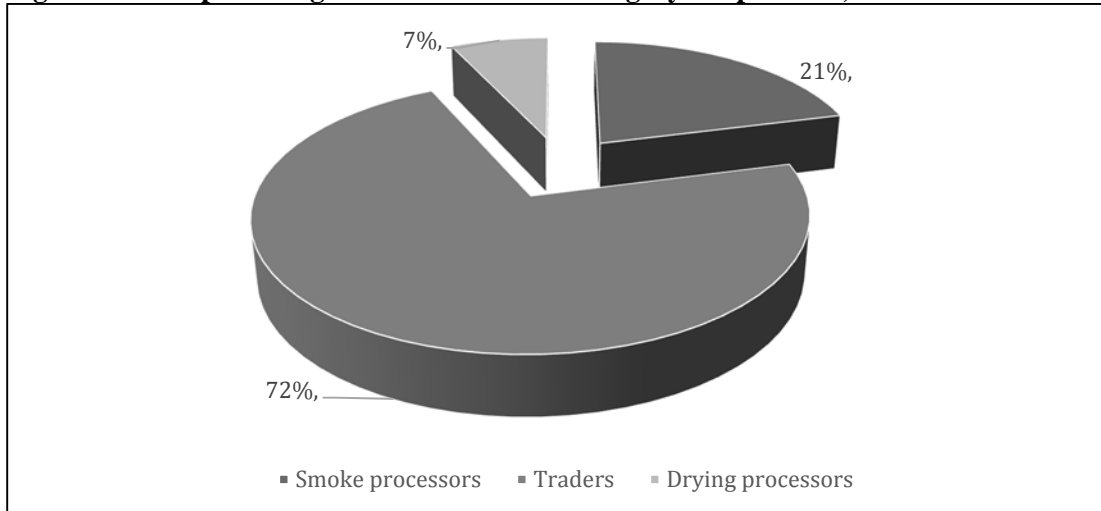
Source: FAO (2015) Fisheries and Aquaculture Circular C1105.

Figure 6. Comparative percentage of losses for each study site, Ghana



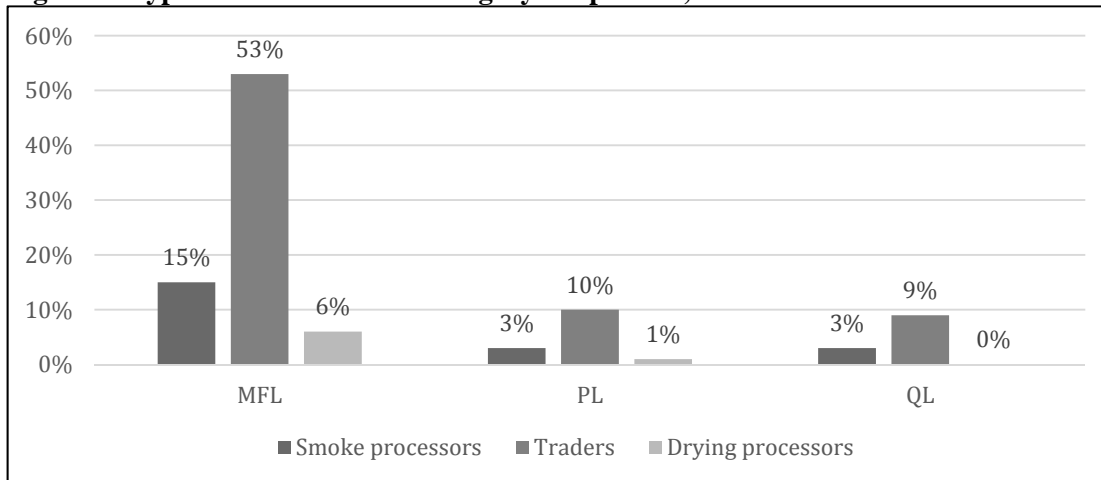
Note: QL = quality losses; MFL = market forces losses; PL = physical losses.

Source: FAO (2015) Fisheries and Aquaculture Circular C1105.

Figure 7. Total percentages of losses for each category of operators, Ghana

Note: QL = quality losses; MFL = market forces losses; PL = physical losses.

Source: FAO (2015) Fisheries and Aquaculture Circular C1105.

Figure 8. Types of losses for each category of operator, Ghana

Note: QL = quality losses; MFL = market forces losses; PL = physical losses.

Source: FAO (2015) Fisheries and Aquaculture Circular C1105.

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 minimal, but the result of the pilot study carried out by the 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, losses are also due to rancidity and attack by insects. Quality losses make up to one-third of the average annual amount of fish purchased primarily during the good season and were identified as the major loss. Losses due 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 about US\$97 913.88 per fishmonger. The causes identified by the post-harvest loss assessment case study are inadequate infrastructure (non-equipped landing sites), lack of equipment (cold rooms and ice plants) and lack of drinking water.

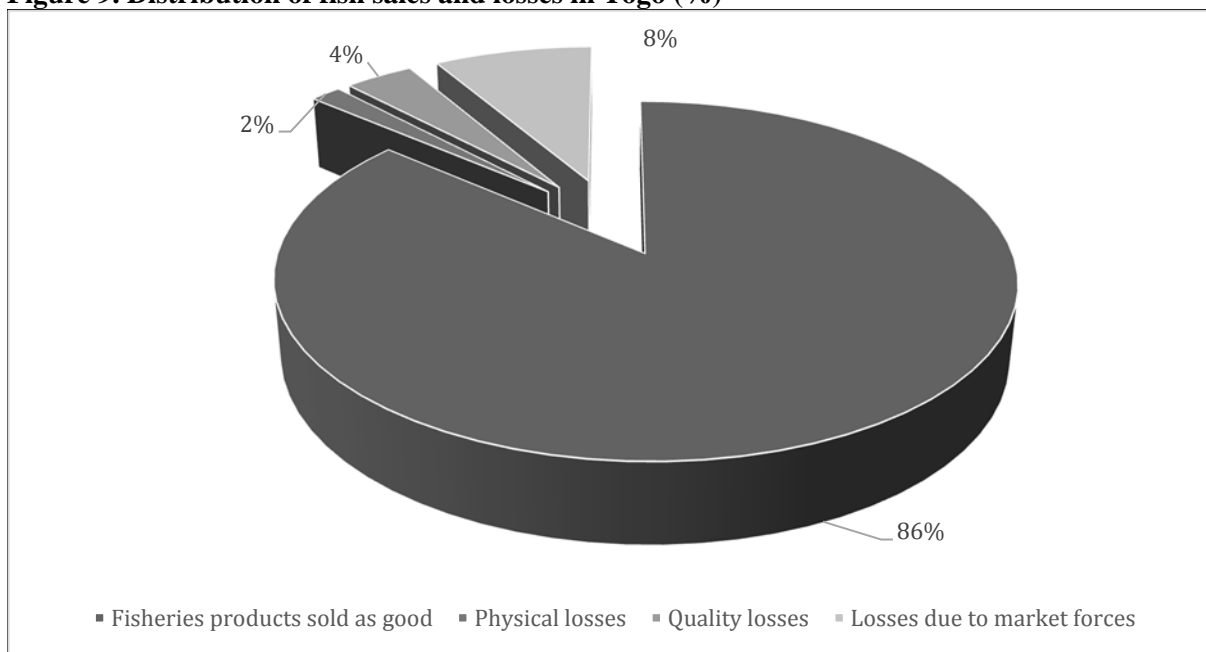
2.2.5 Mali

Quality losses, losses due to market forces and physical losses were recorded for fresh fish and smoked fish during the NFFP study in 2013. The average quality and physical losses were 10.87 and 1.28 percent, respectively. Fresh fish losses on the Konna site constituted 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; and poor preservation and storage conditions. In addition, prices of products are often reduced for fear of poor sales due to the lack of infrastructure and equipment; weak knowledge of good hygiene practices (GHPs) and good manufacturing practices (GMPs); inadequate processing capability; robbery attacks; and use of inappropriate fishing gear or set nets.

