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THE VALUE OF AFRICAN FISHERIES

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THE VALUE OF AFRICAN FISHERIES

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PREPARATION OF THIS DOCUMENT

The Value of African Fisheries study was carried out in the framework of the New Partnership for Africa's Development (NEPAD)-FAO Fisheries Programme (NFFP) funded by the Swedish International Development Cooperation Agency (Sida). It saw the participation of national experts from Ministry/Department of Fisheries and National Bureau of Statistics in 23 African countries, three Regional Fishery Bodies (Regional Fisheries Committee for the Gulf of Guinea [COREP], Fishery Committee for the West Central Gulf of Guinea [FCWC] and Southwest Indian Ocean Fisheries Commission [SWIOFC]), the NEPAD Planning and Coordinating Agency (NPCA) and the International Partnership for African Fisheries Governance and Trade (PAF) Programme.

A workshop to discuss the methodology used and validate the preliminary results of the study was organized by the NFFP in Brussels, Belgium, from 31 October to 1 November 2013. It was attended by 14 participants from the African Union–Interafrican Bureau for Animal Resources (AU-IBAR), FAO, NPCA, Regional Fisheries Bodies (COREP, FCWC, Lake Victoria Fisheries Organization [LVFO], Sub-Regional Fisheries Commission [SRFC] and SWIOFC), the Economic Community of Central African States (ECCAS) and national experts from Malawi and the United Republic of Tanzania who participated in the study.

The workshop requested the authors of the study to verify some information provided by national experts on prices and full-and/part-time employment, and to run the model again applying to all countries the average value added ratios calculated from the data submitted by the sampled countries for the different types of fishery. The implementation of these requests generated the results that are presented in this publication, which slightly differ from those of the first draft version. In addition, the Brussels' workshop put forward general recommendations to national offices and regional organization which are listed in Chapter 10.

de Graaf, G. & Garibaldi, L. 2014.
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ABSTRACT

The "The value of African fisheries" study was carried out in the framework of the New Partnership for Africa's Development (NEPAD)-FAO Fisheries Programme (NFFP) funded by the Swedish International Development Cooperation Agency (Sida). The aim was to estimate the contribution to national and agriculture Gross Domestic Products (GDPs) and the employment generated by the whole fisheries sector, defined as including inland and marine capture fisheries, post-harvest, licensing of local fleets, and aquaculture.

Information was provided by 42 experts from the 23 countries (more than 40 percent of all African States) collaborating in the study. To obtain indicative figures for the entire continent, data from the sampled countries were analysed and calibrated to extrapolate values for the non-sampled countries, which were classified into separate groups for marine fisheries, inland fisheries and aquaculture according to their geographical location or productivity.

The value added by the fisheries sector as a whole in 2011 was estimated at more than US$24 billion, 1.26 percent of the GDP of all African countries. Detailed figures by subsector highlight the relevance of marine artisanal fisheries and related processing, and also of inland fisheries, which contribute one-third of the total catches in African countries. Aquaculture is still developing in Africa and is mostly concentrated in a few countries but it already produces an estimated value of almost US$3 billion per year. As data on licence fees paid by foreign fleets were not easily available to the national experts participating in this study, an attempt was also made to estimate the value of fisheries agreements with Distant Water Fishing Nations (DWFNs) fishing in the exclusive economic zones of African States. Considering that 25 percent of all marine catches around Africa are still by non-African countries, if also these catches were caught by African States in theory they could generate an additional value of US$3.3 billion, which is eight times higher than the current US$0.4 billion African countries earn from fisheries agreements.

According to the new estimates produced by the study, the fisheries sector as a whole employs 12.3 million people as full-time fishers or full-time and part-time processors, representing 2.1 percent of Africa's population of between 15 and 64 years old. Fishers represent half of all people engaged in the sector, 42.4 percent are processors and 7.5 percent work in aquaculture. About 27.3 percent of the people engaged in fisheries and aquaculture are women, with marked differences in their share among fishers (3.6 percent), processors (58 percent), and aquaculture workers (4 percent).

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ACKNOWLEDGEMENTS

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Many persons contributed and collaborated with the study.

The major contribution was made by the experts who provided the national data (see Appendix 1 for details): Edgard Divadi and Herman Gangbazo (Benin), Felix Bonkoungou and Henri Zerbo (Burkina Faso), Lydia Bukuru and Joseph Ndikumana (Burundi), Alain Mahunina and Sylvain Tusanga Mukanga (Democratic Republic of the Congo), Apollinaire Mananga Sangtou and Jean Samba (Republic of the Congo), Ahuatchy Kodjo and Tomepka Ligbet (Côte d'Ivoire), Idris Nour Elmi (Djibouti), Ahmed Salem (Egypt), Beyene Haile Habekiristos and Brook Lemma-Mamarou (Ethiopia), Salifu Ceesay and Alieu Saho (Gambia), Mamadou Moussa Diallo and Sekou Dioubate (Guinea), Paul Maina Nderitu and Peter Mateta Nzungi (Kenya), Rado Rakotoarisoa and Njaka Ratsimanarisoa (Madagascar), Lizzie Chikoti and Friday Njaya (Malawi), Alhousseyni Sarro and Soumana Traore (Mali), Sadun Khadun (Mauritius), Eugenio de Amarante Antonio and Osvaldo Gaspar (Mozambique), Bertrand Dushimayezu and Wilson Rutaganira (Rwanda), Etienne Anibal and Graciano Do Espirito Costa (Sao Tome and Principe), Moustapha Deme (Senegal), Koffi Adoli and Kossi Sedzro (Togo), Lilian Joshua Ibengwe and Gabriel Kulomba Simbila (United Republic of Tanzania-mainland), Hamad Said Khatib and Bakari Kitwana Makame (United Republic of Tanzania-Zanzibar).

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Finally, thanks go to the NFFP co-ordinator, Gunilla Greig, who provided continuous support to the study.

ABREVIATIONS

AU	African Union
AU-IBAR	African Union–Interafrican Bureau for Animal Resources
CAADP	Comprehensive Africa Agriculture Development Program
COREP	Regional Fisheries Committee for the Gulf of Guinea
DWFN	distant water fishing nation
ECCAS	Economic Community of Central African States
EEZ	exclusive economic zones
FCWC	Fisheries Committee for the West Central Gulf of Guinea
GDP	gross domestic product
GDPA	Contribution of Agriculture to GDP
GPV	gross production value
GVA	gross value added
ICCAT	International Commission for the Conservation of Atlantic Tunas
IOTC	Indian Ocean Tuna Commission
ISIC	International Standard Industrial Classification
LVFO	Lake Victoria Fisheries Organization
NEPAD	New Partnership for Africa's Development
NFFP	NEPAD-FAO Fish Programme
NPCA	NEPAD Planning and Coordinating Agency
PAF	International Partnership for African Fisheries Governance and Trade
RFB	regional fishery body
SNA	System of National Accounts
SRFC	Sub-Regional Fisheries Commission
SWIOFC	South West Indian Ocean Fisheries Commission
US$	United States Dollar
VAR	value added ratio

EXTENDED SUMMARY

The New Partnership for Africa's Development (NEPAD)-FAO Fish Programme (NFFP), in collaboration with three Regional Fishery Bodies (Regional Fisheries Committee for the Gulf of Guinea [COREP], Fisheries Committee for the West Central Gulf of Guinea [FCWC] and South West Indian Ocean Fisheries Commission [SWIOFC]), the NEPAD Planning and Coordinating Agency (NPCA) and the International Partnership for African Fisheries Governance and Trade (PAF) Programme tried to estimate the value of fisheries in Africa, including inland and marine capture fisheries, post-harvest, licensing of local fleets, and aquaculture. The main objective of this study was to collect and analyse data available at the national level with the aim of providing an overview on the value of the sector to national and regional policy institutions.

The project mostly focused on two aspects:

1. the contribution of the whole fisheries sector to Gross Domestic Product (GDP) and to Agriculture GDP (GDPA)
2. the employment generated by the whole fisheries sector.

Fisheries and aquaculture are an integral part of the Comprehensive Africa Agriculture Development Programme (CAADP). This is the agricultural programme of the NEPAD, which in turn is a programme of the African Union (AU). As an African-led and African-owned process, the CAADP addresses policy and capacity issues across the entire agriculture sector and the African continent. To monitor the results of the CAADP with respect to fisheries and aquaculture, their contribution to GDPA is an important indicator. To make this information available, this study also estimated the share of the whole fisheries sector in GDPA, differentiating also between large-scale and artisanal fisheries.

The study started in October 2012. In collaboration with COREP, FCWC and SWIOFC, 40 departments of fisheries were contacted with a request to collaborate with the study, and 23 countries agreed to collaborate. In each country, two experts were contracted: one from the Fisheries Department, with sound knowledge of fisheries and aquaculture statistics, and one from the National Bureau of Statistics, with experience in the calculation of GDP in the System of National Accounts (SNA).

The national teams were requested to fill in a standard questionnaire. These questionnaires were checked for consistency by the study team, and, once finalized, all the data from the questionnaire were entered in a database for storage and analysis.

The data obtained from the 23 sampled countries were analysed and used as basis to extrapolate values for the African countries that were not sampled. It is recognized that the extrapolation has some limitations, but the study team believes that the results of the extrapolation can provide a useful picture of the importance of fisheries and aquaculture in Africa.

Most data in the study refer to 2011 but some countries reported data for other years.

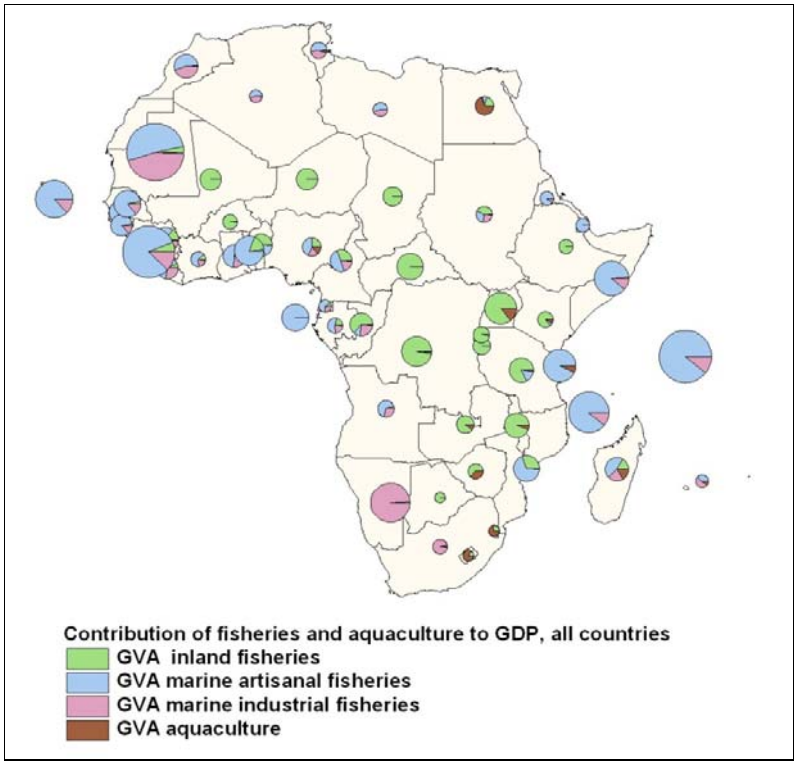
Value added

The value added by the fisheries and aquaculture sector as a whole in 2011 was estimated at more than US$ 24.0 billion, 1.26 percent of the GDP of all African countries. Among the various fisheries, the highest value is produced by the marine artisanal fisheries (0.43 percent), followed by marine industrial fisheries (0.36 percent), inland fisheries (0.33 percent), and aquaculture (0.15 percent).

Fisheries and aquaculture contribution to GDP in the whole Africa by subsector

	Gross Value Added (US$ millions)	Contribution to GDP (%)
Total GDPs African countries	**1,909,514**	
Total Fisheries and Aquaculture	**24,030**	**1.26**
Total Inland Fisheries	**6,275**	**0.33**
Inland fishing	4,676	0.24
Post-harvest	1,590	0.08
Local licences	8	0.00
Total Marine Artisanal Fisheries	**8,130**	**0.43**
Marine artisanal fishing	5,246	0.27
Post-harvest	2,870	0.15
Local licences	13	0.00
Total Marine Industrial Fisheries	**6,849**	**0.36**
Marine industrial fishing	4,670	0.24
Post-harvest	1,878	0.10
Local licences	302	0.02
Total Aquaculture	**2,776**	**0.15**

In West Africa fishing activities, mostly in the marine artisanal subsector, are a major contributor to GDP with high overall contributions in Ghana, Mauritania and Sierra Leone. In Central Africa, inland fisheries is the major contributor to GDP with high overall contributions by the Democratic Republic of the Congo and Uganda. In Southern Africa, marine industrial fisheries is the major contributor to GDP.



Contribution to GDP by subsector
(size of the pie indicates total contribution to GDP)

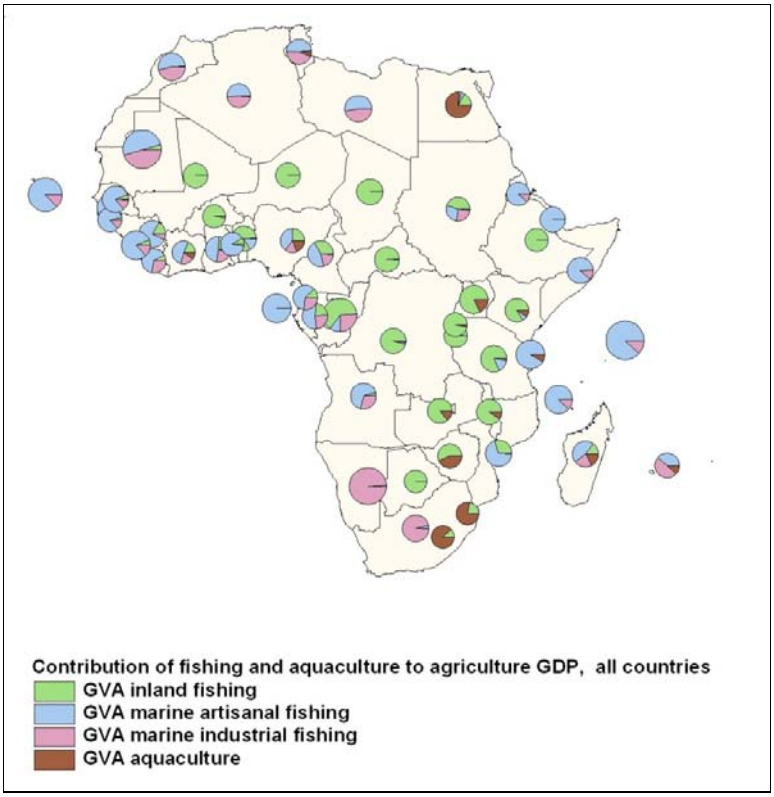
Note: This study and the maps of Africa used to show the results do not include South Sudan because the reference year for the study is 2011 and South Sudan became independent in July 2011.

The total GDPA is compiled by the national statistical offices according to the International Standard Industrial Classification (ISIC). It includes "Agriculture, livestock, hunting, forestry, and fishing" but excludes processing, which is covered under "Manufacture of Food Products". Therefore, the contribution of fisheries to GDPA can be only calculated as the share of fishing and aquaculture economic activities in the agriculture production but excluding the value generated by post-harvest.

Total value added of fishing and aquaculture in Africa is US$17.4 billion. With a total GDPA of US$288.4 billion, the fisheries sector contributes 6 percent of the GDPA for the whole of Africa. The highest contribution is from marine artisanal fishing contributing 1.82 percent of total GDPA, whereas inland fishing and marine industrial fishing have the same contribution of 1.62 percent, and aquaculture contributes almost 1 percent.