2.2.6 Togo

All three types of losses were observed. The NFFP 2013 study sites comprised a total of 61 013 kg in production, out of which 86.25 percent (52 625 kg) were of good quality when sold, while losses due to market forces accounted for 8.46 percent (5 162 kg), quality losses for 3.65 percent (2 226 kg) and physical losses for 1.64 percent (1 000 kg), as summarized in Figure 9.

Figure 9. Distribution of fish sales and losses in Togo (%)



Source: FAO (2015) Fisheries and Aquaculture Circular C1105.

At the fishing stage, the main causes of losses include inadequate or dormant fishing gillnets, longlines and beach seine, which 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 the 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.

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 NFFP studies, Table 1 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 policies and regulations as well as policy-related and developmental issues such stakeholders' capacity development, infrastructure and services, technology and techniques, and consumer-level interventions, while integrating gender dimensions.

Table 1. Factors that influence post-harvest losses and trade, issues, category and level of relevance and gender concerns

Factors that may influence post-harvest losses and trade of fish	Key issues	Category*	Level of relevance	
			Gender concerns	Subregional
<p>1. Changes in species distribution and the link with the preservation and processing of fish</p>	<ul style="list-style-type: none"> - The hydroelectric dam being constructed at the end of the Volta Basin has reduced the number of the prevailing species; 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. - The competitive situation may change for some fishermen who migrate to this area. - No change has been reported in other countries. 	T, I, IM, CI, CD	<ul style="list-style-type: none"> - Women and other vulnerable groups are capable of responding to the challenges of changing markets and changing technologies. - Training is 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. - New marketing systems may require investment. - There is a need to improve women's and other vulnerable groups' access to capacity building, development programmes and market information. - There are losses in terms of income and fish quality, which especially affect fishers who in turn affect other household members. - There is a risk of more competition and, at times, conflict between migrants and non-migrants. - The health risks for women and other vulnerable groups (lung disease and eyes) increase when smoking instead of drying fish using inappropriate technology.. 	<p>Ghana for the dam issue.</p>

<p>2. Pollution or degradation of the environment in the fishing zone</p>	<ul style="list-style-type: none"> - Silting occurs in fishing areas, which also impacts on spawning grounds. - Water quality is affected by several factors. - Riverbanks are occupied by vegetable growers in Sourou (creating silting and polluting with fertilizers/manure and pesticides). - Pollution is caused by women who wash dishes and clothes on the banks. - In Burkina Faso: The grass that grows at certain times of the year on Lake Komienga and seasonal flooding cause rotten fish and higher fish mortality in these fishing areas. - In Togo: The water level has been affected by the Komienga dam, and previously flooded habitat plains are no longer receiving enough water and therefore have lost their spawning function. - Since the fuel such as fuelwood is scarce, technology must be used, such as improved ovens to preserve the fish. 	<p>T, P, R</p>	<ul style="list-style-type: none"> - Men and women are affected by the decline in harvest. - Women and other vulnerable groups are more affected by the decline in profit margin because of increasing timber prices. - If regulations prohibit washing practices on the riverbanks, water supply and filtering infrastructure must be provided. 	<p>Regional problem</p>	<p>Burkina Faso and Mali Togo, Burkina Faso Burkina Faso Togo</p>
<p>3. Fishing practices coping with increased pressure on the resource/ the vicious cycle of vulnerability and loss and fishing efforts</p>	<ul style="list-style-type: none"> - Fishermen use strategies of changing fishing techniques such as using finer mesh nets and illegal practices to cope with the decline in harvest, but these are harmful to the resource, including fish habitat destruction. - Longer periods before hauling the nets (resulting in altering the quality and also market losses due to quality/fish size). - Poor fishing practices such as using dynamite lead to fish skin bruising and breaking; chemicals are used. - Fish fall out of the net when hauling bac. 	<p>P, R</p>	<ul style="list-style-type: none"> - Women's work time needed for processing and marketing is not worthwhile considering the size and the quality of the fish. - There is more competition between women and other vulnerable groups, and more migration. 	<p>Regional problem</p>	

	<ul style="list-style-type: none"> - Poor handling causes bruising. - Fish are left in the nets too long and rot. - No chilling on board; fish are exposed to high ambient temperatures in the boats. - Insulated boxes are rarely used. - The cold chain is not ensured. - Climate change affects seasonal variations, making it difficult to plan fishing activities. 	P, T, MI, CD, CI		<ul style="list-style-type: none"> - Although everyone 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. - Infrastructure should be provided by local and central government institutions. - Actors are not well organized and therefore lack lobbying capacity to improve conditions for landing. - All actors are negatively affected by the lack of management because the community-based fisheries management committees are not active. 	Regional	
4. Adverse weather conditions / climate change						Burkina Faso, Mali
5. Offloading and handling of fish	<ul style="list-style-type: none"> - Infrastructure is not consistent with good hygiene practices (GHPs) (e.g. use of baskets) (Burkina Faso, Mali) - There are huge losses due to poor handling and storage conditions (quality loss): <ul style="list-style-type: none"> o Fish drop from containers during unloading and transport on shore. o Spoilage occurs as fish are left on the beach and no ice is used. o There is a delay returning to landing after fishing, and exposure of fish to high ambient temperatures. o Stepping on fish causes physical damage. o Poor hygiene practices cause contamination. o There is a very long bargaining time at first point-of-sale, while fish are kept on the ground and exposed to ambient temperature. - Theft occurs at the landing site during offloading of fish. 	P, R, I, CD			Regional	Ghana

<p>6. Fresh fish sales</p>	<ul style="list-style-type: none"> - There inadequate application of ice; makeshift insulated containers are used. - There is limited preservation capacity during bumper catches. - There is no access to, or there is a lack of marketing information, with oversupply of market leading to market force losses. 	DC, I, T	<ul style="list-style-type: none"> - Women are more affected than men; in 90% of the cases, they are the ones who do the selling. 	
<p>7. Access to fish preservation and processing techniques or technologies</p>	<ul style="list-style-type: none"> - More input in the fish processing, hence increasing the operation costs. - Training of processors takes time and is highly informal. - Trainees start out as apprentices and learn through observation, instructions and self-mastery to then advance to the professional level. - There is a lack of access to capital for post-training investments (i.e. new technologies are known, but lack of funds to make the necessary investment). - There is a lack of drinking water at some sites (Togo). - There is a loss of quality due to the use of inadequate technologies. - There are poor hygiene practices – personal and in the workplace. - Fish handling practices are inadequate. - There is no business planning. - Capacity to absorb raw material landings is inadequate, especially during the glut season. - Adverse weather conditions make drying difficult. - Insect infestation is a problem. - Technology adoption is a problem. - Processing methods are inefficient. - Already spoiled fish are sometimes processed. 	T, I, CD, R, P, CI, MI	<ul style="list-style-type: none"> - Women and other vulnerable groups are more affected. The difference in literacy and school enrolment rates disadvantages women in management capacity. - Villages are often difficult to access, and women's training needs are not taken into account. 	Regional