Fisheries and aquaculture contribution to GDPA in the whole Africa by subsector

	Gross Value Added (US$ millions)	**Contribution to Agriculture GDP (%)**
Total GDPA African countries	**288,392**	
Total Fishing and Aquaculture GVA (excluding post-harvest)	**17,369**	**6.02**
Inland fishing	4,676	1.62
Marine artisanal fishing	5,246	1.82
Marine industrial fishing	4,670	1.62
Aquaculture	2,776	0.96



Contribution to GDPA by subsector
(size of the pie indicates total contribution to Agriculture GDP)

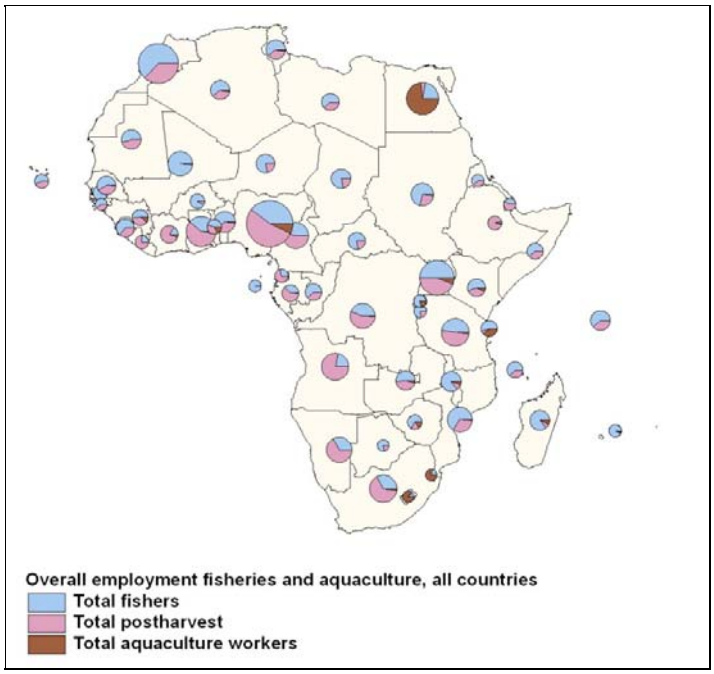
Employment

This study estimated that in the continent the fisheries and aquaculture sector employs about 12.3 million people. Half of the 12.3 million people employed in the whole fisheries sector are fishers, 4.9 million (42.4 percent) are processors and 0.9 million (7.5 percent) work in fish farming. More than half of the fishers (55 percent) are employed in inland fisheries whereas the largest share of processors (42 percent) works in marine artisanal fisheries followed by 30 percent in inland fisheries and 28 percent in industrial fisheries.

Employment by subsector

	No. of employees (thousands)	Share subsector (%)	Share within subsector (%)
Total Employment	**12,269**		
Total Inland Fisheries	4,958	40.4	
Fishers	3,370		68.0
Processors	1,588		32.0
Total Marine Artisanal Fisheries	4,041	32.9	
Fishers	1,876		46.4
Processors	2,166		53.6
Total Marine Industrial Fisheries	2,350	19.2	
Fishers	901		38.4
Processors	1,448		61.6
Aquaculture workers	920	7.5	

Significant regional differences can be noted, with higher percentages of processors in western and southern Africa and lower percentages in eastern Africa.

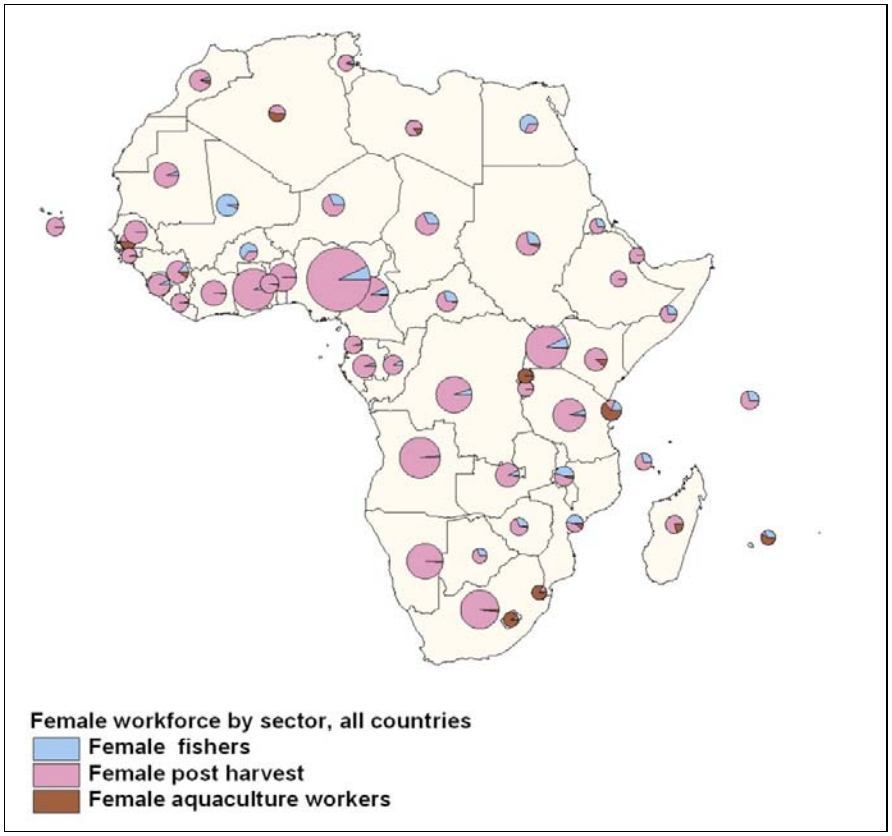


Employment by type of work
(size of the pie indicates total employment)

Females make up more than one-fourth of the workforce in the African fisheries and aquaculture sector. The great majority of women are employed in post-harvest (91.5 percent), 7.2 percent work as fisher (mostly in inland fisheries with no women reported in marine industrial fisheries) and only 1.3 percent in aquaculture.

Employment by gender

	Males (thousands)	Females (thousands)	Females (%)
Grand Total	**8,917**	**3,352**	**27.3**
Total Inland Fisheries	3,632	1,326	26.7
Fishers	3,143	227	6.7
Processors	489	1,099	69.2
Total Marine Artisanal Fisheries	4,041	961	23.8
Fishers	1,861	15	0.8
Processors	1,220	946	43.7
Total Marine Industrial Fisheries	1,328	1,021	43.5
Fishers	901	0	0
Processors	427	1,021	70.5
Aquaculture workers	876	44	4.8



Female employment by type of work
(size of the pie indicates total female workforce)

Challenges and the way forward

The results of the study provide an overall picture of the sector, underlining the importance of fisheries and aquaculture in Africa. However, during the course of the study, several challenges were encountered, mainly related to the availability of some data, including:

- The fish prices, provided by the countries as first-sale value for fisheries and aquaculture, seemed high in some instances and it may be that a mix of ex-vessel prices and market prices was reported for some countries;
- Information available on the economics of fishing and aquaculture, which is essential for the estimation of value added, is very limited in most of the countries;
- Very few data are available on post-harvest and this may have caused a possible underestimation of the value generated by post-harvest;
- In the questionnaire, data on licensing of local and foreign fleets were requested. However, as data on foreign fleets were reported only by a few countries and in a scattered form, it was decided to exclude them from the results and to attempt an estimation of the value of fisheries agreements between Distant Water Fishing Nations (DWFNs) and African States through other sources.

These challenges were acknowledged by the NFFP workshop (Brussels, Belgium, 31 October - 1 November 2013) held to discuss the methodology adopted and validate the preliminary results of the study. The workshop made a series of suggestions to the study team on how to deal with doubtful data which are reflected in this final version of the study, and some general recommendations on what should be done to improve socio-economic data on fisheries and aquaculture in Africa. The major recommendations were:

- This study at the continental level required considerable time and efforts, and it is doubtful that it can be repeated at regular intervals. Therefore, institutional mechanisms should be developed at the national and regional level to compile socio-economic data similar to what was done in the present study;
- A similar study could be carried out at the level of Regional Fishery Bodies level, also with the purpose of refining the methodology;
- Improvements in national data collection systems should be linked to the "*Pan-African Strategy on improvement of fisheries and aquaculture data collection, analysis and dissemination*", which was elaborated in the AU framework in parallel with this study;
- Data on the economics of fishing operations and the processing sector collected at the national level should also include information on the production cost of the different types of fishing in order to compare Value Added Ratios at the regional level and establish standards, as well as detailed data on volumes and values in the post-harvest value chain;
- Statistical staff in national and regional institutions should be trained in the collection and analysis of data needed to estimate the contribution of the fisheries and aquaculture sector to GDP and employment;
- Access to information on fisheries agreements with DWFNs and on fishing operations by foreign fleets should be facilitated;
- Working group(s) on fisheries and aquaculture statistics should be constituted at the continental and/or RFB levels to share knowledge and establish standards, linking this process to the "*Pan-African Strategy on improvement of fisheries and aquaculture data collection, analysis and dissemination*";
- Liaisons between AU and FAO in the field of fishery statistics should be strengthened.

THE VALUE OF AFRICAN FISHERIES

1. INTRODUCTION

The contribution of a sector to national Gross Domestic Product (GDP) is a key macroeconomic indicator frequently referred to by decision-makers and donors when highlighting a particular sector's importance for a national economy. Information on the contribution of a natural-resource sector to GDP is useful as one of many indicators, not only to monitor the progress of sustainable resource management, but also to gain the attention of decision-makers.

Although often not fully recognized as a major productive activity in many countries, the contribution of capture and aquaculture production to national economies is multifaceted. In addition to supplying food, capture and aquaculture production contributes to GDP, provides livelihoods for fishers and processors, is a source of hard currency (from exports of fishery products), and boosts government revenues through fisheries agreements and taxes.

Fisheries in Africa are characterized by large small-scale fisheries contributing greatly to employment. However, while fishing itself is clearly an important source of employment, a previous study (World Bank, 2012) highlighted that the bulk of fisheries employment is in the post-harvest economic activities, which includes fish processing and marketing.

The NEPAD-FAO Fish Programme (NFFP), in collaboration with Regional Fisheries Bodies, the NEPAD Planning and Coordinating Agency (NPCA) and the International Partnership for African Fisheries Governance and Trade (PAF) Programme, tried to estimate the value of the whole fisheries sector, including marine and inland capture fisheries, aquaculture and related post-harvest activities, for all of Africa.

2. MAIN ASPECTS OF THE STUDY

The main objective of this study was to collect and analyse data available at the national level with the aim of improving the estimation methods and providing information on the value of the fisheries sector to national and regional policy and decision-making institutions.

The project focused mostly on two aspects:

1. the contribution of the whole fisheries sector (disaggregated by Fishing, Aquaculture, Post-harvest and Licensing) to Gross Domestic Product (GDP) and Agricultural GDP (GDPA); and
2. the employment generated by the whole fisheries sector.

2.1 The contribution of fisheries to GDP[1]

The published values for fisheries contribution to GDP are commonly created through national accounts in accordance with the international standard for System of National Accounts (SNA). The SNA is based on a set of internationally agreed concepts, definitions, classifications and accounting rules. It defines some major statistics that are widely used as indicators of economic activity, including GDP.

In most countries, macroeconomic statistics such as GDP are compiled by national statistical offices. Specific data for the fisheries sector are mostly compiled by the relevant ministries, such as the Ministry of Fisheries, and the required fisheries-related statistics are sent to national statistical offices.

[1] Summarized from World Bank, 2012.

National statistical offices then compile GDP statistics based on the data provided by these line ministries and agencies.

To produce internationally comparable statistics, most countries adopt the International Standard Industrial Classification (ISIC) of all industrial activities classification systems and the Central Product Classification, both developed by the United Nations. The ISIC classification is structured according to the type of economic activity rather than the type of product produced by each sector. Fisheries-related activities are most commonly reported at an aggregated level under "Agriculture, forestry, and fishing," and it is often not possible to isolate the economic values of fishing activities from the other sectors.

In most countries where disaggregated data are available, fisheries-related activities are often reported under "Fishing and aquaculture." This means that the values of capture fishing and fish farming to the point of first sale are included, whereas the economic contributions of related or dependent activities such as fish processing and marketing or fishing-vessel construction are not included but are accounted for under manufacturing or other sectors in the national accounts. Thus, the fisheries GDP values generally include only value added created in primary production activities, i.e. the catching and farming of fish.

According to the results of a study (Kébé and Tallec, 2006) carried out in the framework of the FAO Sustainable Fisheries Livelihoods Programme (SFLP) in West Africa, contribution to GDP by the post-harvest sector, including fish processing and marketing, is high, as in that region it makes almost 43 percent of the total contribution to GDP by the whole fisheries sector (Table 1).

Table 1. Contribution of fishing and post-harvest to GDP in some West-African countries

Country	Fishing GDP (%)	Post-harvest GDP (%)	Total Fisheries GDP (%)	Post-harvest share in Fisheries GDP (%)
Benin	1.76	1.24	3.00	41.3
Burkina Faso	0.20	0.10	0.30	33.3
Cameroon	0.90	0.80	1.70	47.1
Cape Verde	1.28	2.66	3.94	67.5
Côte d'Ivoire	0.76	0.76	1.52	50.0
Gabon	0.76	0.75	1.51	49.7
Gambia	1.75	3.95	5.70	69.3
Sao Tome & Principe	5.20	0.60	5.80	10.3
Senegal	11.15	2.30	13.45	17.1
Average	**2.64**	**1.46**	**4.10**	**42.8**

Source: Kébé and Tallec, 2006

Artisanal fisheries are highly important in the African continent but it has been difficult to calculate their contribution to GDP with the information compiled so far. The present study aimed at estimating the contribution of the whole fisheries sector to GDP, also differentiating between industrial and artisanal fisheries.

2.2 The contribution of fisheries to GDPA

Fisheries and aquaculture are an integral part of the Comprehensive Africa Agriculture Development Programme (CAADP). This is the agricultural programme of the NEPAD, which in turn is a programme of the African Union (AU). As an African-led and African-owned process, the CAADP

addresses policy and capacity issues across the entire agriculture sector and the African continent aiming to:

- Designate agriculture-led growth as a main strategy to achieve the Millennium Development Goal (MDG) of halving the proportion of poor and hungry people;
- Pursue a 6 percent average annual agriculture-sector growth rate at the national level;
- Allocate 10 percent of national budgets to the agriculture sector;
- Use regional complements and cooperation to boost growth; and;
- Promote partnerships, policy dialogue, review, and accountability to improve efficiency.

To monitor the results of the CAADP with respect to fisheries and aquaculture, their contribution to GDPA is an important indicator. To make this information available, this study also estimated the share of the whole fisheries sector in the GDPA, differentiating also between large-scale and artisanal fisheries.

2.3 Employment generated by the fisheries and aquaculture sector

A recent study by the World Bank (2012) estimated total employment in the whole fisheries sector in Africa at 25.4 million people, with 7.8 million people employed in fishing and 17.6 in post-harvest. However, that study had a global coverage and figures on total employment in Africa were raised on the basis of data from only four countries.

According to data presented in *The State of World Aquaculture and Fisheries 2014* (FAO, 2014), in 2012 there were about 5.9 million fishers and fish farmers in Africa (Table 2) but this figure does not include employment in post-harvest activities.

Table 2. Number of fishers and fish farmers in Africa

	1995	**2000**	**2005**	**2010**	**2011**	**2012**
			(thousands)			
Fishers	2,327	4,084	4,290	4,796	4,993	5,587
Fish Farmers	65	91	140	231	257	298
Total	**2,392**	**4,175**	**4,430**	**5,027**	**5,250**	**5,885**

Source: FAO, 2014

Employment is an essential component of human well-being and an important indicator for decision-makers in development. Therefore, this study has tried to estimate the employment generated by each economic activity in the whole fisheries sector also disaggregated by gender.

3. THE STUDY DESIGN

3.1 The countries

The study started in October 2012. In collaboration with the Regional Fisheries Bodies COREP, FCWC and SWIOFC, 40 Department/Ministry of Fisheries and National Bureau of Statistics of African countries were contacted with a request to contribute to the study. Of these, 23 countries[2] agreed to

[2] See list of countries in Table 7 and following ones.
As the FAO capture and aquaculture databases include separate statistics for Tanzania mainland and Zanzibar that are submitted by two different offices, the two entities have been treated separately also in this study. Although Zanzibar is a semi-autonomous part of the United Republic of Tanzania, for a matter of simplicity it is referred to it as a "country" throughout this study.

collaborate, thereby representing more than 40 percent of all African States and 48 percent of the continent's population. In most of these countries, two experts were contracted: one from the Department/Ministry of Fisheries, with sound knowledge of fisheries and aquaculture statistics; and one from the National Bureau of Statistics with experience in the calculation of GDP in the System of National Accounts (SNA). In total, information was provided by 42 national experts from the 23 countries. However, coverage of African regions was somewhat unbalanced in the sample as Western and Central Africa were very well represented, 3 out of 9 Central African countries participated in the study but only one from Northern Africa did so and none from Southern Africa.

Each national team was requested to complete a standard questionnaire and submissions were carefully checked for consistency by the authors of the study. When figures reported were questionable, the national expert was consulted for clarifications. Once verified, data from the questionnaire were entered in a database for storage and analysis.

3.2 The questionnaire

The questionnaire was organized into four main sections with some sub-sections:

- Fishing
  - Inland fishing
  - Marine artisanal fishing
  - Marine industrial fishing
- Aquaculture
- Post-harvest
  - Fish marketed fresh
  - Artisanal processing
  - Industrial processing
- Licensing

In each section of the questionnaire, the following classification by type of fishery was used to enable following all variables throughout the chain for both industrial and artisanal fisheries. Most data in the study are referring to 2011 but some countries reported data for other years (see Appendix 2).