	<ul style="list-style-type: none"> - There is an inadequate control of heat intensity during smoking leads to overly smoked fish and possible burning. - Drying on the ground or cooling of fish is unsupervised; there is breakage or damage due to inadequate packaging method and materials. 				
8. Waste of other natural resources (e.g. wood)	<ul style="list-style-type: none"> - There is an excessive use of wood during smoking operations. - There is a lack of access to new technologies. - Research outcomes are not adaptable to women processors. For example, the research failed to consider their inputs at the planning stage. - There is a lack of knowledge about the correct methods for processing different species; for example, salt is wasted when processing the fish. 	T, CD, I, R, P	<ul style="list-style-type: none"> - Women are more affected than men since they do most of the smoking and other types of product processing. - Women make low profits (economics). 	Regional	
9. Packaging and storage of fish	<ul style="list-style-type: none"> - Quality and quantity of packaging and storage facilities are inadequate, leading to spoilage. - Processors lack skills. - Growth of mould causes spoilage and makes the fish damp. - Insect infestation is a problem. Insects consume fish during storage. - Discoloration occurs owing to chemical changes during long storage. - Theft of fish leads to financial losses. 	R, CD, I, T	<ul style="list-style-type: none"> - Men and women. 	Regional	

<p>10. Resistance from fishermen (or post-harvest operators) to change to adopt good practices</p>	<ul style="list-style-type: none"> - There is a low level of regulation enforcement. - There are adjustment difficulties (lack of resources, skills, information, illiteracy, etc.). - Age is a negative factor (especially when fishers are 50 years old and over). 	R, CD, I, T	<ul style="list-style-type: none"> - Men and women. 	Regional	
<p>11. Comprehensive knowledge on fish handling and skills of fishers</p>	<ul style="list-style-type: none"> - There is a lack of knowledge of good handling practices. - There is a lack of financial resources. 	CD, I, T	<ul style="list-style-type: none"> - Men and women. 	Regional	
<p>12. No record-keeping and ignorance of the reasons for loss</p>	<ul style="list-style-type: none"> - Due to illiteracy, records cannot be kept. - There is a lack of entrepreneurship. - There is a low level of organization. - There is a low level of technical support. - Consumers are poorly aware of quality. 	P, CD	<ul style="list-style-type: none"> - Men and women 	Regional	
<p>13. Management capacity of fishermen during exceptional harvest (facilities and expertise, information)</p>	<ul style="list-style-type: none"> - There are problems of preservation, processing and storage equipment and infrastructure. - There is a lack of market information. 	CD, I, T, IM	<ul style="list-style-type: none"> - Men and women. 	Regional	
<p>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)</p>	<ul style="list-style-type: none"> - Use of types of fishing gear/technique that incur more losses. - use of prohibited methods (chemicals, dynamite). - mixture of fresh and altered fish. 	P, R, CI	<ul style="list-style-type: none"> - Women and other vulnerable groups 	Subregional	Ghana, Togo, Burkina Faso

15. Logistics infrastructure / communication (roads, trucks)	Problems include: <ul style="list-style-type: none"> • physical damage to fish; • delays owing to breakdown of inadequate and defective transport vehicles and inaccessibility of production areas; • impassable roads; • poor road conditions; • ill-adapted vehicles resulting in longer transit times and spoilage. 	P, R, I, T	– Women and other vulnerable groups.	Regional	Burkina Faso, Togo
16. Insecurity and unreliable transportation	– Armed robberies occurs (loss of supply capacity by fishmongers / artificial glut in supply sites with eventual losses). – Vehicles are defective.	P, I, T, R	– Women and other vulnerable groups.	Subregional	Ghana
17. Market demand (e.g. social status and demand for specific types of fishery products or portion sizes)	– There is low awareness of quality. – Purchasing power is weak and the poverty level may lead to special requests, contributing to the use of prohibited means of harvest.	R, CD, I, T, P, CI	– Men and women.	Subregional	Burkina Faso
18. Marketing: market access (physical facilities, the available information and management, the local organization and arrangements for sales performance)	Problems include: <ul style="list-style-type: none"> • insect infestation; • inadequate/ inconsistent supply and demand; • inadequate cold-storage facilities and warehouses; • unwillingness; • low level of regulation enforcement; • age (50 years and older); • lack of information on market and of the professionalization of actors. • supply to the market at inopportune times; • the weak purchasing power of buyers/consumers; • lack of market information availability and management; 	R, CD, I, T I, P, R CD, I, IM	– Men and women. – Women and other vulnerable groups are the more affected by the losses linked to these issues.	Subregional	

	<ul style="list-style-type: none"> poorly synchronized competitiveness of imports of the same species various incidents of harassments. 	CD, I, T	<ul style="list-style-type: none"> Both men and women. Depend on the market regulation in specific countries. 	Subregional	
<p>19. Weekly or bi-weekly market days are pre-established and do not change, even in times of exceptional harvest</p>	<ul style="list-style-type: none"> Low capacity of the local/central government to set up an informed or evidence-based market management structure (adjusting the frequency to the production seasons). The regular removal of catches is problematic, especially for fresh fish, or inadequate storage of products, yet this is required for weekly market days, resulting in losses. 	P, CD	<ul style="list-style-type: none"> Men and women. 	Subregional	
<p>20. Barriers to regional trade</p>	<ul style="list-style-type: none"> Barriers include: <ul style="list-style-type: none"> Regional trade bottlenecks. Illiteracy. Lack of entrepreneurship. Low level of organization. Low level of technical support. Low quality awareness of consumers. Police harassment and inopportune or lengthy customs and health checks resulting in longer periods of transactions with an impact on quality of perishable product like fish. At times, there is a mishandling of products and physical removal of some products from the chain. 	P, R			

<p>21. Implementation and support / government institutions services Weak upstream control over the monitoring of the implementation of legislation along all of the value chains)</p>	<ul style="list-style-type: none"> - The policy and regulatory framework regarding fishing practices is insufficient or not harmonized. - There is a lack of childcare facilities for women processors. - Financing is inadequate. - There is a poor network for e-commerce or secured transactions. - There is poor fish import management during the glut period of the national artisanal fisheries. 	<p>R, CD, I, T, IM</p>	<p>- Men and women.</p>	<p>Subregional</p>	
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*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

3.1 Prioritization 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 critical areas linked to the losses identified during the PHLAs, the corresponding components in terms of potential loss-reduction interventions, together with the roles and responsibilities of the stakeholders along the chain and the challenges and opportunities in the implementation.