INLAND FISHERIES
- Fishers without vessel/subsistence fisheries
- Non-motorized dugout/planked canoes
- Motorized small canoes (<10 meter)
- Motorized large canoes/artisanal vessels (>10 meter)

MARINE ARTISANAL FISHERIES
- Fishers without vessel/subsistence fisheries
- Non-motorized dugout/planked canoes
- Motorized small canoes (<10 meter)
- Motorized large canoes/artisanal vessels (>10 meter)

MARINE INDUSTRIAL FISHERIES

Inshore vessels locally based
- Trawler and purse seiner

Offshore vessels locally based
- Industrial trawlers
- Industrial pair trawlers
- Industrial shrimpers
- Industrial tuna pole and line
- Industrial tuna purse seiners

Offshore vessels foreign based
Industrial trawlers
Industrial pair trawlers
Industrial shrimpers
Industrial tuna pole and line
Industrial tuna purse seiners

3.2.1 Fishing

Items covered in the Fishing section of the questionnaire are listed in Table 3.

Table 3. Items covered in the Fishing section of the questionnaire

	Inland fisheries	Marine artisanal	Marine industrial
No. of fishing units by type of fishery	X	X	X
Total annual catches by type of fishery (tonnes)	X	X	X
Average fish price (ex-vessel or landing site price)	X	X	X
Gross Value Product by type of fishery (local currency)	X	X	X
Annual production cost[3] by type of fishery (local currency)	X	X	X
Value Added Ratio by type of fishery	X	X	X
Total value added (local currency)	X	X	X
No. of crew by type of fishery	X	X	X
Total male employment	X	X	X
Total female employment	X	X	X
Males/females %	X	X	X
Total crew number	X	X	X

3.2.2 Aquaculture

Items covered in the Aquaculture section of the questionnaire are listed in Table 4.

Table 4. Items covered in the Aquaculture section of the questionnaire

Aquaculture production type
No. of farms by aquaculture production type
No. of ponds/units by aquaculture production type
Production area by aquaculture production type (ha)
Total annual production by aquaculture production type (tonnes)
Annual production density by aquaculture production type (kg/ha/year) or (kg/unit/year)
Average farm gate price by aquaculture production type (local currency)
Total Gross Product Value by aquaculture production type (local currency)
Gross Product Value by aquaculture production type and by hectare (local currency)

[3] Estimate of production cost excludes labour and capital costs, and taxes.

Production cost[4] by aquaculture production type and by hectare
Gross Value Added ratio by aquaculture production type
Total value added
Employment by aquaculture production type and by hectare
Total male employment
Total female employment
Males-females %

3.2.3 Post-harvest

Items covered in the Post-harvest section of the questionnaire are listed in Table 5. Differently from the fishing and aquaculture sections of the questionnaire in which questions on employment were included in the main section of the questionnaire, in the Post-harvest section a separate sub-section was dedicated to employment in post-harvest.

Table 5. Items covered in the Post-harvest section of the questionnaire

	Inland fisheries	Marine artisanal	Marine industrial
Type of fishery	X	X	X
Total catches (tonnes)	X	X	X
Percentage of catches marketed fresh by fish-mongers (%)	X	X	X
Quantity of catches marketed fresh by fish-mongers (tonnes)	X	X	X
Conversion factor from live weight to marketed or processed fresh product	X	X	X
Quantity of fresh fish produced (tonnes)	X	X	X
Price fresh fish per kg	X	X	X
Gross Production Value fish marketed fresh	X	X	X
Production cost[4] per kg fish marketed fresh	X	X	X
Value Added Ratio fish marketed fresh	X	X	X
Gross Value Added fish marketed fresh	X	X	X
Percentage of catches used for artisanal processing (%)	X	X	X
Quantity of catches used for artisanal processing (tonnes)	X	X	X
Conversion factor from live weight to artisanal processed product	X	X	X
Quantity of artisanal processed product (tonnes)	X	X	X
Price artisanal processed product per kg	X	X	X

[4] Estimate of production cost excludes labour and capital costs, and taxes.

Gross Production Value artisanal processing	X	X	X
Production cost[5] per kg of artisanal processed product	X	X	X
Value Added Ratio artisanal processing	X	X	X
Gross Value Added artisanal processing	X	X	X
Percentage of catches used for industrial processing (%)	X	X	X
Quantity of catches used for industrial processing (tonnes)	X	X	X
Conversion factor from live weight to industrial processed product	X	X	X
Quantity of industrial processed product (tonnes)	X	X	X
Price industrial processed product per kg	X	X	X
Gross Production Value industrial processing	X	X	X
Production cost[5] per kg of industrial processed product	X	X	X
Value Added Ratio industrial processing	X	X	X
Gross Value Added industrial processing	X	X	X
Sub-section on employment in Post-harvest			
No. of full-time employed in artisanal processing	X	X	X
Males-females % employed full-time in artisanal processing	X	X	X
No. part-time employed in artisanal processing	X	X	X
Males-females % employed part-time in artisanal processing	X	X	X
Total males employed in artisanal processing	X	X	X
Total females employed in artisanal processing	X	X	X
No. of full-time employed in industrial processing	X	X	X
Males-females % employed full-time in industrial processing	X	X	X
No. part-time employed in industrial processing	X	X	X
Males-females % employed part-time in industrial processing	X	X	X
Total males employed in industrial processing	X	X	X
Total females employed in industrial processing	X	X	X

[5] Estimate of production cost excludes labour and capital costs, and taxes.

3.2.4 Licensing

Items covered in the Licensing section of the questionnaire are listed in Table 6.

Table 6. Items covered in the Licensing section of the questionnaire

	Inland fisheries	Marine artisanal	Marine industrial locally based	Marine industrial foreign based
No. of fishing units by type of fishery	X	X	X	X
Licence fees (local currency) per vessel per year	X	X	X	X
Licensing fees (local currency) by type of fishery	X	X	X	X
Total licence fees (local currency)	X	X	X	X

4. GROSS VALUE ADDED AND CONTRIBUTION TO GDP BY ECONOMIC ACTIVITY IN SAMPLED COUNTRIES

4.1 Gross value added of fishing

Gross Domestic Product (GDP) is the market value of all officially recognized final goods and services produced within a country in a given period. GDP per capita is often considered an indicator of a country's standard of living.

A common way to estimate GDP is the "production approach" through the calculation of the Gross Value Added (GVA) whereby:

$$GDP = GVA + Taxes - Subsidies$$

However, data on taxes and subsidies were not available for most of the sampled countries. Therefore, this study has considered the GVA as the contribution of the whole fisheries sector to GDP.

The GVA is calculated through the following steps:

1) Calculate Gross Production Value (GPV)

The GPV is the total capture or aquaculture production value. It is calculated by multiplying the total catches by the ex-vessel price or the price obtained at landing sites for artisanal fisheries. Ideally, it should be calculated by species as prices may vary significantly among fish species.

$$Gross\ Production\ Value\ = Total\ Catches * Fish\ Price$$

2) Estimate production cost

The production cost depends on the type of vessel or operational unit, i.e. production cost of a dugout non-motorized canoe is less compared with that of a 12 meter planked motorized canoe. For the purposes of this study, national experts were requested to specify the annual production cost by type of fishery, excluding labour and capital costs, and taxes.

$$Production\ Cost = Operating\ Expenses\ (fees,\ fuel,\ maintenance\ and\ repair)$$

3) Calculate Value Added Ratio (VAR)

The VAR is calculated as:

$$Value\ Added\ Ratio = \frac{Gross\ Production\ Value - Production\ Cost}{Gross\ Production\ Value}$$

4) Calculate Gross Value Added (GVA)

In the last step, the GVA by fishing subsector (inland, marine artisanal and industrial fishing) is calculated as:

$$Gross\ Value\ Added = Gross\ Production\ Value * Value\ Added\ Ratio$$

All countries provided the data in local currencies, which were converted into US$ with exchange rates of the reference year (Appendix 2).

Tables 7-9 lists the calculated GPV, VAR and GVA and contribution to GDP by fishing subsector for the 23 sampled countries.

Table 7. Gross Production Values (GPV) by fishing subsector in sampled countries

Country	Inland fishing (US$)	Marine artisanal fishing (US$)	Marine industrial fishing (US$)	Total GPV (US$)
Benin	157,325,208	49,299,489	1,401,540	208,026,237
Burkina Faso	19,522,728			19,522,728
Burundi	21,680,346			21,680,346
Congo, Dem Rep of the	563,282,100	12,895,934	0	576,178,034
Congo, Republic of	182,176,500	32,947,961	71,216,156	286,340,617
Côte d'Ivoire	8,182,012	24,786,842	10,063,526	43,032,379
Djibouti	0	4,438,200	0	4,438,200
Egypt	529,239,795	136,693,095	260,451,538	926,384,428
Ethiopia	106,201,521			106,201,521
Gambia	1,442,954	4,163,504	361,713	5,968,171
Guinea	29,220,300	152,016,120	34,048,080	215,284,500
Kenya	135,254,281	10,207,683	220,001	145,681,964
Madagascar	49,310,520	138,310,373	129,378,019	316,998,911
Malawi	170,357,472			170,357,472
Mali	270,889,464			270,889,464
Mauritius	0	7,449,426	9,667,726	17,117,152
Mozambique	147,972,160	334,026,000	3,063,200	485,061,360
Rwanda	46,106,580			46,106,580
Sao Tome and Principe	0	13,621,390	0	13,621,390
Senegal	18,550,190	287,345,331	79,812,013	385,707,535
Tanzania	836,980,956	146,002,089	0	982,983,045
Togo	2,548,000	18,477,925	459,680	21,485,605
Zanzibar	0	52,096,086	0	52,096,086
Total	**3,296,243,087**	**1,424,777,449**	**600,143,190**	**5,321,163,726**

Table 8. Weighted average Value Added Ratios (VARs) by fishing subsector

Country	VARs inland fishing	VARs marine artisanal fishing	VARs marine industrial fishing	VARs overall fishing
Benin	0.76	0.45	0.71	0.64
Burkina Faso	0.94			0.94
Burundi	0.34			0.34
Congo, Dem Rep of the	0.79	0.89		0.84
Congo, Republic of	0.97	0.80	0.99	0.92
Côte d'Ivoire	0.80	0.79	0.71	0.77
Djibouti		0.65		0.65
Egypt	0.81	0.70	0.25	0.58
Ethiopia	0.96			0.96
Gambia	0.84	0.62	0.30	0.59
Guinea	0.82	0.75	0.30	0.62
Kenya	0.92	0.83	0.40	0.72
Madagascar	0.76	0.78	0.43	0.66
Malawi	0.56			0.56
Mali	0.53			0.53
Mauritius		0.79	0.77	0.78
Mozambique	0.80	0.80	0.40	0.67
Rwanda	0.80			0.80
Sao Tome and Principe		0.69		0.69
Senegal	0.60	0.62	0.37	0.53
Tanzania	0.62	0.71		0.66
Togo	0.46	0.68	0.71	0.62
Zanzibar		0.83		0.83

Table 9. Gross Value Added (GVA) and contribution to GDP by fishing subsector in sampled countries

Country	Inland fishing (US$ millions)	Marine artisanal fishing (US$ millions)	Marine industrial fishing (US$ millions)	Total GVA fishing (US$ millions)	GDP* (US$ millions)	Fishing contribution to GDP (%)
Benin	120	22	1	144	6,558	2.19%
Burkina Faso	18			18	8,351	0.22%
Burundi	7			7	1,612	0.46%
Congo, Dem Rep of the	444	11		455	11,933	3.81%
Congo, Republic of	176	26	70	273	13,240	2.06%
Côte d'Ivoire	7	20	7	33	23,043	0.14%
Djibouti		3		3	1,129	0.25%
Egypt	429	96	65	591	231,222	0.26%
Ethiopia	102			102	30,247	0.34%
Gambia	1	3	0	4	1,225	0.32%
Guinea	24	114	10	148	5,233	2.83%
Kenya	125	8	0	134	34,059	0.39%
Madagascar	37	108	55	201	9,844	2.04%
Malawi	95			95	5,966	1.59%
Mali	144			144	9,400	1.53%
Mauritius		6	7	13	9,714	0.14%
Mozambique	118	267	1	387	12,823	3.02%
Rwanda	37			37	6,377	0.58%
Sao Tome and Principe		9		9	264	3.55%
Senegal	11	179	30	220	12,858	1.71%
Tanzania	517	104		621	23,615	2.63%
Togo	1	12	0	14	3,173	0.43%
Zanzibar		43		43	762	5.68%
Total	**2,415**	**1,032**	**248**	**3,695**	**462,649**	**0.80%**

*Source: United Nations Statistics Division, 2013.

4.1.1 Discussion and bottlenecks encountered

According to data in Table 9, fishing contributes 0.8 percent to total GDP in sampled countries, with respectively 0.52 percent coming from inland fishing, 0.22 percent from marine artisanal fishing and 0.05 percent from marine industrial fishing. Estimates for marine artisanal and industrial fishing seem to be rather low but inland fishing is the prevalent subsector in the sampled countries (see Figure 1[6] and Table 10).

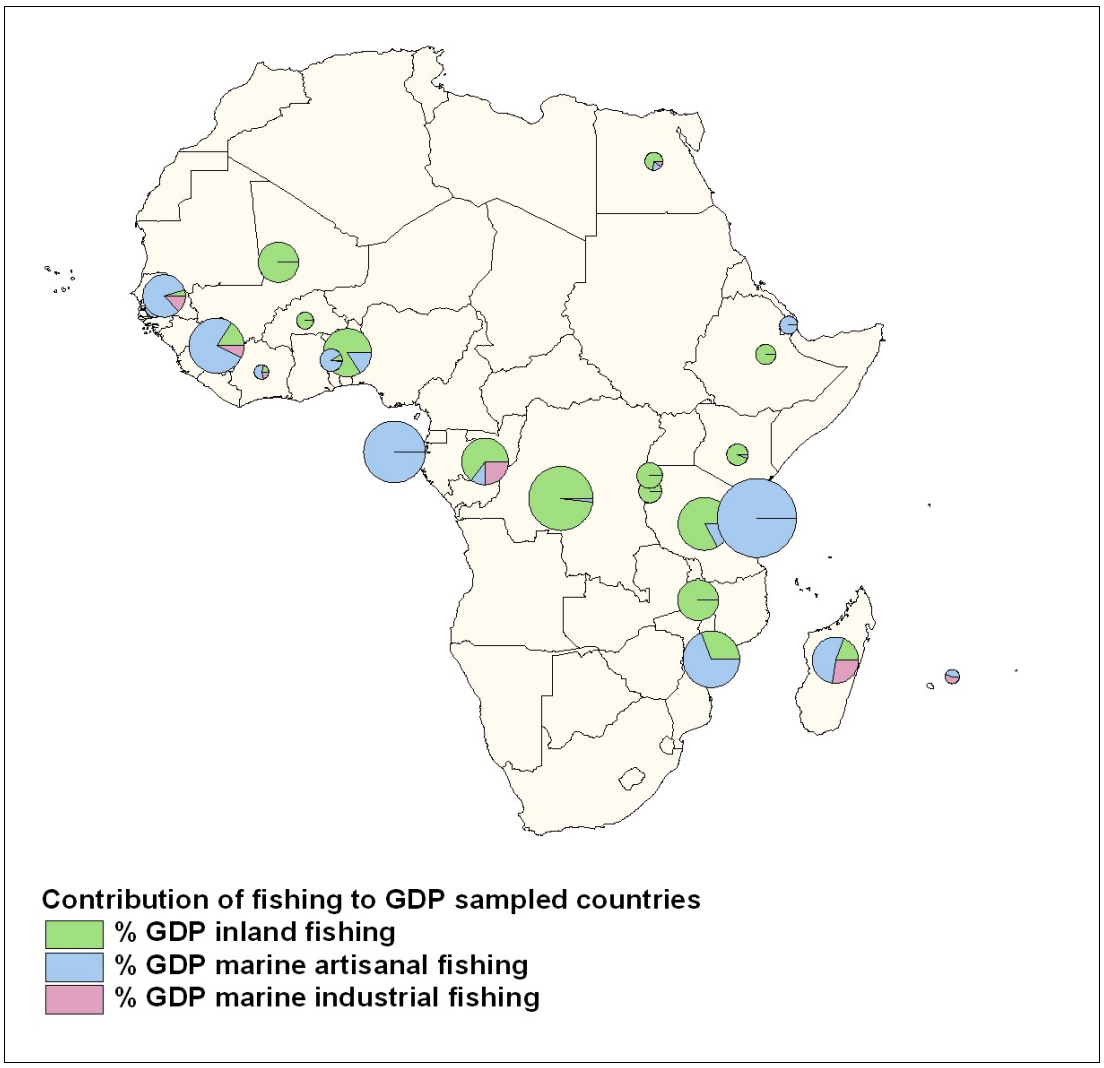


Figure 1. Contribution of fishing to GDP by activity in sampled countries
(size of the pie indicates total contribution to GDP)

[6]This study and the maps of Africa used to show the results do not include South Sudan because the reference year for the study is 2011 and South Sudan became independent in July 2011.
The designations employed and the presentation of material in the maps are for illustration only and do not imply the expression of any opinion whatsoever on the part of FAO concerning the legal or constitutional status of any country, territory or sea area, or concerning the delimitation of frontiers or boundaries.