Table 2. Critical areas, interventions, responsible entities, and implementation challenges and opportunities

Critical gaps or weaknesses reported by the case studies	Required interventions		Responsible entities	Implementation challenges and opportunities	
	Interventions	Gender related actions		Challenges	Opportunities
1. INFRASTRUCTURE/SERVICES <ul style="list-style-type: none"> • Infrastructure and equipment not conducive to good hygiene practices (GHPs). • Physical losses due to fish theft because of non-equipped landing sites • Inadequate preservation, processing, packaging and storage equipment, both in terms of quantity and quality • Poor road conditions • Non-operational quality assurance services. 	<ul style="list-style-type: none"> - Identify priority docks to be constructed. - Ensure the security of wharfs, construction and layout. - Raise awareness on GHPs during handling. - Focus on sanitation and drinking-water supply. - Conduct a feasibility study for cold storage installation. - Strengthen organizational capacity of all actors along the value chain. - Provide training on managing community assets. - Provide training for artisans to manufacture insulated boxes. - Carry out advocacy with authorities responsible for road maintenance. - Organize waste management (linked to human and fishing activities). 	<p>Involve women and other vulnerable groups in decision-making on the dock-building process and the management of these docks. Set up and run childcare infrastructures and services. Organize women and other vulnerable groups in recognized groups so that they may be agents of change. Ensure that infrastructure management committees have 50% female members.</p>	<ul style="list-style-type: none"> - Volta Basin Authority (VBA) State Technical Services. - The state (construction). - Watchdog committee for security. - Non-governmental organizations (NGOs) and technical services in charge of these issues (hygiene, sanitation, capacity building). - Local authorities. - NGOs and technical services in charge of these issues. - Local authorities. - The private sector for investment in technical installations at landings (cold rooms, refrigerated vehicles, etc.). 	<ul style="list-style-type: none"> - High construction costs. - Specific priorities of donors - Infrastructure management. - Land issues. - Women needing more empowerment. - Funding partners' priority issues. - The creation of favourable environment for sustainable first-aid centres and social and educational facilities at landing sites and major markets. - An ensured exchange of information between first-care centres, socio-educational facilities and monitoring bodies. - Organization of a sustainable system of infrastructure maintenance. 	<ul style="list-style-type: none"> - Access to funds from many donors. - Technical expertise, in some cases. - VBA Strategic Plan. - United States Agency for International Development (USAID) programme on waste management (Côte d'Ivoire, Ghana, Benin, etc.)

<p>2. TECHNOLOGY/TECHNIQUES</p> <ul style="list-style-type: none"> • Disruption of fishers' activity following the disappearance of some species due to the new dam or climate change effects • Large quantities of wood/fuel used due to rudimentary techniques • No use of GHPs and good manufacturing practices (GMPs) resulting in quality losses • Lack of knowledge about correct processing methods for different fish species 	<ul style="list-style-type: none"> - Provide passages for fish when building dams. - Research into technology for adaptation. - Educate and train on GHPs and GMPs. - Carry out research on dietary habits and preferences of operators and consumers. - Draft and implement community-resilience action plans. 	<ul style="list-style-type: none"> - Take into account women's and other vulnerable groups' issues such as access to land, credit, loans, access to working capital. - Provide women and other vulnerable groups with literacy courses before other training to assimilate better. - Consider the issue of migration. 	<ul style="list-style-type: none"> - Line ministries. - Line ministry and partners. - Technical and financial partners. 	<ul style="list-style-type: none"> - High interest rate loans. - No working capital. - Financing of techniques and technology. 	<ul style="list-style-type: none"> - Many microfinance institutions, even if not always tailored to specific needs. - Ongoing climate change adaptation programmes (Côte d'Ivoire, Ghana, Mali, Togo) such as the AICC programme.
<p>3. CAPACITY DEVELOPMENT</p> <ul style="list-style-type: none"> • Changing processing techniques 	<ul style="list-style-type: none"> - Provide training of stakeholders. 	<ul style="list-style-type: none"> - Ensure that women and other vulnerable groups have access to all the training sessions. - Build capacity for women and other vulnerable groups on value addition opportunities for their products. 	<ul style="list-style-type: none"> - The state. - Local authorities. - Technical and financial partners. - NGOs. - Civil society. 	<ul style="list-style-type: none"> - Setting up of a transparent participative process to identify training sessions and select actors. - Training of key actors. 	<ul style="list-style-type: none"> - Information sharing through new communication technologies.
<ul style="list-style-type: none"> • Strategy to adapt to change of technology 	<ul style="list-style-type: none"> - Increase information and awareness. 		<ul style="list-style-type: none"> - The state. - Local authorities. - Technical and financial partners. - NGOs. - Civil society. 	<ul style="list-style-type: none"> - Adoption of GMPs. 	<ul style="list-style-type: none"> - Better resource conservation. - Improved fish quality.

<ul style="list-style-type: none"> • More input in fish processing • Fish processors beginning as apprentices and come into the profession through observation, instructions and self-mastery 	<ul style="list-style-type: none"> - Provide training of stakeholders. 	Attention must be paid to women and other vulnerable groups more concerned.	<ul style="list-style-type: none"> - The state. - Local authorities. - Technical and financial partners. - NGOs. - Civil society. 	<ul style="list-style-type: none"> - Improvement of the quality of fishery products. 	<ul style="list-style-type: none"> - Quality fish products made available.
<ul style="list-style-type: none"> • Loss of quality through the use of technologies that are not GHP/GMP-compliant • Poor hygiene practices – personal and in the workplace 	<ul style="list-style-type: none"> - Consult support on GHPs/GMPs 	Attention must be paid to women and other vulnerable groups more concerned.	<ul style="list-style-type: none"> - The state. - Local authorities. - Technical and financial partners. - NGOs. - Civil society. 	<ul style="list-style-type: none"> - Reduction of losses. 	
<ul style="list-style-type: none"> • Bad handling practices. • Poor business planning. • Lack of knowledge of good handling practices. 	<ul style="list-style-type: none"> - Increase information and awareness. - Provide training. 		<ul style="list-style-type: none"> - The state. - Local authorities. - Technical and financial partners. - NGOs. - Civil society. 	<ul style="list-style-type: none"> - Abandonment of inefficient practices. - Planning of activities. 	<ul style="list-style-type: none"> - Quality fish products made available.
<ul style="list-style-type: none"> • Lack of knowledge about correct handling and processing methods for different fish species; for example, fish is wasted due to improper salting, leading to fermentation • Operators lacking skills 	<ul style="list-style-type: none"> - Increase information and awareness. - Training. 		<ul style="list-style-type: none"> - The State. - Local authorities. - Technical and financial partners. - NGOs. - Civil society. 	<ul style="list-style-type: none"> - Improvement of knowledge. 	<ul style="list-style-type: none"> - Better managed available resources.
<ul style="list-style-type: none"> • Low level of organization and technical leadership 	<ul style="list-style-type: none"> - Provide training. 			<ul style="list-style-type: none"> - Improvement of the skills of operators. 	<ul style="list-style-type: none"> - New markets conquered. - Easy flow of products. - Increased income.
<ul style="list-style-type: none"> • Advisory-support institutions and quality-control authorities lacking capacity 	<ul style="list-style-type: none"> - Increase information and awareness. - Provide training. 		<ul style="list-style-type: none"> - The State. - Local authorities. - Technical and financial partners. - NGOs. - Civil society. 	<ul style="list-style-type: none"> - Good organization and better techniques. 	<ul style="list-style-type: none"> - New markets conquered. - Easy flow of products. - Increased income.
	<ul style="list-style-type: none"> - Increase information and awareness. - Provide training. 			<ul style="list-style-type: none"> - Improvement of the skills of these institutions. 	<ul style="list-style-type: none"> - Good management of activities.

<ul style="list-style-type: none"> • Illiteracy 	<ul style="list-style-type: none"> - Provide training 	<p>Attention must be paid to women and other vulnerable groups more concerned.</p>	<ul style="list-style-type: none"> - The State. - Local authorities. - Technical and financial partners. - NGOs. - Civil society. 	<ul style="list-style-type: none"> - Improvement of the competency and group dynamics between actors. 	<ul style="list-style-type: none"> - Good management of activities.
4. MARKET INFORMATION					
<ul style="list-style-type: none"> • Lack of entrepreneurship 	<ul style="list-style-type: none"> - Provide training 		<ul style="list-style-type: none"> - The State. - Local authorities. - Technical and financial partners. - NGOs. - Civil society. 	<ul style="list-style-type: none"> - Ensuring the sustainability activities. 	<ul style="list-style-type: none"> - Profitable and sustainable activities.
<ul style="list-style-type: none"> • Low-quality awareness of consumers 	<ul style="list-style-type: none"> - Increase information. 		<ul style="list-style-type: none"> - The State. - Local authorities. - Technical and financial partners. - NGOs. - Civil society. - Consumer associations. 	<ul style="list-style-type: none"> - Choice of quality products. 	<ul style="list-style-type: none"> - Improved health of individuals.
<ul style="list-style-type: none"> • Lack of market information 	<ul style="list-style-type: none"> - Collect, process and disseminate information. - Build awareness. 		<ul style="list-style-type: none"> - The state. - Local authorities. - Technical and financial partners. - NGOs. - Civil society. - Consumer associations. 	<ul style="list-style-type: none"> - Better information dissemination. - Poorly performing information systems. 	<ul style="list-style-type: none"> - INFOPECHE . - Products known and available. - Accessible markets are - Knowledge sharing due to new communication technologies. - E-commerce. - Economic Community of West African States (ECOWA) regulations on free movement of goods and persons.

<p>5. CONSUMER INTERVENTIONS</p> <ul style="list-style-type: none"> • Demand for specific fishery products or portion size 	<ul style="list-style-type: none"> - Develop a communication plan for a change in consumer behaviour. - Target socio-economic measures towards vulnerable /weak-purchasing-power consumers 		<ul style="list-style-type: none"> - The state. - Communities. - NGOs. 	<ul style="list-style-type: none"> - The level of fish utilization remains a concern in terms of meeting the demand for responsibly caught and prepared. 	
<ul style="list-style-type: none"> • Quality blindness or unawareness • Purchasing power 	<ul style="list-style-type: none"> - Educate consumers on product knowledge and quality. - Implement social measures to address the purchasing or promotion of alternative protein source for poorer consumers. - Implement information and awareness campaigns. 	<ul style="list-style-type: none"> - Train homemakers on product quality. 	<ul style="list-style-type: none"> - The state. - Communities. - NGOs. 	<ul style="list-style-type: none"> - The level of fish utilization remains a concern in terms of meeting the demand for responsibly caught and prepared . 	<ul style="list-style-type: none"> - NGOs. - National regulations. - International usage codes.
<p>6. RESILIENCE AND WELFARE</p> <ul style="list-style-type: none"> • Fishermen migrating to areas of abundant fishing because of the disappearance of some species due to the construction of the dam • Fishermen migrating to other areas due to pollution and siltation of fishing sites 	<ul style="list-style-type: none"> - Encourage fishermen to engage in other income-generating activities. - Build awareness in market gardeners and farmers to respect the easement strip. 		<ul style="list-style-type: none"> - Technical services and local authorities. 	<ul style="list-style-type: none"> - Access to land, water, credit and services. 	<ul style="list-style-type: none"> - Resilience initiatives already in place or are being developed, including the Global Alliance for Resilience (AGIR) (Permanent Interstate Committee for Drought Control in the Sahel [CILSS]), West African

<ul style="list-style-type: none"> • Migration of fishing communities due to climate change effects 					<p>Economic and Monetary Union [UEMOA] and ECOWAS initiative).</p> <ul style="list-style-type: none"> - Activities rendered sustainable. - Resource availability.
<ul style="list-style-type: none"> • Seasons are no longer well-defined and therefore the fisheries are difficult to plan 	<ul style="list-style-type: none"> - Develop adaptation strategy (technology). 		<ul style="list-style-type: none"> - The State. - Local authorities. - Technical and financial partners. - NGOs. - Civil society. 	<ul style="list-style-type: none"> - Adaptation to climate change. 	
<ul style="list-style-type: none"> • Destruction of habitat 	<ul style="list-style-type: none"> - Increase information and awareness. 		<ul style="list-style-type: none"> - The State. - Local authorities. - Technical and financial partners. - NGOs. - Civil society. 	<ul style="list-style-type: none"> - Enforcement of regulations. - Raising the awareness of stakeholders from the current low level destruction of habit. 	<ul style="list-style-type: none"> - Activities rendered sustainable. - Resource availability.
<ul style="list-style-type: none"> • 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) 	<ul style="list-style-type: none"> - Implement accompanying measures. 	<ul style="list-style-type: none"> - Attention must be paid to women and other vulnerable groups more concerned. 	<ul style="list-style-type: none"> - The State. - Local authorities. - Technical and financial partners. - NGOs. - Civil society. 	<ul style="list-style-type: none"> - Access to financial services for all. - Access to seed capital. 	<ul style="list-style-type: none"> - Jobs created. - Competitive sector.
<ul style="list-style-type: none"> • Excessive use of wood for smoking since the fuel (fuelwood) used is scarce (there is a need to use technology that reduces its consumption such as improved ovens to smoke the fish). 	<ul style="list-style-type: none"> - Develop new energy-efficient processing techniques. - Promote other types of renewable energies and value addition methods. 	<ul style="list-style-type: none"> - Attention must be paid to women and other vulnerable groups more concerned. 	<ul style="list-style-type: none"> - Research/academia. - The State. - Technical partners for development. 	<ul style="list-style-type: none"> - Reduced consumption of fuelwood. 	<ul style="list-style-type: none"> - Environmental protection.
<ul style="list-style-type: none"> • Specific consumer demand, causing the use of prohibited means of harvest 	<ul style="list-style-type: none"> - Improve people's livelihoods. 		<ul style="list-style-type: none"> - The State. - Local authorities. - Technical and financial partners. - NGOs. 	<ul style="list-style-type: none"> - Poverty reduction. 	<ul style="list-style-type: none"> - Discontinuation of bad fishing practices. - Regenerated resources.

<ul style="list-style-type: none"> • Issue linked to catches needing to be transported from landing sites on a regular basis 	<ul style="list-style-type: none"> - Organize sales channels. 	<ul style="list-style-type: none"> - Attention must be paid to women and other vulnerable groups more concerned. 	<ul style="list-style-type: none"> - The State. - Local and traditional authorities. - Technical and financial partners. - NGOs. - Civil society. 		<ul style="list-style-type: none"> - Improved income. - Loss reduction.
<ul style="list-style-type: none"> • Silting of fishing areas • Impact on spawning grounds • 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 	<ul style="list-style-type: none"> - Ensure dune fixation and bank protection. - Ensure dredging of waterbody. - Reconstitute canopy. - Implement measures against invading aquatic plants. 	<ul style="list-style-type: none"> - Create income-generating activities. 	<ul style="list-style-type: none"> -The State. -Communities. -Traditional leaders. 	<ul style="list-style-type: none"> -Protection of the aquatic ecosystem. 	<ul style="list-style-type: none"> -Creation of professional organizations and community groups -Recycling and selling of sand for construction works.
<ul style="list-style-type: none"> • Seasonality/adverse weather conditions 	<ul style="list-style-type: none"> - Draft and strategy for resilience action plans. 	<ul style="list-style-type: none"> -Suggest alternative income-generating activities to women and youth. -Provide easy access to finance for women and youth. 	<ul style="list-style-type: none"> -The State. 	<ul style="list-style-type: none"> -Securing of household income. -Number of beneficiaries. 	<ul style="list-style-type: none"> -Microfinance institutions. -NGOs. -Regional and international conventions and programmes.
<p>7. POLICY / REGULATIONS</p>					
<ul style="list-style-type: none"> • Riverbanks occupied by vegetable growers in Sourou (creating silting and polluting with fertilizers/manure and pesticides) • Pollution from women washing dishes and clothes on the riverbanks 	<ul style="list-style-type: none"> -Regulate the use of riverbanks. -Enforce existing regulations. -Monitor and evaluate the implementation of regulations. -Introduce community-led total sanitation in programme. 	<ul style="list-style-type: none"> -Create water proximity points (boreholes). -Create vegetable gardening areas for women and other vulnerable groups with water from boreholes. 	<ul style="list-style-type: none"> -The State. -Communities. -Beneficiaries. 	<ul style="list-style-type: none"> -Behaviour change. -Protection of waterbodies. 	<ul style="list-style-type: none"> -Decentralization. -NGOs and traditional leaders. - Professional organizations. -Technical development partners. - regional institutions, i.e. Fisheries Committee for the West Central Gulf of Guinea (FCWC.) - ECOWAS, West African Economic and