Table 10. Capture production by subsector in sampled countries

Fishing subsector	Total catches* (tonnes)	Percentage (%)	Total catches** (tonnes)
Inland fishing	1,444,539	57	1,440,878
Marine artisanal fishing	911,281	36	
Marine industrial fishing	173,531	7	
Total marine fishing	***1,084,812***		***1,101,505***
Grand total	**2,529,351**	**100**	**2,542,383**

*Data provided by the national experts for this study; **FAO, 2013.

Marine fishing is much more important in those countries that did not participate in the study (Table 11). Given the low importance of marine industrial fishing in the sampled countries and common under-reporting of catches for small scale fisheries (de Graaf *et al.*, 2011; FAO 2010), the values added for fishing as calculated in this study should be probably considered as minimum estimates.

Table 11. Capture production by subsector in non-sampled countries

Fishing Subsector	Total catches (tonnes)	Percentage (%)
Inland fishing	1,262,776	25
Marine fishing	3,759,246	75
Total	**5,022,022**	**100**

Source: FAO, 2013.

A major bottleneck was the limited information available on the economics of fishing. Some countries reported unreliable VARs for some types of fishery, as values close to 1 certainly did not include the production costs whereas values verging on 0 would make the fishing activity unprofitable (see Table 8). Taking into account also the recommendations by the workshop (Brussels, Belgium, 31 October-1 November 2013) held to validate the preliminary results of this study, it was decided to apply the subsector weighted averages (Table 12) to all type of fishery.

Table 12. Value Added Ratios (VARs) by fishing subsector

	Maximum VARs	Minimum VARs	Weighted average VARs applied
Inland fishing	1.00	0.12	0.77
Marine artisanal fishing	1.00	0.08	0.68
Marine industrial fishing	0.99	0.09	0.55

Table A3.2 in the comprehensive study by Gillett (2009), which estimated the value of fishing in the Pacific island countries and territories, presented the VARs adopted by type of fishery (Table 13) as modified from previous studies and experience gained. Although the economic conditions in Pacific island countries may differ from those in Africa, the VARs, especially for industrial fisheries, should be quite similar.

In general, the VARs reported by the sampled countries were rather high, but this was partially smoothed by applying weighted averages. The use of VARs that are too high, mostly owing to the fact that production costs are not properly calculated, leads to an overestimation of the GVA and the contribution of fishing to GDP.

Table 13. Value Added Ratios by type of fishery in the Pacific island countries and territories

Category of fishing	Specific type	VAR
Offshore tuna fishing	Locally based long lining	0.20
	Locally based purse seining	0.50
	Locally based pole-and-line	0.60
Coastal commercial and subsistence	Fishing without a boat	0.90
	Fishing in non-motorized canoe	0.92
	Fishing with small outboard boat	0.60-0.80
	Tuna trolling	0.60
	Long line fishing	0.47

Source: Gillett, 2009.

4.2 Gross value added of aquaculture

The GVA of aquaculture was calculated similarly to that for fishing using the following variables collected through the questionnaire:

1. Production area by aquaculture production type (pond rearing Tilapia, pond rearing African catfish, cage culture Tilapia, etc.)
2. Annual production by aquaculture production type
3. Production density by aquaculture production type
4. Average farm gate price by aquaculture production type
5. GPV by aquaculture production type and by hectare
6. Production cost by aquaculture production type and by hectare (excluding labour and capital cost, and taxes) to calculate the VAR
7. GVA by aquaculture production type

Table 14 list the annual production, production rate, GPV, GVA and aquaculture contribution to GDP by the sampled countries.

4.2.1 Discussion and bottlenecks encountered

The resulting overall contribution of aquaculture to GDP at 0.44 percent is high if compared with the contribution of fishing in the sampled countries at 0.80 percent. However, the high GVA for aquaculture was mostly due to the presence of Egypt among the 23 sampled countries, given that this country alone contributes more than 70 percent of total African aquaculture production.

Aquaculture production is still negligible in most of the other sampled countries, although in countries such as Kenya, Madagascar and Malawi – in addition to Tanzania and Zanzibar which mostly cultivate seaweed - aquaculture is developing and its contribution to GDP is rising.

As well as for the other sectors, also for aquaculture the availability of reliable data on the economic aspects has been a major constraint when analysing the data made available by national experts. Annual production levels of more than 3,000 kg/ha indicate that intensive feeding takes place. In general, feed costs represent 30-35 percent of total production costs and, therefore, the reliability of VAR higher than 0.6 should be seriously doubted.

Table 14. Aquaculture's production, Gross Production Value, Gross Value Added and contribution to GDP in sampled countries

Country	Annual production* (tonnes)	Average production rate (kg/ha/year)	Gross Production Value (US$ million)	Gross Value Added (US$ million)	Contribution to GDP (%)
Benin	251	10,904	1	0.2	0.00
Burkina Faso	401	5,588	1	0.3	0.00
Burundi	-	-	-	-	-
Congo, Dem Rep of the	2,274	4,469	17	7.0	0.06
Congo, Republic of	68	571	0	0.1	0.00
Côte d'Ivoire	1,310	6,771	4	3.5	0.02
Djibouti	-	-	-	-	-
Egypt	986,820	5,875	1,985	1,954.3	0.85
Ethiopia	16	1,951	0	0.0	0.00
Gambia	71	8,143	0	0.1	0.01
Guinea	120	1,000	1	0.2	0.00
Kenya	19,535	8,040	50	15.1	0.04
Madagascar	8,805	2,661	78	41.5	0.42
Malawi	3,124	1,893	11	10.4	0.17
Mali	16	5,739	0	0.0	0.00
Mauritius	568	23,383	3	1.9	0.02
Mozambique	603	5,297	1	1.3	0.01
Rwanda	797	3,001	3	1.0	0.02
Sao Tome and Principe	-	-	-	-	-
Senegal	68	1,465	0	0.1	0.00
Tanzania	9,207	15,043	29	12.5	0.05
Togo	20	943	0	0.0	0.00
Zanzibar	15,095	1,737	4	3.7	0.49
Total	**1,049,169**		**2,189**	**2,054**	**0.44**

*Data provided by the national experts for this study, including also seaweed; Zanzibar's seaweed production is in dry weight and not converted to live weight.

4.3 Gross value added of post-harvest

Figure 2 shows a simplified scheme of post-harvest value chains. In the post-harvest section of the questionnaire, data requested were organized by the following three post-harvest categories:

1. Fish marketed fresh by fish-mongers (no. 3 in Figure 2);
2. Artisanal fish processing (no 4 in Figure 2);
3. Industrial fish processing (no. 5 and 6 in Figure 2).

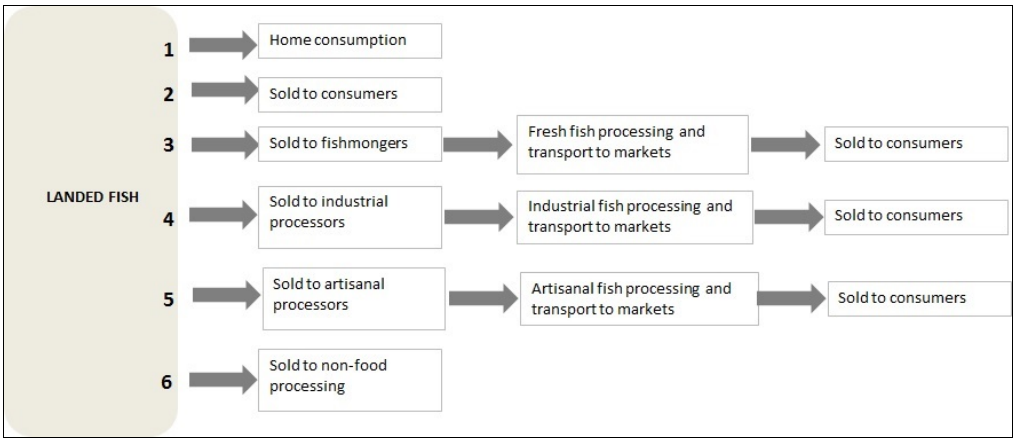


Figure 2. Simple scheme of post-harvest value chains

The GVA of fish processing was calculated similarly to that for fishing (section 4.1). However, for post-harvest it was necessary to take into account the whole value chain and for the GVA calculation the following parameters were derived from data submitted or estimated:

- Quantity of catches used by the three post-harvest categories;
- Conversion from live weight to processed product;
- Fresh fish or processed product price to calculate the GPV;
- Production cost (excluding labour and capital cost, and taxes) to calculate the VAR;
- GVA and contribution to GDP for the three post-harvest categories.

Tables 15-19 list the quantities of catches marketed or processed, GPV, VARs, GVA and contribution to GDP by the three post-harvest categories and by fishing subsector for the 23 sampled countries.

Table 15. Annual quantity of catches marketed fresh or processed in sampled countries

Country	Fish marketed fresh (tonnes)	Artisanal fish processing (tonnes)	Industrial fish processing (tonnes)
Benin	34,679	1,331	
Burkina Faso	6,106	2,351	
Burundi	10,998	2,111	
Congo, Dem Rep of the	8,749	99,976	
Congo, Republic of	27,587	18,925	
Côte d'Ivoire	15,490	11,016	2,443
Djibouti		144	
Egypt	372,571		
Ethiopia	15,636	3,999	

Gambia	7,161	4,355	15,209
Guinea	18,272	51,303	18,992
Kenya	98,839	10,805	8,207
Madagascar	13,042	12,579	9,027
Malawi	26,750	19,332	180
Mali	14,286	25,610	919
Mauritius	1,232		
Mozambique	184,352		
Rwanda		1,257	
Sao Tome and Principe	1,368		
Senegal	228,226	59,357	56,902
Tanzania	142,620	16,922	59,167
Togo	557	12,797	
Zanzibar	2,226	1,904	
Total	**1,230,750**	**356,074**	**171,045**

Table 16. Gross Production Value (GPV) by post-harvest category in sampled countries

Country	GPV fish marketed fresh (US$)	GPV artisanal fish processing (US$)	GPV industrial fish processing (US$)
Benin	131,476,610	9,331,507	
Burkina Faso	19,258,144	12,021,444	
Burundi	18,869,454	10,973,709	
Congo, Dem Rep of the	26,670,425	494,297,717	
Congo, Republic of	125,554,357	175,272,754	
Côte d'Ivoire	50,971,339	51,856,909	14,799,587
Djibouti		352,069	
Egypt	1,248,549,400		
Ethiopia	76,974,403	19,414,408	
Gambia	5,921,195	5,123,739	88,628,075
Guinea	38,499,543	120,981,542	47,941,956
Kenya	141,744,773	18,177,148	42,216,277
Madagascar	38,089,232	67,200,591	29,126,229
Malawi	97,477,023	69,928,521	981,818
Mali	43,829,376	116,001,830	3,329,790
Mauritius	6,213,501		
Mozambique	448,153,917		
Rwanda		10,624,236	
Sao Tome and Principe	4,527,176		
Senegal	676,578,174	80,774,160	260,987,396
Tanzania	603,506,586	70,360,262	303,332,435
Togo	714,686	186,440,800	
Zanzibar	4,091,926	7,990,598	
Total	**3,807,671,240**	**1,527,123,944**	**791,343,563**

Table 17. Value Added Ratios (VARs) by post-harvest category in sampled countries

Country	VARs fish marketed fresh	VARs artisanal processing	VARs industrial processing
Benin	0.09	0.22	
Burkina Faso	0.41	0.59	
Burundi	0.23	0.33	
Congo, Dem Rep of the	0.20	0.39	
Congo, Republic of	0.18	0.18	
Côte d'Ivoire	0.56	0.48	0.58
Djibouti		0.42	
Egypt	0.22		
Ethiopia	0.10	0.10	
Gambia	0.35	0.23	0.27
Guinea	0.17	0.21	0.17
Kenya	0.15	0.24	0.22
Madagascar	0.15	0.19	0.36
Malawi	0.50	0.37	0.33
Mali	0.06	0.38	0.17
Mauritius	0.19		
Mozambique	0.20		
Rwanda		0.64	
Sao Tome and Principe	0.32		
Senegal	0.24	0.36	0.44
Tanzania	0.11	0.11	0.06
Togo	0.16	0.83	
Zanzibar	0.33	0.28	

Table 18. Gross Value Added (GVA) and contribution to GDP by post-harvest category in sampled countries

Country	GVA fish marketed fresh		GVA artisanal processing		GVA industrial processing		Total GVA
	(US$ millions)	(% of GDP)	(US$ millions)	(% of GDP)	(US$ millions)	(% of GDP)	(US$ millions)
Benin	13	0.20	2	0.03			15
Burkina Faso	7	0.09	7	0.09			15
Burundi	4	0.27	4	0.23			8
Congo, Dem Rep.	5	0.04	191	1.60			196
Congo, Republic	23	0.18	30	0.23			54
Côte d'Ivoire	29	0.13	25	0.11	9	0.04	63
Djibouti			0	0.02			0
Egypt	283	0.12					283
Ethiopia	4	0.01	1	0.00			5
Gambia	2	0.15	1	0.08	24	1.95	27
Guinea	6	0.11	26	0.50	7	0.13	39
Kenya	22	0.06	4	0.01	9	0.03	36

Madagascar	5	0.05	12	0.12	8	0.09	26
Malawi	49	0.82	26	0.44	0	0.01	75
Mali	3	0.03	42	0.45	1	0.01	46
Mauritius	1	0.01					1
Mozambique	90	0.70					90
Rwanda	0	0.00	7	0.11			7
Sao Tome Principe	1	0.55					1
Senegal	164	1.28	30	0.23	116	0.90	310
Tanzania	66	0.28	8	0.03	15	0.06	89
Togo			154	4.86			154
Zanzibar	1	0.18	2	0.29			4
Total	**780**	**0.17**	**572**	**0.12**	**189**	**0.04**	**1544**

Table 19. Post-harvest GVA by fishing subsector and contribution to GDP (US$ millions) in sampled countries

Country	Post-harvest inland fishing (US$ millions)	Post-harvest marine artisanal fishing (US$ millions)	Post-harvest Marine industrial fishing (US$ millions)	Total post-harvest GVA (US$ millions)	Contribution to GDP (%)
Benin	11	4	0	15	0.23
Burkina Faso	15			15	0.18
Burundi	8			8	0.50
Congo, Dem Rep	194	2		196	1.65
Congo, Republic	33	8	13	54	0.41
Côte d'Ivoire	5	45	14	63	0.27
Djibouti		0		0	0.02
Egypt	174	103	6	283	0.12
Ethiopia	5			5	0.02
Gambia	4	23	0	27	2.18
Guinea	8	28	3	39	0.74
Kenya	34	2	0	36	0.10
Madagascar	9	14	2	26	0.26
Malawi	75			75	1.26
Mali	46			46	0.49
Mauritius		0	1	1	0.01
Mozambique	30	60	1	90	0.70
Rwanda	7			7	0.11
Sao Tome Principe		1		1	0.55
Senegal	4	264	42	310	2.41
Tanzania	76	13		89	0.38
Togo	30	123	1	154	4.86
Zanzibar		4		4	0.47
Total	**767**	**694**	**81**	**1544**	**0.33**

4.3.1 Discussion and bottlenecks encountered

The results indicate that the overall contribution of post-harvest to GDP in the sampled countries is 0.33 percent. Fish marketed fresh by fish-mongers is the major contributor to GDP (0.17 percent) (Table 18) and most fresh and processed fish come from inland fishing (49.8 percent) and marine artisanal fishing (45.2 percent) (Table 10). Figure 3 shows contribution of post-harvest to GDP by fishing subsector in sampled countries