<ul style="list-style-type: none"> • Fishermen' strategy to change fishing techniques designed to cope with the decline in harvest such as finer mesh nets and illegal practices, but these are harmful to fisheries resources • Longer fishing times, having an effect on quality and also resulting in loss of market due to poor quality / fish size 	<ul style="list-style-type: none"> -Regulate Illegal, unreported and unregulated (IUU) fishing. -Enforce existing regulations. -Develop fisheries management local covenants/ specifications. -Monitor and evaluate the implementation of regulations. - Develop subregional cooperation for a harmonized regulatory framework on fishing gears (Burkina Faso and Mali). 	<ul style="list-style-type: none"> -Create income-generating activities for women and youth. -Guarantee the protection of women and other vulnerable groups who report illegal practices. 	<ul style="list-style-type: none"> -The State. -Communities. -Beneficiaries. 	<ul style="list-style-type: none"> -Re-training of fishermen in other income-generating activities. 	<ul style="list-style-type: none"> Monetary Union (WAEMU). -National and international legal instruments. -Subregional organizations. -Microfinance institutions. -Regional institutions (FCWC, ECOWAS, WAEMU).
<ul style="list-style-type: none"> • Seasons are affected by climate change and are no longer well defined. Thus, fishing is difficult to plan 	<ul style="list-style-type: none"> -Define and support the implementation of a mitigation and adaptation strategy inclusive of fisheries' specific concerns. 		<ul style="list-style-type: none"> -The State. 	<ul style="list-style-type: none"> -Re-training fishermen in other income-generating activities. 	<ul style="list-style-type: none"> -National and international legal instruments. - Subregional organizations. - National and international programmes on climate change.
<ul style="list-style-type: none"> • Infrastructures are not conducive to GHPs • Huge quality losses due to inadequate storage conditions • Physical losses due to theft of the fish at landing site 	<ul style="list-style-type: none"> -Establish basic infrastructure and marketing (dock/piet, safe water, jetties, cold chain). 		<ul style="list-style-type: none"> -The State. -Technical and financial partners. -Communities. -Beneficiaries. 	<ul style="list-style-type: none"> -Food safety. 	<ul style="list-style-type: none"> -National budget. -Donations and aid. -Technical and financial partners. - Regional institutions FCWC, ECOWAS, WAEMU).

<ul style="list-style-type: none"> • Excessive use of wood for smoking • No access to new technologies • 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 likely not taken into consideration during design and planning stages • Lack of knowledge about correct handling and processing methods for different fish species 	<p>-Promote alternative energy sources.</p> <p>-Promote good research practices and technologies that are adapted to smallholders living conditions (demand-driven and socio-centred).</p>		<p>-The State.</p> <p>-Technical and financial partners.</p> <p>-Communities.</p> <p>-Beneficiaries.</p>	<p>-Forest and environment conservation.</p>	<p>-Development of renewable energies (sun, water, air).</p>
<ul style="list-style-type: none"> • Illiteracy • Lack of entrepreneurship • Low level of organization • Low level of technical support 	<p>-Create social and educational training centres.</p>	<p>-Provide programmes on functional literacy for women and youth.</p>	<p>-The State.</p> <p>-Technical and financial partners.</p> <p>-Communities.</p> <p>-Beneficiaries.</p>	<p>-School enrolment and literacy.</p>	<p>-NGOs.</p> <p>-Technical and financial partners.</p> <p>-Decentralized services.</p> <p>-Ministries.</p> <p>-Regional institutions (FCWC, ECOWAS, WAEMU).</p> <p>-WAEMU Guidelines.</p>
<ul style="list-style-type: none"> • Use of gear, techniques and prohibited substances 	<p>-Regulate IUU fishing.</p> <p>-Enforce existing regulations.</p> <p>-Monitor and evaluate the implementation of regulations.</p> <p>-Develop subregional cooperation for a harmonized regulatory framework on fishing gears (Burkina Faso and Mali).</p>	<p>-Assess and address the direct short-term impact of regulations on women and other vulnerable groups' post-harvest activities.</p>			

<ul style="list-style-type: none"> • Poor road conditions • Inadequate transport vehicles 	<ul style="list-style-type: none"> -Link production areas. 		<ul style="list-style-type: none"> -The State. -Technical and financial partners. -Communities. -Beneficiaries. 	<ul style="list-style-type: none"> -Facilitating of the movement of goods. 	<ul style="list-style-type: none"> -The State. -Technical and financial partners. -Decentralized services. -Ministries.
<ul style="list-style-type: none"> • Armed robberies affecting fishmongers (loss of supply capacity; fishmongers/artificial glut in supply sites with eventual losses) 	<ul style="list-style-type: none"> -Enhance public safety. -Promote marketing transactions with minimum cash carrying, e-commerce and mobile money transactions. 	<ul style="list-style-type: none"> -Create money transfer instruments adapted to fishmongers. 	<ul style="list-style-type: none"> -The State. -Technical and financial partners. -Communities. -Beneficiaries. 	<ul style="list-style-type: none"> -Free movement of people and goods. 	<ul style="list-style-type: none"> -Money transfer companies.
<ul style="list-style-type: none"> • Specific consumer demand, causing the use of prohibited means of harvest 	<ul style="list-style-type: none"> -See IUU above. 				
<ul style="list-style-type: none"> • Inadequate infrastructure and equipment causing physical and quality losses 	<ul style="list-style-type: none"> -See above. 	<ul style="list-style-type: none"> -Build gender-sensitive infrastructures. 			
<ul style="list-style-type: none"> • Harassment by the police, customs and health authorities, causing delays and longer transactions 	<ul style="list-style-type: none"> - Enforce national and regional conventions/regulations. 		<ul style="list-style-type: none"> -The States. -Subregional organizations. -Civil society. 	<ul style="list-style-type: none"> -Good governance. -Free movement of people and goods. 	<ul style="list-style-type: none"> -International conventions. -Subregional and bilateral agreements.
<ul style="list-style-type: none"> • Control institutions with insufficient capacity resulting in losses 	<ul style="list-style-type: none"> - Establish or operationalize quality assurance infrastructures and services. - Develop capacity. - Provide training of trainers programme development and support. 		<ul style="list-style-type: none"> -The States. -Subregional organizations. -Technical development partners. -Consumers. 	<ul style="list-style-type: none"> -Recovery and food security. 	<ul style="list-style-type: none"> -In some riparian countries there are statal institutions with the relevant capacity and experience in tackling the issues at stake. -Decentralized communities.