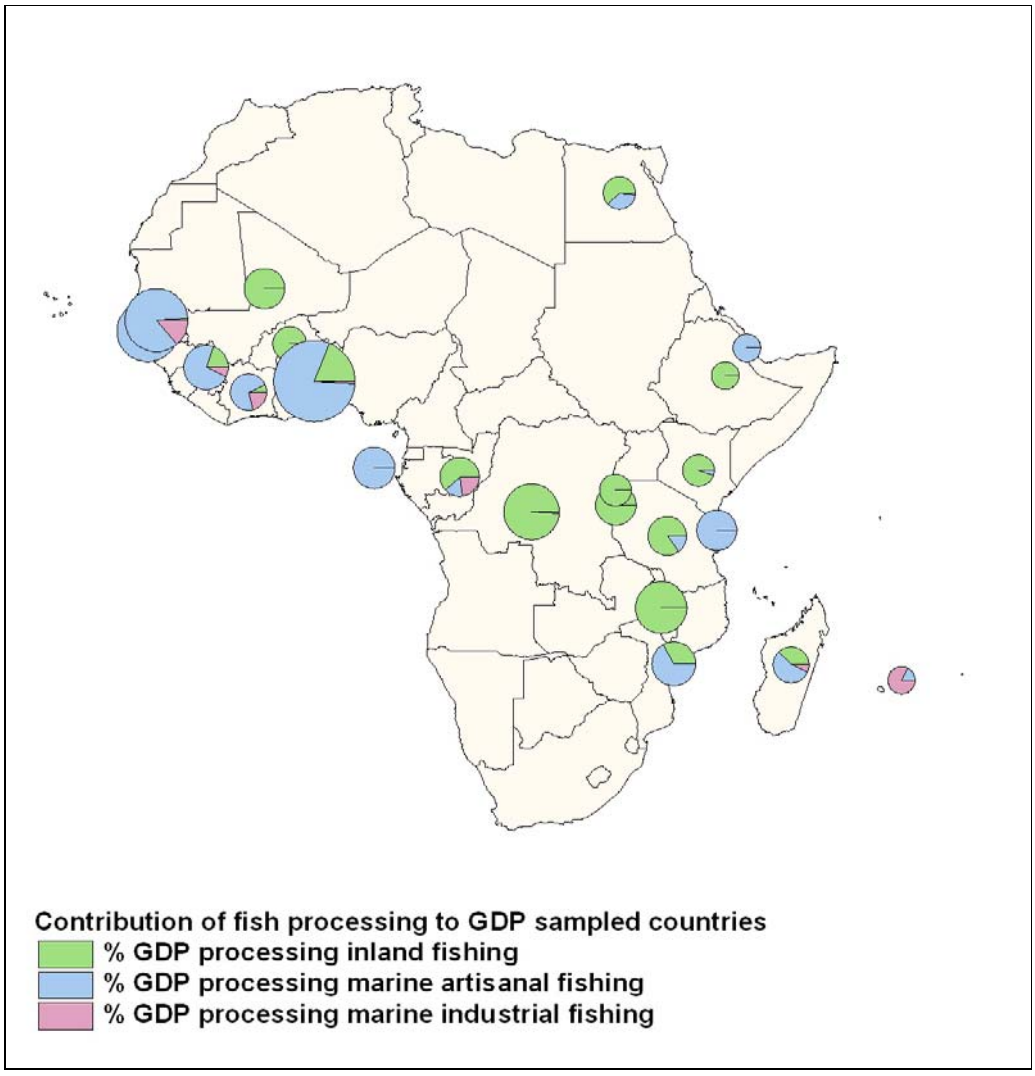


Figure 3. Contribution of post-harvest to GDP by fishing subsector in sampled countries
(size of the pie indicates total contribution of post-harvest sector to GDP)

An overall 0.33 percent total contribution of post-harvest to GDP for all sampled countries seems to be a low value. While analysing the data on post-harvest provided by the sampled countries, it was noted that the following factors may have influenced the results:

- Within the artisanal and industrial processing categories there are wide ranges of products, production methods, markets and prices and it was difficult for the national experts to apply the *"one size fits all"* categories shown in Figure 2;

- According to Table 15, total quantity marketed fresh or processed was about 1,755,000 tonnes whereas the total annual catches by the sampled countries were about 2,530,000 tonnes (Table 10). The difference of 775,000 tonnes (30.6 percent of total) should represent the catches directly sold to consumers at the landing site and self-consumption (no. 1 and 2 in Figure 2). As almost one-third of total catches sold by fishers directly to consumers seems to be an overestimation, it is probable that some quantities of "fish sold by fishers to fish-monger who process the fresh fish and transport it to the markets" were instead classified as "fish sold by fishers directly to consumers";
- Separated data on post-harvest of fish farmed were not collected by this study. Although a significant part of the aquaculture production may have been entered into the capture production processing chain, the absence of data on aquaculture post-harvest could have contributed to the resulting low value generated by post-harvest;
- Similarly to calculations done for Fishing, the availability and reliability of VARs were scarce.

4.4 Gross value added of local licensing

The questionnaire requested to provide data on number of vessels licensed, annual licence fee per vessel, and total licence fees by types of fishery for both local and foreign fleets (see section 3.2). However, only a few sampled countries submitted data on licence fees from foreign fleets as in most countries this information was not available to the national experts.

To remedy this lack, a survey of the publicly available data on fisheries agreements between Distant Water Fishing Nations (DWFNs) and African States was done by the FAO Fisheries and Aquaculture Statistics and Information Branch (FIPS) outside the framework of the present study. These additional data are included in this publication in section 7.3.

Licence fees in this section refer to those paid by local fishers to national authorities. Differently from the other main economic activities, data on production cost and VARs were not requested for local licences and, therefore, the GVA was assumed to be same as the GPV.

Table 20 shows the GVA and contribution to GDP of local licences by the sampled countries. The contribution of local licences to the GDPs in all sampled countries is very scarce representing only 0.002 percent

Table 20. Gross Value Added and contribution to GDP of local licences in sampled countries

Country	Inland fishing (US$)	Marine artisanal (US$)	Marine industrial (US$)	Total value local licences (US$)	Contribution to GDP (%)
Benin		29,492	13,845	43,337	0.001
Burkina Faso	72,233			72,233	0.001
Burundi	298			298	0.000
Congo, Dem Rep	1,023,876	28,617		1,052,493	0.009
Congo, Republic		50,025	569,494	619,519	0.005
Côte d'Ivoire					
Djibouti		35,847		35,847	0.003
Egypt	73,749	70,959	67,396	212,104	0.000
Ethiopia					
Gambia	6,080	21,231	5,611	32,922	0.003
Guinea		458,353	5,417,969	5,876,322	0.112

Kenya	91,896	10,897	343	103,136	0.000
Madagascar			3,170,725	3,170,725	0.032
Malawi	13,979			13,979	0.000
Mali	567,708			567,708	0.006
Mauritius		22,865	22,592	45,457	0.000
Mozambique	110,621	251,387	17,612	379,620	0.003
Rwanda					
Sao Tome Principe		7,975		7,975	0.003
Senegal	15,920	98,117	842,111	956,148	0.007
Tanzania	1,467,655	363,734		1,831,389	0.008
Togo	196,560	17,254	6,240	220,054	0.007
Zanzibar		26,144		26,144	0.003
Total	**3,640,576**	**1,492,895**	**10,133,939**	**15,267,410**	**0.002**

4.5 Gross value added and contribution to GDP by the whole fisheries sector

Overall GVA and contribution to GDP of the whole fisheries sector were calculated by summing up the GVAs by Fishing, Aquaculture, Post-harvest, and Licensing for local fleets as presented in Tables 9, 14, 19 and 20.

$$Contribution\ to\ GDP = \frac{GVA\ Fishing + GVA\ Aquaculture + GVA\ Postharvest + GVA\ Licensing}{GDP}$$

Total GVA is USS 7.3 billion which represents a contribution of 1.58 percent to the total GDPs of sampled countries (Table 21). The main contribution to GDP comes from the inland fishing subsector (43.7 percent), followed by aquaculture (28.1 percent), marine artisanal fisheries (23.7 percent), and 4.5 percent from marine industrial fisheries.

Table 21. The contribution of fisheries and aquaculture to GDP in sampled countries

	Gross Value Added (US$ millions)	Contribution to GDP (%)
Total GDPs sampled countries	**462,649**	
Total Fisheries and Aquaculture Value Added	**7,308**	**1.58**
Total Inland Fisheries	**3,186**	**0.69**
Inland Fishing	2,415	0.52
Post-harvest	767	0.17
Local licences	4	0.00
Total Marine Artisanal Fisheries	**1,730**	**0.37**
Marine Artisanal Fishing	1,032	0.22
Post-harvest	696	0.15
Local licences	1	0.00
Total Marine Industrial Fisheries	**339**	**0.07**
Marine Industrial Fishing	248	0.05
Post-harvest	81	0.02
Local licences	10	0.00
Total Aquaculture	**2,054**	**0.44**

Table 22 shows total GVA and contribution to GDP by sampled countries.

Table 22. Gross Value Added (GVA) and contribution to GDP by economic activity in sampled countries

Country	Fishing		Aquaculture		Processing		Local Licences		Total sampled countries	
	GVA (US$ millions)	GDP (%)	GVA (US$ millions)	GDP (%)	GVA (US$ millions)	GDP (%)	GVA (US$ millions)	GDP (%)	GVA (US$ millions)	GDP (%)
Benin	144	2.19	0	0.00	15	0.23	0	0.001	159	2.42
Burkina Faso	18	0.22	0	0.00	15	0.18	0	0.001	33	0.40
Burundi	7	0.46			8	0.50	0	0.000	15	0.96
Congo, Dem Rep of the	455	3.81	7	0.06	196	1.65	1	0.009	659	5.53
Congo, Republic of	273	2.06	0	0.00	54	0.41	1	0.005	328	2.47
Côte d'Ivoire	33	0.14	3	0.02	63	0.27		0.000	100	0.43
Djibouti	3	0.25			0	0.02	0	0.003	3	0.27
Egypt	591	0.26	1,954	0.85	283	0.12	0	0.000	2,828	1.22
Ethiopia	102	0.34	0	0.00	5	0.02		0.000	108	0.36
Gambia	4	0.32	0	0.01	27	2.18	0	0.003	31	2.51
Guinea	148	2.83	0	0.00	39	0.74	6	0.112	193	3.68
Kenya	134	0.39	15	0.04	36	0.10	0	0.000	185	0.54
Madagascar	201	2.04	41	0.42	26	0.26	3	0.032	271	2.76
Malawi	95	1.59	11	0.18	75	1.26	0	0.000	181	3.03
Mali	144	1.53	0	0.00	46	0.49	1	0.006	190	2.02
Mauritius	13	0.14	2	0.02	1	0.01	0	0.000	16	0.17
Mozambique	387	3.02	1	0.01	90	0.70	0	0.003	478	3.73
Rwanda	37	0.58	1	0.02	7	0.11		0.000	45	0.70
Sao Tome and Principe	9	3.55			1	0.55	0	0.003	11	4.11
Senegal	220	1.71	0	0.00	310	2.41	1	0.007	531	4.13
Tanzania	621	2.63	13	0.05	89	0.38	2	0.008	725	3.07
Togo	14	0.43	0	0.00	154	4.86	0	0.007	168	5.30
Zanzibar	43	5.68	4	0.49	4	0.47	0	0.003	51	6.64
Total	**3,695**	**0.80**	**2,054**	**0.44**	**1,544**	**0.33**	**15**	**0.003**	**7,308**	**1,58**

Significant regional differences can be noted (Figure 4): East Africa countries (e.g. Madagascar, Mozambique, Tanzania and Zanzibar) have a high contribution to GDP of between 2.7 and 6.6 percent mostly due to fishing. The contribution to GDP is also considerable in some West Africa countries (e.g. the Gambia, Senegal and Togo) but it is mostly derived from post-harvest. In Central Africa the Democratic Republic of Congo and the Republic of Congo have a contribution to GDP of 2.5-5.5 percent mainly from inland fishing. Figure 5 shows the total contribution to GDP by major activity for the sampled countries, indicating that, in general, fishing is the major contributor to GDP, followed by post-harvest activities and aquaculture.

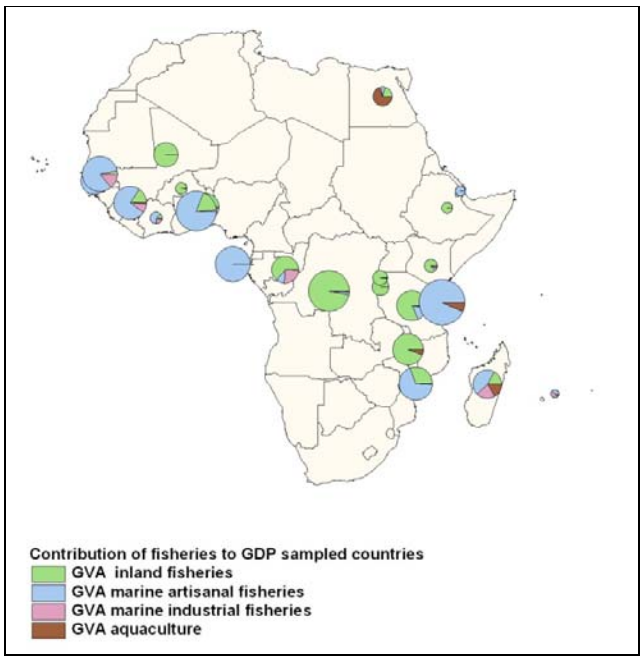


Figure 4. Contribution to GDP by subsector in sampled countries
(size of the pie indicates total contribution to GDP)

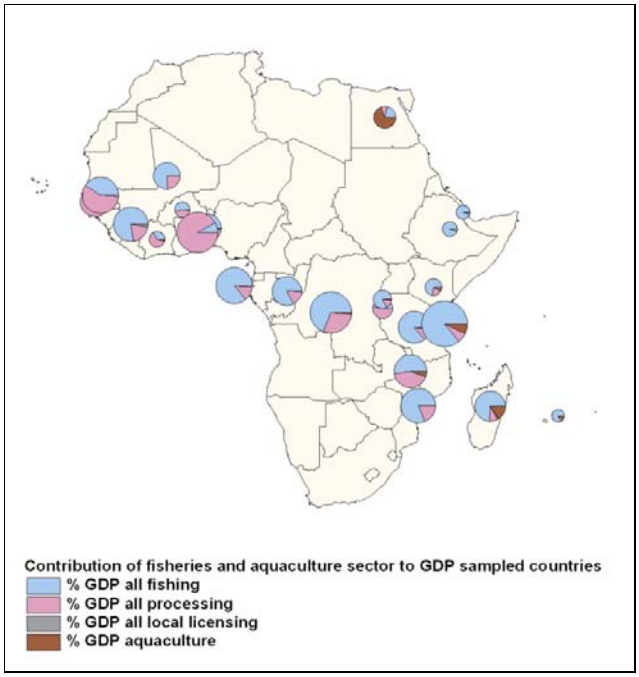


Figure 5. Contribution to GDP by economic activity in sampled countries
(size of the pie indicates total contribution to GDP)

5. EMPLOYMENT IN SAMPLED COUNTRIES

Employment is an essential component of human well-being and an important indicator for decision-makers in development. To cover also this aspect of the value of African fisheries, this study aimed at estimating the details of the employment generated by the whole fisheries and aquaculture sector, differentiating fishers and processors by gender in inland fishing, marine artisanal and industrial fishing, and aquaculture.

Many people in Africa dedicate only a portion of their time to work as fishers or processors. It is difficult for national offices to classify and collect separate data on people working full-time or part-time in the fisheries sector. National experts were requested to provide data on employment in fishing and aquaculture accounting only for full-time employment, while employment in processing should have included full-time and part-time employment. However, it may be that criteria for inclusion/exclusion of part-time processors may differ significantly among countries.

5.1 Employment in inland fisheries

As already noted for the GVA analysis, inland fisheries is very relevant in the sample of countries that participated in this study. Almost 2.0 million persons are employed in the inland fisheries subsector, 66 percent as fisher and 34 percent as processor. Almost 0.53 million females (26 percent of the total) are employed in the inland fisheries subsector, the great majority (87 percent) of whom work as processors (Table 23).

Table 23. Employment in inland fisheries in sampled countries

Country	Fishers			Processors			Inland fisheries
	Males	Females	Total	Males	Females	Total	Total
Benin	124,731	37	124,768	0	78,513	78,513	203,281
Burkina Faso	25,904	4,675	30,579	463	2,520	2,983	33,562
Burundi	5,236	0	5,236	503	1,174	1,678	6,914
Congo, Dem Rep	154,666	9,161	163,827	22,530	175,717	198,247	362,074
Congo, Republic	39,486	1,362	40,848	8,475	11,159	19,634	60,482
Côte d'Ivoire	6,480	0	6,480	4,793	10,198	14,991	21,471
Djibouti	-	-	-	-	-	-	-
Egypt	63,610	5,907	69,517	4,000	2,000	6,000	75,517
Ethiopia	1,016	10	1,026	19,018	2,502	21,520	22,546
Gambia	6,249	0	6,249	211	278	488	6,737
Guinea	11,523	3,839	15,362	0	11,524	11,524	26,886
Kenya	48,579	0	48,579	8,487	30,587	39,074	87,653
Madagascar	17,325	0	17,325	449	367	816	18,141
Malawi	142,502	7,196	149,698	7,455	7,841	15,296	164,994
Mali	323,200	27,800	351,000	1,500	1,500	3,000	354,000
Mauritius	-	-	-	-	-	-	-
Mozambique	82,342	832	83,174	23,664	160	23,824	106,998
Rwanda	5,499	0	5,499	0	0	0	5,499

Sao Tome Principe	-	-	-	-	-	-	-
Senegal	15,986	0	15,986	3,352	5,371	8,723	24,709
Tanzania	207,787	3,543	211,330	111,100	123,551	234,651	445,981
Togo	8,575	25	8,600	150	3,350	3,500	12,100
Zanzibar	-	-	-	-	-	-	-
Total	**1,290,696**	**64,387**	**1,355,083**	**216,150**	**468,312**	**684,462**	**2,039,545**

5.2 Employment in marine artisanal fisheries

In the sampled countries, more than 0.84 million persons are employed in the marine artisanal fisheries sector, 66 percent are employed as fishers and 34 percent as processors. The share of females employed is lower (15 percent) than in inland fisheries. The majority of workers in processing are also males (Table 24).

Table 24. Employment in marine artisanal fisheries in sampled countries

Country	Fishers			Processors			Marine artisanal Total
	Males	Females	Total	Males	Females	Total	
Benin	6,314	0	6,314	0	1,648	1,648	7,962
Burkina Faso	-	-	-	-	-	-	-
Burundi	-	-	-	-	-	-	-
Congo, Dem Rep	3,172	6	3,178	1,256	7,732	8,988	12,166
Congo, Republic	4,863	0	4,863	5,350	3,798	9,148	14,011
Côte d'Ivoire	8,232	0	8,232	7,754	29,305	37,059	45,291
Djibouti	1,460	0	1,460	1,233	767	2,000	3,460
Egypt	53,135	0	53,135	29,900	850	30,750	83,885
Ethiopia	-	-	-	-	-	-	-
Gambia	30,859	0	30,859	611	546	1,156	32,015
Guinea	16,902	96	16,998	598	12,689	13,287	30,285
Kenya	8,757	0	8,757	298	473	772	9,529
Madagascar	119,334	0	119,334	6,103	5,395	11,498	130,832
Malawi	-	-	-	-	-	-	-
Mali	-	-	-	-	-	-	-
Mauritius	3,506	58	3,564	0	0	0	3,564
Mozambique	161,605	1,633	163,238	99,318	1,930	101,248	264,487
Rwanda	-	-	-	-	-	-	-
Sao Tome Principe	3,640	0	3,640	0	0	0	3,640
Senegal	57,710	41	57,751	9,444	30,927	40,371	98,122
Tanzania	33,741	3,912	37,653	10,928	11,762	22,690	60,343
Togo	5,640	0	5,640	85	8,415	8,500	14,140
Zanzibar	31,248	4,061	35,309	1,002	3,600	4,602	39,911
Total	**550,118**	**9,807**	**559,925**	**173,880**	**119,837**	**293,717**	**853,643**

5.3 Employment in marine industrial fisheries

The share of persons employed in marine industrial fisheries is slightly more than 11 percent of those employed in the marine artisanal subsector. Out of a total of 93,000 persons, 68 percent are employed in fishing and 32 percent in processing. No females have been reported working as fishers but they represent the majority (67 percent) of people employed in processing (Table 25).

Table 25. Employment in marine industrial fisheries in sampled countries

Country	Fishers			Processors			Marine industrial
	Males	Females	Total	Males	Females	Total	Total
Benin	156	0	156	0	0	0	156
Burkina Faso	-	-	-	-	-	-	-
Burundi	-	-	-	-	-	-	-
Congo, Dem Rep	0	0	0	0	0	0	0
Congo, Republic of	1,703	0	1,703	0	0	0	1,703
Côte d'Ivoire	461	0	461	6,610	17,112	23,722	24,181
Djibouti	0	0	0	0	0	0	0
Egypt	49,355	0	49,355	1,406	115	1,520	50,875
Ethiopia	-	-	-	-	-	-	-
Gambia	75	0	75	0	0	0	75
Guinea	1,400	0	1,400	0	0	0	1,400
Kenya	72	0	72	39	1	39	111
Madagascar	4,205	0	4,205	375	250	625	4,830
Malawi	-	-	-	-	-	-	-
Mali	-	-	-	-	-	-	-
Mauritius	2,862	0	2,862	52	15	66	2,928
Mozambique	1,620	0	1,620	0	0	0	1,620
Rwanda	-	-	-	-	-	-	-
Sao Tome Principe	0	0	0	0	0	0	0
Senegal	1,491	0	1,491	1,375	2,610	3,985	5,476
Tanzania	0	0	0	0	0	0	0
Togo	15	0	15	0	0	0	15
Zanzibar	0	0	0	0	0	0	0
Total	**63,415**	**0**	**63,415**	**9,857**	**20,103**	**29,960**	**93,375**

5.4 Employment in aquaculture

In the sampled countries, almost 680,000 persons are employed in aquaculture, of whom 96 percent are males and only 4 percent are females (Table 26).

Table 26. Employment in aquaculture in sampled countries

Country	Males	Females	Aquaculture Total
Benin	2,594	209	2,803
Burkina Faso	124	12	136
Burundi	-	-	-
Congo, Dem Rep of the	1,424	610	2,035
Congo, Republic of	303	53	357
Côte d'Ivoire	5,462	694	6,156
Djibouti	-	-	-
Egypt	586,123	0	586,123
Ethiopia	819	0	819
Gambia	376	814	1,191
Guinea	2,938	3,182	6,120
Kenya	3,920	3,919	7,840
Madagascar	10,568	1,642	12,210
Malawi	7,512	822	8,334
Mali	48	13	61
Mauritius	249	97	346
Mozambique	327	595	922
Rwanda	2,039	87	2,126
Sao Tome and Principe	-	-	-
Senegal	783	0	783
Tanzania	9,268	1,534	10,802
Togo	4,835	303	5,138
Zanzibar	10,247	13,592	23,839
Total	**649,959**	**28,178**	**678,140**

5.5 Total employment in the whole fisheries sector

The overall fisheries and aquaculture sector employs more than 3.7 million people in the sampled countries. Female employees represent 19 percent of the total workforce (Table 27). Considering the importance of women in processing activities in Africa the resulting overall female employment seems to be low but, as mentioned in the introduction of this section, it may be that some countries underestimated women working part-time as processors.

Table 27. Total employment in the fisheries and aquaculture sector in sampled countries

Country	Males	Female	Females (%)	Employment Total
Benin	133,795	80,407	38	214,202
Burkina Faso	26,491	7,205	21	33,698
Burundi	5,739	1,174	17	6,914
Congo, Dem Rep of the	183,047	193,227	51	376,275
Congo, Republic of	60,181	16,372	21	76,553
Côte d'Ivoire	39,793	57,309	59	97,102

Djibouti	2,693	767	22	3,460
Egypt	787,528	8,872	1	796,400
Ethiopia	20,853	2,512	11	23,365
Gambia	38,382	1,637	4	40,018
Guinea	33,361	31,330	48	64,691
Kenya	70,152	34,980	33	105,132
Madagascar	158,359	7,654	5	166,013
Malawi	157,469	15,859	9	173,328
Mali	324,748	29,313	8	354,060
Mauritius	6,669	170	2	6,838
Mozambique	368,877	5,149	1	374,027
Rwanda	7,538	87	1	7625
Sao Tome and Principe	3,640	0	0	3,640
Senegal	90,141	38,949	30	129,090
Tanzania	372,824	144,302	28	517,126
Togo	19,300	12,093	39	31,393
Zanzibar	42,497	21,253	33	63,750
Total	**2,954,077**	**710,621**	**19**	**3,664,700**

As shown in Figure 6 there are large differences among countries and regions, with more female workers in West and Central Africa in comparison with North and East Africa.

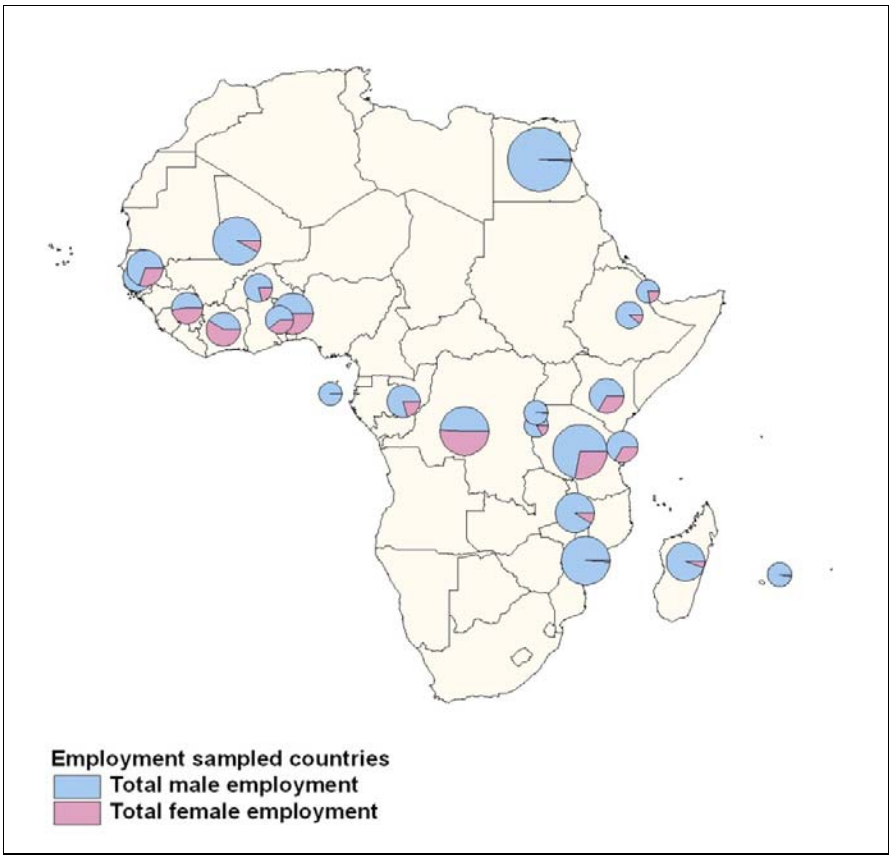


Figure 6. Employment and gender in the fisheries and aquaculture sector in sampled countries (size of pie indicates total employment)

6. METHOD TO EXTRAPOLATE GROSS VALUE ADDED FOR NON-SAMPLED COUNTRIES

In order to estimate values for the whole continent, data obtained from the 23 sampled countries were used as basis to extrapolate figures for the African countries that had not been sampled. Previous results of extrapolations presented at the Brussels workshop, had been based on regional clustered average values for inland, marine and aquaculture. Using regional averages resulted in some extreme values owing to the limited number of samples per region. Therefore the participants of the workshop recommended running the model again applying to all countries the overall average VARs calculated from the data submitted by the sampled countries for the different types of fishery.

Below are the steps followed for the extrapolation:

1. Grouping of marine African countries
2. Separation of marine artisanal and industrial catches
3. Calculation of overall average values used in the extrapolation
4. Calibration of the extrapolation
5. Calculation of total GVA for non-sampled countries

6.1 Grouping of marine African countries

The results of the sampled countries indicated that there are large regional differences in the relative importance of marine artisanal and industrial catches. Therefore, as first step to separate marine artisanal and industrial catches, African marine countries were separated into groups. The marine groups (Figure 7 and Table 28) were mainly based on geographical characteristics, in most cases matching with Large Marine Ecosystems and membership in Regional Fishery Bodies.

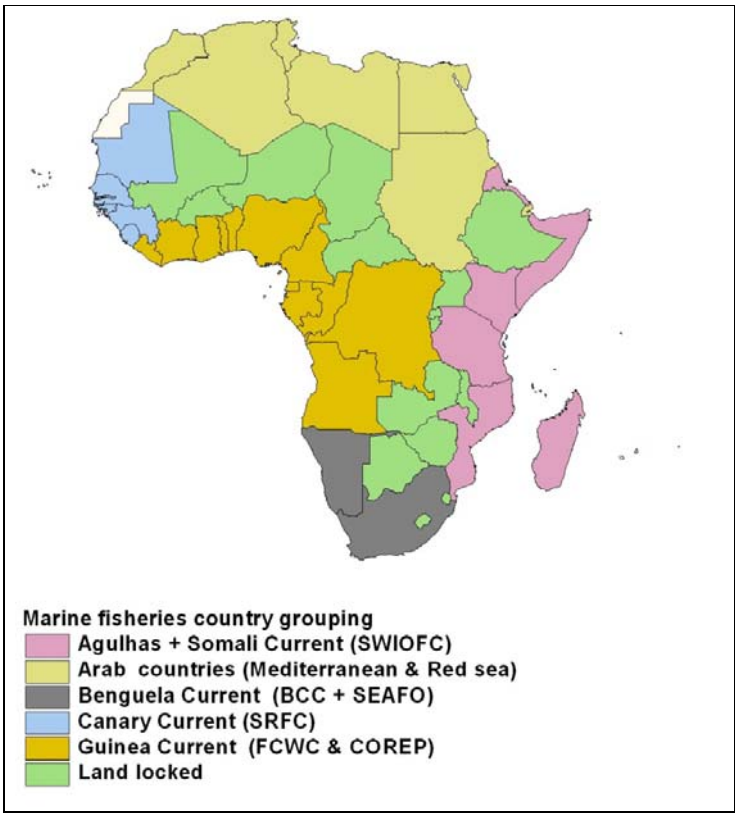


Figure 7. Marine country grouping

Table 28. Marine fisheries groups

Group	Sampled countries	Non-sampled countries	# countries
Arab countries (Mediterranean+Red Sea)	Djibouti, Egypt	Algeria, Libya, Morocco, Sudan, Tunisia	7
Canary current SRFC	Gambia, Guinea, Senegal	Cape Verde, Guinea-Bissau, Mauritania, Sierra Leone	7
Guinea current FCWC+COREP	Benin, Congo Rep., Congo DR, Cote d'Ivoire, Sao Tome & Principe,Togo	Angola, Cameroon, Equatorial Guinea, Gabon, Ghana, Liberia, Nigeria	13
Benguela current BCC+SEAFO		Namibia, South Africa	2
Agulhas+Somali current SWIOFC	Kenya, Madagascar, Mauritius, Mozambique, Tanzania, Zanzibar	Comoros, Eritrea, Seychelles, Somalia	10

6.2 Separation of marine artisanal and industrial catches

Catch data officially reported by countries to FAO and included in the "FAO global capture production" database are not separated by artisanal and industrial catches. For inland fisheries, all catches from the FAO database were considered as artisanal. In order to separate marine catch into artisanal and industrial, ratios of artisanal/industrial catches by group as derived from data reported by national experts for sampled countries (Table 29) were applied to the non-sampled countries.

Table 29. Artisanal/industrial catches ratios in sampled countries by marine group

Marine fisheries group	Artisanal catches (tonnes)	Industrial catches (tonnes)	Total marine catches (tonnes)	Artisanal catches (%)	Industrial catches (%)
Arab countries (Mediterranean+Red Sea)	71,974	51,929	123,903	58	42
Canary current SRFC	480,934	61,299	542,233	89	11
Guinea current FCWC+COREP	84,766	30,674	115,440	73	27
Benguela current BCC+SEAFO	-	-	-	*5*	*95*
Agulhas+Somali current SWIOFC	273,607	29,629	303,236	90	10

As no countries from Southern Africa participated in this study, those countries that are members of the Benguela Current Commission (BCC) were classified differently: (i) Angola was assigned to the Guinea current group as geographically adjacent to that area for which data were available; (ii) Namibia and South Africa were kept in the Benguela Current group but with different artisanal/industrial catch ratios, i.e. zero artisanal catches for Namibia, and 5 percent for South Africa.

6.3 Calculation of overall average values used in the extrapolation

The overall African average values, as derived from sampled countries, used in the extrapolation are presented in Table 30. The definition of each parameter is provided in Appendix 4.

Table 30. Overall average values for parameters used in the extrapolation

Parameter	Inland fisheries	Marine artisanal fisheries	Marine industrial fisheries	Aqua culture
Average ex-vessel price/farm gate price (US$/kg)	2.28	1.56	2.45	2.11
Value Added Ratio fishing/aquaculture	0.73	0.73	0.41	0.59
Fresh fish ratio	0.46	0.53	0.30	
Artisanal processed fish ratio	0.15	0.15	0.02	
Industrial processed fish ratio	0.04	0.08	0.16	
Price fresh fish (US$/kg)	2.97	2.90	5.55	
Price artisanal processed fish (US$/kg)	4.67	3.53	8.89	
Price industrial processed fish (US$/kg)	5.11	4.90	3.41	
Value Added Ratio fresh fish	0.21	0.23	0.21	
Value Added Ratio artisanal processed fish	0.31	0.32	0.46	
Value Added Ratio industrial processed fish	0.20	0.28	0.38	
Value Added licensing (US$ tonne)	2.52	1.47	41.44	

6.4 Calibration of the extrapolation

To calibrate the extrapolation, real values and extrapolated values of the sampled countries were compared. The calibration coefficients were obtained by plotting the extrapolated GVA against the real GVA of the sampled countries (Figure 8). For all the parameters a calibration coefficient, estimated as 1/correlation coefficient, was calculated and then applied for correction (Table 31).