3.2 Guidelines for a subregional programme and national action plans addressing priority areas of intervention

Transforming the subregion'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: (i) resilience and social protection; and (ii) specific gender concerns. The essential characteristics of each are described below, and the dynamics of relationships and linkages between actors and drivers of improvement strategies are illustrated in Figure 9.

National action plans define the necessary government policies and interventions that aim to improve productivity and competitiveness in the fisheries and aquaculture post-harvest chain as well as regional trade. These plans are not limited to fishing/farm and processing, nor to effective marketing in the domestic, regional and international arenas, but also concern 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.

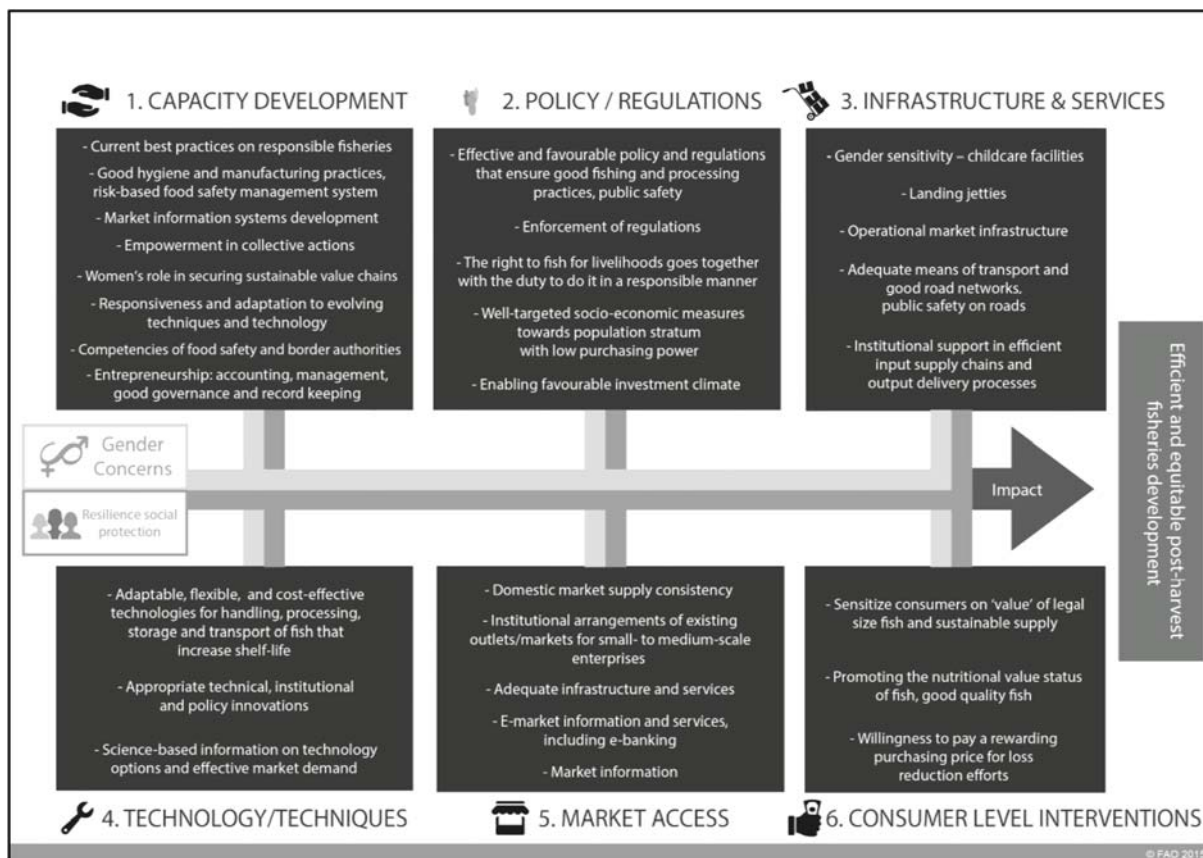
It is recommended that these national plans form part of a subregional programme that will align common and cross-cutting activities between countries that are to be developed, particularly in terms of:

- negotiations with technical and financial partners for the funding of post-harvest loss reduction action plans and programmes for the Volta Basin;
- gender concerns to be taken into account throughout the value chain together with information on post-harvest losses in order to better design the activities to be implemented;
- climate change adaptation 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;
- linking the strategy, the regional programme and national action plans to the Sustainable Development Goals, at the appropriate time.

It is also recommended that FAO and NPCA collaborate together and with all the stakeholders of the subregional programme and national projects in order to:

- set up a subregional network of resource persons dedicated to post-harvest loss control (assessment and reduction interventions) in order to share experiences, as well as strengths and weaknesses among stakeholders; this responds to the need of fish operators to share ideas as well as the data and information generated and analysed by the resources persons towards 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.

Figure 9. Priority areas and cross-cutting beams to reduce post-harvest losses



Courtesy of: S. McDonough, FAO Regional Office for Africa.

3.2.1 The role of the government

The role of the government is to: (i) create an enabling and secure environment that favours post-harvest fish loss reduction; (ii) formulate policies; and (iii) create regulatory frameworks for enhanced post-harvest fish loss reduction and improved domestic and cross-border trade. Other government interventions include finance mobilization, gender mainstreaming, capacity development at all levels, and infrastructure development (Figure 10). Regulatory bodies and government agencies should 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. The government can also provide public safety and incentive measures, ensuring implementation of social measures for consumers with weak purchasing power, and supporting safe fish consumption and responsible supply-related promotional programmes/initiatives. It should 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 Africa subregion, each government should look into the possibility of financing PHLAs at the country and basin level, and work together with the various authorities of the Volta Basin through the Comprehensive Africa Agriculture Development Programme (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 to affect quality.

Each government should also ensure that information on the PHLA and national action plans is consolidated and linked with the Economic Community of West African States (ECOWAS) Bank for Investment and Development (EBID).

3.2.2 *The role of the private sector*

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

- promoting and supporting technologies that can foster diversification and value addition;
- improving infrastructures and technology development through appropriate investment schemes;
- providing support to processors and traders, in particular to women and youth entrepreneurs, in order to further develop their businesses;
- strengthening financing mechanisms, in particular credits and microfinance, with particular attention to constraints faced by youth and women.

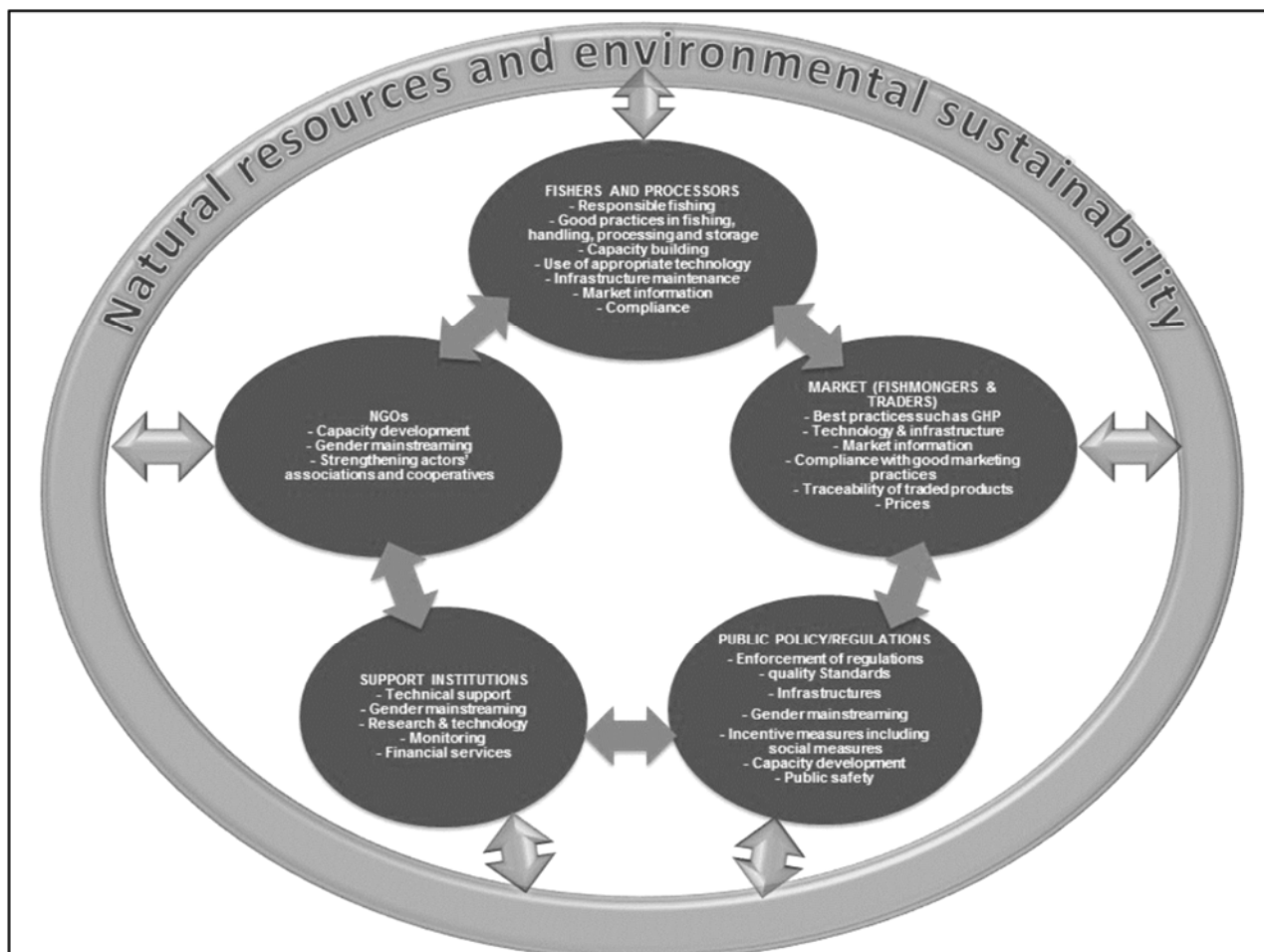
The actors along the value chain are expected to be responsive to the various government policies and align their action plans, procedures and activities with them.

3.2.3 *The overarching supporting umbrella: coordination, collaboration and partnership*

Once each national action plan has been drafted, its successful implementation will call for a consensus among 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, and specific gender issues. The line ministry will be responsible for ensuring coordination of the six priority areas through public-private partnerships, which include:

- government staff, non-governmental organizations (NGOs) and donors (institutional or individuals), which provide funding and/or technical support for capacity building for developing an 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 organizations and groups as well as stakeholders, which work within the regulatory frameworks to ensure compliance with various financial, environmental, health and safety, and market regulations;
- financial and development institutions and NGOs, which provide financial assistance and support to fishers, processors, traders and individuals' interests along the value chain;
- research institutes and universities, which generate the required technology that meets genuine needs and demands for development. They also engage in the capacity building of all stakeholders for dissemination/ease of transfer of these technologies;
- the six riparian countries, which share new technologies, climate adaptation, good water use practices and trade issues, both at the government level and through exchange visits and peer-assisted activities.
- the promotion of aquaculture as a means that allows processing activities to continue 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 of the initiative led by the VBA with donor funding must take into account a number of factors, such as: the regulating of aquaculture production; the environmental and commercial impact, the impact on fishers' 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; and regulating the arrival of the fish on the markets.

Figure 10. Actors' responsibilities, linkages and drivers of improvement strategies



3.2.4 *First cross-cutting beam: resilience and social protection*

Freshwater resources are natural ecosystems with 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 Lake Volta, the resilience of these resources is fast approaching its critical level of unsustainability. Thus, interventions are urgently needed to greatly reduce, if not stop, overfishing and habitat degradation due to human activities such as dam construction, nutrient overloading, eutrophication and pollution. Climate variability and the resultant effects on water levels are 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 PHLAs, strategies and programmes addressing post-harvest losses reduction will greatly benefit from addition information on gender-related issues within the value chain. Value chain analysis and identified upgrading strategies (product, function, process and system) will provide information on the relationships between male and female actors and the related gender concerns. Taking these gender issues into account can contribute to the optimization or sustainability of actions on technology and on infrastructure and services. The

identified gender concerns will also influence capacity-building needs that are specific to male and female actors or actions to improve dialogue and collaboration between different actors in the chain. This calls for a supplementary gender analysis of PHLA combined with value chain analysis information and will lead to, among other things, gender-sensitive technologies and innovations. Services 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 in order to contribute to increased well-being. Key issues are the specific needs and the employment conditions of youth, and specific training for women to make them equal participants in management and decision-making processes.

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

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 requires investment 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 (GAPs), GHPs, GMPs, Hazard Analysis and Critical Control Point (HACCP) for food safety management systems in processing and handling, packaging and storage; development of market information systems; management; and entrepreneurship. These should be underpinned by functional literacy and basic accounting skills, depending on the needs of operators, especially those of post-capture actors.

Moreover, when fishers organize 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, and take actions that enable economies of scale. Based on best practices identified and analysed, in particular by FAO, organizations should be strengthened and, when pertinent, new groups/cooperatives should be set up for fishers and processors.

3.2.7 Priority Area 2: Policy/regulations

Access to electricity and other energy sources, good roads and good storage facilities are state prerogatives. Effectively enforcing good fishing, handling and processing practices through effective enforcement of fisheries regulation/laws as regards to net mesh sizes, gear type and prohibited physical or chemical methods of fishing will result in improving production and preserve natural stocks of the various fish species in the Volta Basin. The State should also promote and guarantee, through good governance, a favourable investment climate for investment and producer and trade organizations, 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 should 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. Moreover, participatory implementation and monitoring should be promoted and accompanied by a monitoring, control and surveillance plan.

Depending on the national and regional context, development partners for financial and technical support may be solicited to support all of these efforts.

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; the availability of market-related information, whether for short or long distances; marketing 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 and 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 the 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 the 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, which 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 using mobile phones should be set up, which can also contribute to the safety of fishers, fish farmers, processors and traders as well as that of the general population.

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

3.2.10 Priority Area 5: Market access

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

As discussed in the previous areas of priority, good market access and marketing require adequate infrastructure and services, market information, good financial and insurance services, and 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 to provide better nutrition security should be addressed within the framework of ECOWAS' protocol on free movement of goods and people.

3.2.11 Priority Area 6: Consumer-level intervention

Consumers' awareness should be raised 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 strata with weak purchasing power should also be set up to facilitate their access to needful nutrients and provide sustainable incentives for loss reduction.

Fishers' awareness should also be raised on the benefits of responsible fishing, including the legal size of fish species.

3.3 Coordination and monitoring of 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 need to act as a repository for providing market and technical information, and will assist ministries in developing effective private-public sector collaboration. The governments concerned will need to address 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.

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