Table 31. Calibration coefficient used for the extrapolation of GVA

	Calibration coefficient
Inland fishing	1.05
Marine artisanal fishing	1.90
Marine industrial fishing	1.56
Processing inland fishing	1.20
Processing marine artisanal fishing	1.40
Processing marine industrial fishing	1.29
Aquaculture	1.36

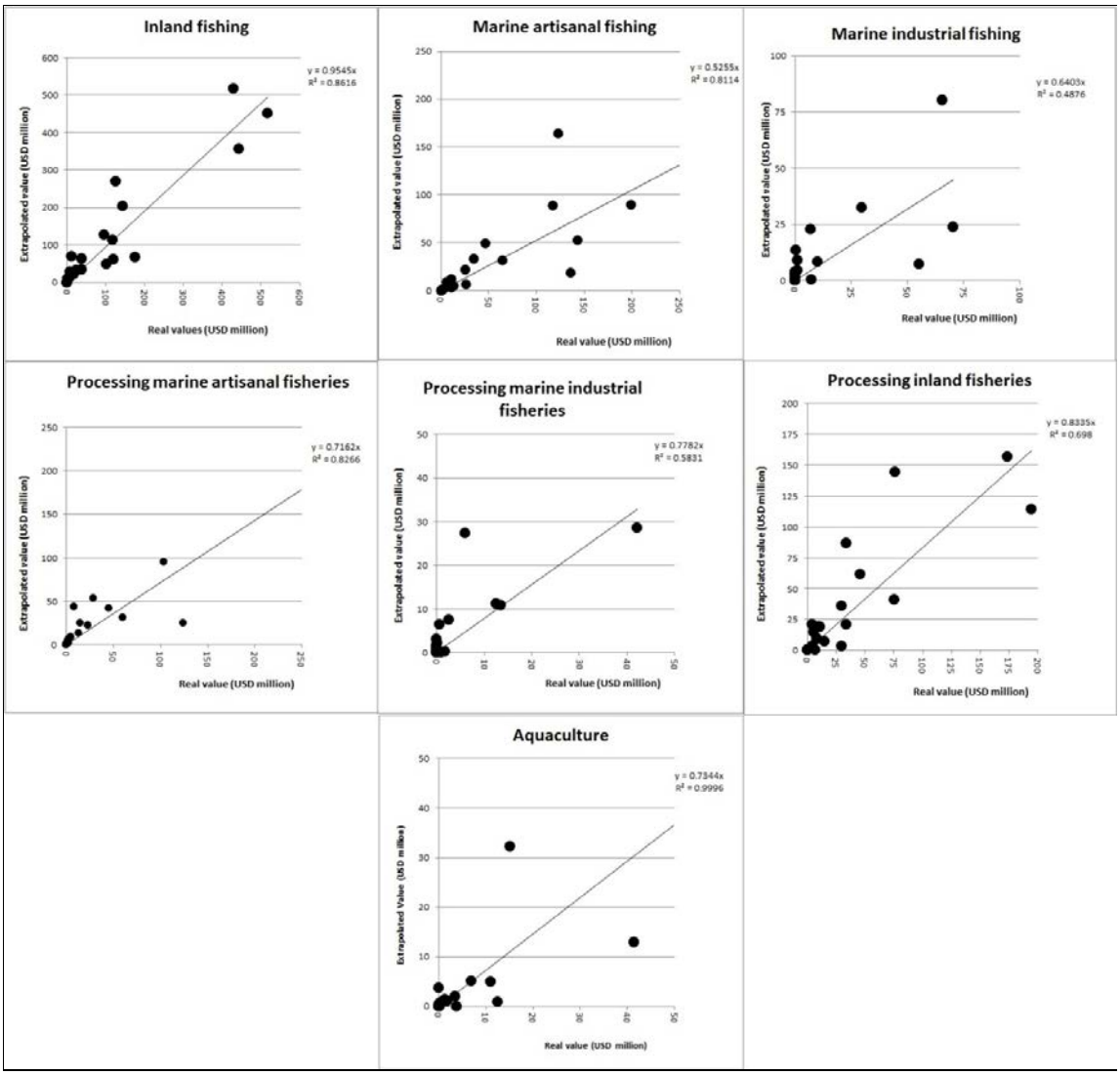


Figure 8. Plots of extrapolated and real GVAs in sampled countries

6.5 Calculation of total GVA for non-sampled countries

The total GVA by country was calculated with the following formula:

*GVA [subsector] = [fishing] Catches*Fish price*1000*Calibration coefficient*VAR +*
*[aquaculture] Production*Fish price*1000*Calibration coefficient*VAR +*
*[post-harvest] Production*Processing ratio*Fish price*1000*Calibration coefficient*VAR +*
*[licensing] Catches*Value Added*

7. GROSS VALUE ADDED AND CONTRIBUTION TO GDP FOR THE WHOLE AFRICA

National Statistical Offices are responsible for estimating the contribution of the sector to GDP. However, national figures on contribution of fisheries to GDP are available for only a few African countries. Moreover, the different methodologies applied in the calculations often lead to results that are not comparable among countries. This study attempted to calculate figures applying standard approaches to all sampled and non-sampled countries but, given the limitations of the extrapolation method, overall figures on the contribution to GDP and GDPA presented in the following sections should be considered as indicative.

7.1 The contribution to GDP

The total GVA of the fisheries and aquaculture sector in Africa as estimated by this study is US$ 24 billion or 1.26 percent of the GDP of all African countries. Table 32 shows values by subsector and economic activity. Marine artisanal fisheries are the major contributor to GDP, followed by marine industrial fisheries inland fisheries which have almost the same value.

Table 32. Fisheries and aquaculture contribution to GDP in the whole Africa by subsector

	Gross Value Added (US$ millions)	Contribution to GDP (%)
Total GDPs African countries	**1,909,514**	
Total Fisheries and Aquaculture	**24,030**	**1.26**
Total Inland Fisheries	**6,275**	**0.33**
Inland fishing	4,676	0.24
Post-harvest	1,590	0.08
Local licences	8	0.00
Total Marine Artisanal Fisheries	**8,130**	**0.43**
Marine artisanal fishing	5,246	0.27
Post-harvest	2,870	0.15
Local licences	13	0.00
Total Marine Industrial Fisheries	**6,849**	**0.36**
Marine industrial fishing	4,670	0.24
Post-harvest	1,878	0.10
Local licences	302	0.02
Total Aquaculture	**2,776**	**0.15**

In West Africa fishing activities, mostly in the marine artisanal subsector, are a major contributor to GDP with high overall contributions in Ghana, Mauritania and Sierra Leone. In Central Africa inland fisheries is the major contributor to GDP with high overall contributions in the Democratic Republic of Congo and Uganda. In Southern Africa marine industrial fisheries is the major contributor to GDP (Figure 9).

Shares of GVA within the fisheries subsectors in sampled and non-sampled countries showed a contribution of the post-harvest subsector lower than expected, in particular for the inland fisheries subsector (see Table 33). As already described in section 4.3.1, almost one-third of the total catches in sampled countries, with a majority of inland waters catches, resulted as being sold directly by fishers at the landing site or self-consumed without entering in the post-harvest chain. This may partially explain low values for post-harvest in sampled countries which were also reflected in the extrapolation for non-sampled countries.

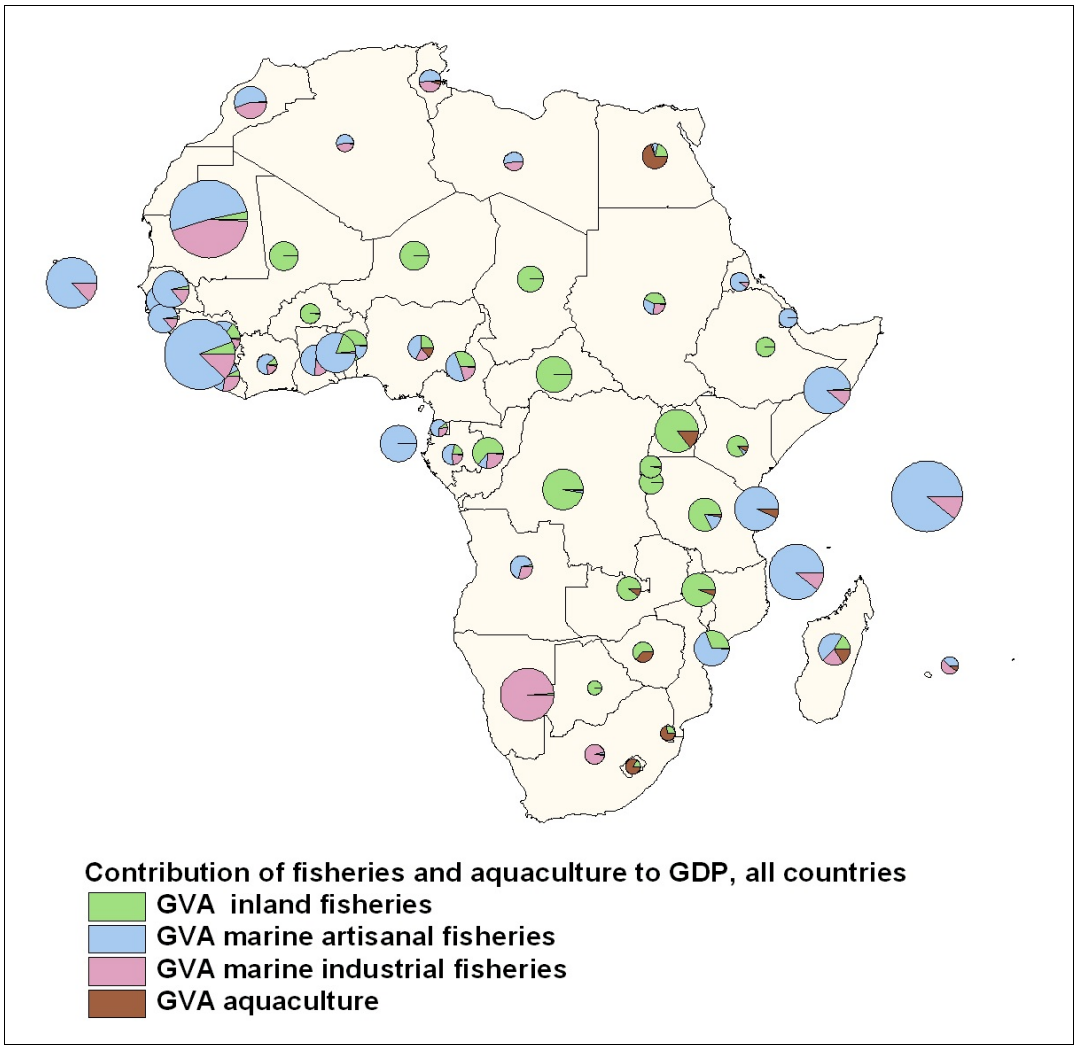


Figure 9. Contribution to GDP by subsector
(size of pie indicates total contribution to GDP)

Table 33. Share of GVA within subsector in sampled and non-sampled countries

Subsector	Economic activity	Sampled countries	Non-sampled countries	All countries
		Share within subsector (%)		
Inland Fisheries	Fishing	75.8	73.2	74.5
	Post-harvest	24.1	26.6	25.3
	Local licences	0.1	0.1	0.1
Marine Artisanal Fisheries	Fishing	59.8	65.8	64.5
	Post-harvest	40.1	34.0	35.3
	Local licences	0.1	0.2	0.2
Marine Industrial Fisheries	Fishing	74.9	67.8	68.2
	Post-harvest	24.5	27.6	27.4
	Local licences	0.6	4.6	4.4

The results obtained combining data from sampled countries with extrapolated values for non-sampled countries provide an indication of the overall values of the African fisheries and aquaculture sector. However, the extrapolation method applied showed some limitations, and it is recognized that the real value of African fisheries could have been obtained only if all the countries had participated in this study. Calculation of the contribution to GDP is responsibility of national statistical offices and fisheries and aquaculture departments and to avoid that the extrapolated values being considered and quoted as real official values, figures on contribution to GDP by each non-sampled country are not presented.

7.1.1 Comparison with previous estimate on the value of African fisheries

The "Hidden Harvest" study (World Bank, 2012) estimated the contribution of fishing and post-harvest globally. In Figure 10, official data on contribution of the fisheries sector to GDP available for some countries are compared with the data produced by the present study and those from the World Bank study (defined as "extended GDP" as including the "*…downstream economic activities in the estimate of the global economic contribution of capture fisheries*").

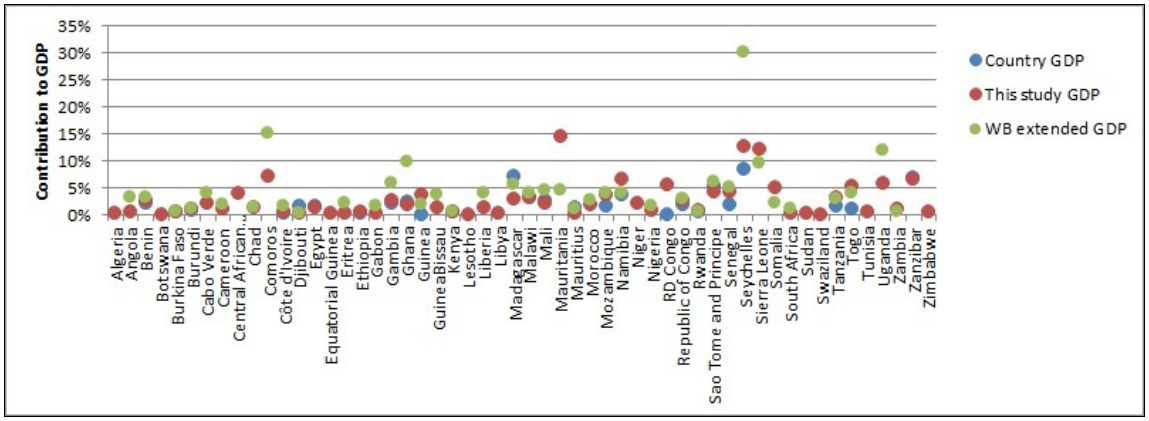


Figure 10. Contribution of fisheries to GDP as from national sources, this study and the World Bank study

The general pattern of all three is more or less the same (if outliers for Guinea, Mauritania and Seychelles are excluded). The World Bank estimations are in general lower if compared with the estimates of the present study (Figure 11) but this can be partially explained by the fact that the present study includes aquaculture.

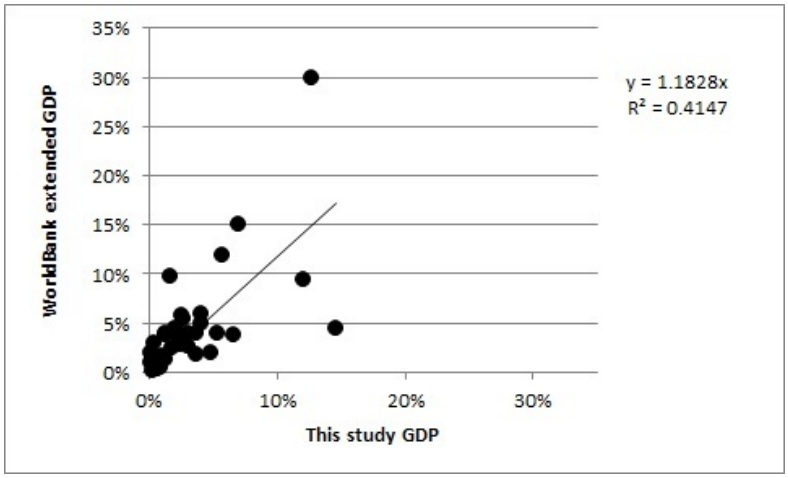


Figure 11. Comparison between contributions to GDP from this study and World Bank (2012)

A country's GDP represents the total value of all goods and services produced in one year within that country and it may be argued as to whether the contribution to GDP is a good indicator for the performance of the fisheries sector as its share could vary also due to external factors. For example, if another important economic sector, such as mining or oil production, increased its annual production dramatically, the contribution of the fisheries sector to GDP would show a decrease even if the fisheries value added remained the same or increased.

7.2 The contribution of fisheries to GDPA

To monitor the results of the CAADP with respect to fisheries and aquaculture, the contribution of the sector to the GDPA could be an important indicator.

The value added of GDPA is compiled by the national statistical offices in accordance with the International Standard Industrial Classification (ISIC). Combined data for ISIC Sections A and B (respectively, "Agriculture, hunting and forestry" and "Fishing") are compiled by the United Nations Statistics Division. Overall GDP and GDPA by country used for this study are listed in Table 45 in Appendix 3. However, the section "Agriculture, hunting and forestry" section excludes processing of agricultural products which are covered under ISIC Section D-15 "Manufacture of Food Products". Therefore, the contribution of fisheries to GDPA can only be calculated as the share of fishing and aquaculture economic activities in agriculture production but excluding the value generated by post-harvest.

The total value added of fishing and aquaculture in Africa is US$ 17.4 billion. With a total GDPA of US$ 288.4 billion, the fisheries sector contributes 6 percent of the GDPA for the whole Africa. The highest contribution is from marine artisanal fishing contributing 1.82 percent of total GDPA, whereas inland fishing and marine industrial fishing have the same contribution of 1.62 percent, and aquaculture contributes almost a percent (see Table 34). Figure 12 shows the contribution to GDPA by subsector.

Table 34. Fisheries and aquaculture contribution to GDPA in the whole Africa by subsector

	Gross Value Added (US$ millions)	Contribution to Agriculture GDP (%)
Total GDPAs African countries	**288,392**	
Total Fishing and Aquaculture GVA (excluding post-harvest)	**17,369**	**6.02**
Inland fishing	4,676	1.62
Marine artisanal fishing	5,246	1.82
Marine industrial fishing	4,670	1.62
Aquaculture	2,776	0.96

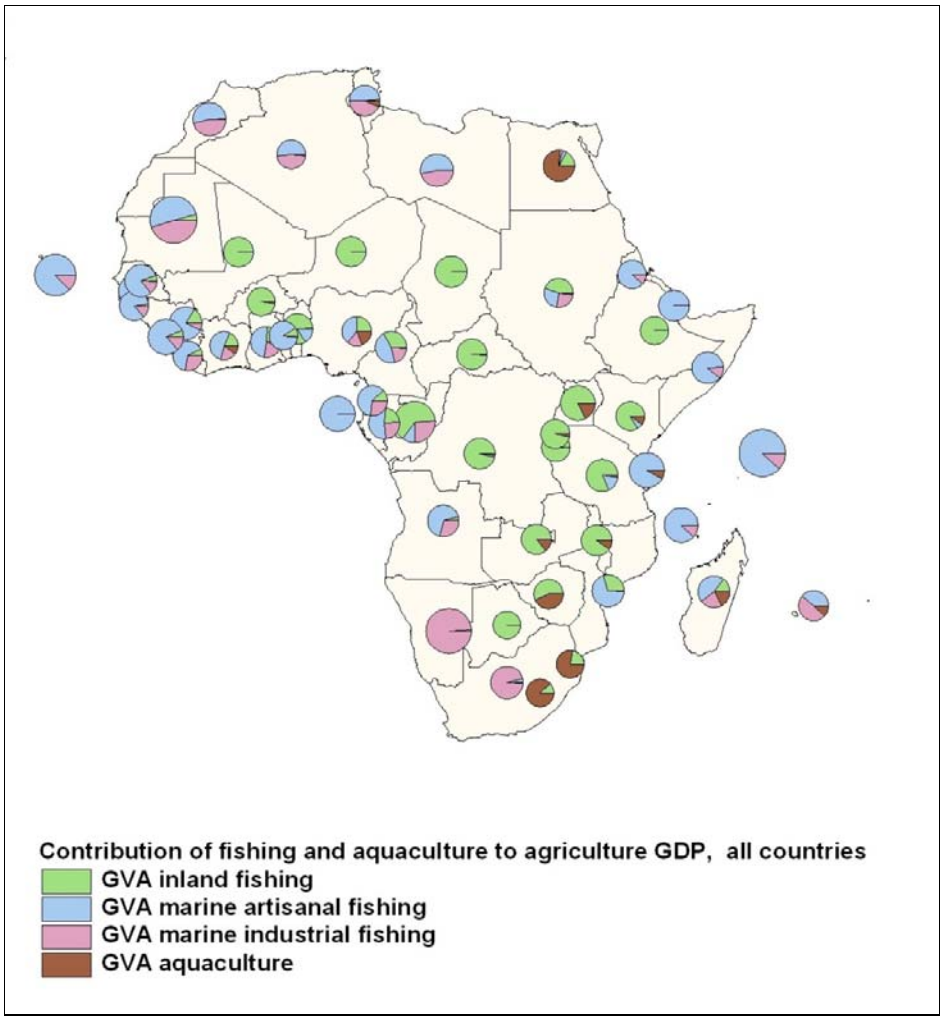


Figure 12. Contribution to GDPA by subsector
(size of the pie indicates total contribution to Agriculture GDP)

7.3 Value of fisheries agreements between Distant Water Fishing Nations and African states

The value of access rights paid by Distant Water Fishing Nations (DWFNs) to be allowed to fish in the national Exclusive Economic Zones (EEZs) is considerable for several African countries and also contributes to the overall value generated by activities related to fisheries. As mentioned in section 4.4, data on licence fees paid by foreign fleets were not easily available to the national experts participating in this study. In order to complement the data produced by this study, the FAO Fisheries and Aquaculture Statistics and Information Branch (FIPS) attempted to estimate the value of fisheries agreements (FAs) between DWFNs and African States. However, as this was an exercise separated from "The Value of African Fisheries" study, the value obtained has not been added to the final results on the contribution of fisheries to GDP.

Information on fisheries agreements between the European Union [EU] (Member Organization) and African States is publicly available on the Internet (European Commission, 2013). The total value of fisheries agreements with the European Union (Member Organization) was calculated by adding up the amount it paid for access rights and the licence fees paid by vessel owners. It was assumed that the catch quotas allocated in the fisheries agreements were fully fished, although there have been recent cases in which this has not occurred (Corten, 2014). Differently from these agreements with the EU, data on fisheries agreements between other countries and African States had to be extrapolated as very little information, if any, is publicly available on these agreements.

Extrapolation was based on 2011 catch data included in the FAO global capture database (FAO, 2013) as reported by the DWFNs, Regional Fishery Bodies (e.g. International Commission for the Conservation of Atlantic Tunas [ICCAT] and Indian Ocean Tuna Commission [IOTC]), and some coastal countries (e.g. Guinea-Bissau and Mauritania) that provide FAO with catch data by foreign fleets in their EEZ and catches identified as unreported by DWFNs are entered in the FAO database. However, some foreign vessels operate in joint ventures with local companies, which makes correct attribution of catch nationality more complex and avoiding catch recording easier. Thus, catches by DWFNs in African waters are somewhat underestimated. However, it was not possible to separate tuna catches caught in EEZs and those from the high seas with a consequent overestimation of DWFNs catches in the EEZs of African countries. The significant value of catches by illegal, unreported, and unregulated (IUU) fishing has not been covered as by definition the FAO capture database does not include these catches.

Catches around Africa by DWFNs were separated by country (EU and other countries), species (tuna and non-tuna), and ocean (Atlantic and Indian). Tuna catches by Spain in the Eastern Central Atlantic, which represented over 60 percent of the total tuna catch by the countries of the European Union (Member Organization) in that area, were excluded as it was assumed that the majority was caught within the Spanish EEZ around the Canary Islands. Two ratios were then calculated on the data for the fleet of the European Union: (i) the ratio between total catches by DWFNs and catches included in the fisheries agreements; and (ii) the value per tonne. These ratios were applied to the catches of countries outside the European Union with one exception: the value per tonne of non-tuna species in the Atlantic was reduced by one-third as the vessels of such countries off West Africa mostly catch small pelagics of lower value whereas the fleet of the European Union also targets demersal fish and cephalopods.

In addition to the US$ 24 billion generated as value added by the fisheries and aquaculture sector, in 2011 African countries also received a total of more than US$ 0.4 billion for fisheries agreements with foreign nations fishing in their EEZs according to the official available data and those extrapolated which can be considered as a conservative estimate (see Tables 34-36, data estimated are in italics).

Table 35. Value of fisheries agreements (FA) between African States and the European Union in 2011

	Atlantic Ocean			Indian Ocean			Total		
	Catches by DWFNs (t)	**Catches covered by FAs (t)**	**FAs value (Euro)**	**Catches by DWFNs (t)**	**Catches covered by FAs (t)**	**FAs value (Euro)**	**Catches by DWFNs (t)**	**Catches covered by FAs (t)**	**FAs value (Euro)**
Tuna	57,449	31,500	3,598,000	177,439	98,800	11,723,000	234,888	130,300	15,321,000
Non-tuna	510,129	500,000	155,750,000	5,200	-	-	515,329	500,000	155,750,000
Total	**567,578**	**531,500**	**159,348,000**	**182,639**	**98,800**	**11,723,000**	**750,217**	**630,300**	**171,071,000**

Table 36. Estimated value of fisheries agreements (FA) between African States and countries outside the European Union in 2011

	Atlantic Ocean			Indian Ocean			Total		
	Catches by DWFNs (t)	**Catches covered by FAs (t)**	**FAs value (Euro)**	**Catches by DWFNs (t)**	**Catches covered by FAs (t)**	**FAs value (Euro)**	**Catches by DWFNs (t)**	**Catches covered by FAs (t)**	**FAs value (Euro)**
Tuna	113,660	*62,000*	*7,070,000*	34,869	*19,500*	*2,315,000*	148,529	*81,500*	*9,385,000*
Non-tuna	651,593	*640,000*	*133,130,000*	10,865	...	...	662,458	*640,000*	*133,130,000*
Total	**765,253**	***702,000***	***140,200,000***	**45,734**	***19,500***	***2,315,000***	**810,987**	***721,500***	***142,515,000***

Table 37. Estimated value of all fisheries agreements (FA) with African states in 2011

	Atlantic Ocean			Indian Ocean			Total			
	Catches by DWFNs (t)	**Catches covered by FAs (t)**	**FAs value (Euro)**	**Catches by DWFNs (t)**	**Catches covered by FAs (t)**	**FAs value (Euro)**	**Catches by DWFNs (t)**	**Catches covered by FAs (t)**	**FAs value (Euro)**	**FAs value (US$)**[1]
Tuna	171,109	*93,500*	*10,668,000*	212,308	*118,300*	*14,038,000*	383,417	*211,800*	*24,706,000*	*33,353,000*
Non-tuna	1,161,722	*1,140,000*	*288,880,000*	16,065	...	...	1,177,787	*1,140,000*	*288,880,000*	*389,988,000*
Total	**1,332,831**	***1,233,500***	***299,548,000***	**228,373**	***118,300***	***14,038,000***	**1,561,204**	***1,351,800***	***313,586,000***	***423,341,000***

[1]Exchange rate Euro/US$ applied = 1.35.

Catches by DWFNs represented more than half of total catch around Africa for 20 years between 1971 and 1991 (see Figure 13). After the dissolution of the Soviet Union their share started to decrease abruptly. Since 2001 the DWFN's share has stabilized at about 25 percent of total catch.

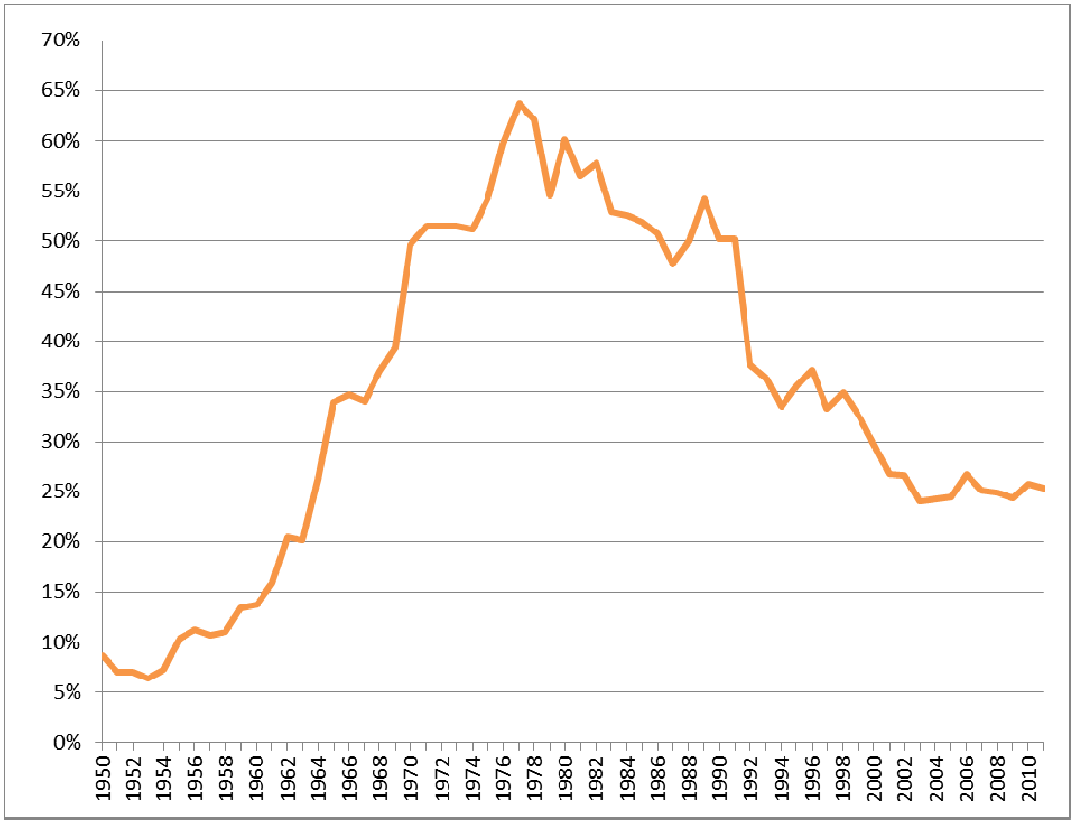


Figure 13. Share of 1950-2011 DWFNs' catches on total catches around Africa

According to this study, the total value added of marine fishing by African countries in 2011 was US$ 9.9 billion[7] (see Table 31). However, this was generated only by 75 percent of the total catch around Africa. With a simple proportion it was calculated that if also the remaining 25 percent of total catch were caught by African countries instead of by DWFNs, in theory these additional catches could generate a value of US$ 3.3 billion, which is 8 times higher than the current US$ 0.4 billion that African countries earn from fisheries agreements. Although many African countries would need investments, expertise and a viable environment to build or expand their fisheries sector, the additional catches would also increase food supply and employment, and boost the processing sector.

[7] Total value added by marine fisheries in African countries would have been to US$ 15 billion if also the post-harvest value had been included. However, part of the catches by DWFNs is processed in African countries. Therefore, to avoid double counting of post-harvest value, it was decided to calculate the possible amount generated by additional catches considering only the value estimated for marine fishing, although the figure thus obtained may be an underestimation.

8. METHOD TO EXTRAPOLATE EMPLOYMENT FOR NON-SAMPLED COUNTRIES

The procedure to extrapolate data on employment for the non-sampled countries was based on the regional average employment per tonne of landed/produced fish by sector and type of employment. Below are the steps followed for the extrapolation:

1. Grouping of African countries for inland fisheries and aquaculture
2. Calculation of weighted average employees per tonne used in the extrapolation
3. Calibration of the extrapolation
4. Calculation of employment for non-sampled countries

8.1 Grouping of African countries for inland fisheries and aquaculture

In addition to groupings by marine fisheries (see section 6.1), to refine the extrapolation of employment data for non-sampled countries, two groupings for inland fisheries and aquaculture were also established. Inland groups (Table 38) separate countries bordering the Great Lakes, where inland fishing produces great volumes, from the other countries. Countries that have increased considerably their aquaculture production in the last ten years were classified as "medium and high development", all the others as "low development (Table 39). Maps of inland and aquaculture groupings are shown in Figure 14.

Table 38. Inland fisheries groups

Group	Sampled countries	Non-sampled countries	# countries
Great Lakes	Burundi, Congo DR, Malawi, Kenya, Mozambique, Tanzania	Uganda, Zambia	8
Other landlocked or marine countries in which inland catches are considerable	Benin, Burkina Faso, Congo Rep., Cote d'Ivoire, Egypt, Ethiopia, Gambia, Guinea, Madagascar, Mali, Rwanda, Senegal, Togo	Angola, Botswana, Cameroon, Central African Republic, Chad, Gabon, Ghana, Lesotho, Liberia, Mauritania, Morocco, Namibia, Niger, Nigeria, Sierra Leone, Sudan, Swaziland, Zimbabwe	31

Table 39. Aquaculture groups

Group	Sampled countries	Non-sampled countries	No. countries
Medium and high development	Cote d'Ivoire, Egypt, Kenya, Madagascar, Malawi, Tanzania	Ghana, Nigeria, Tunisia, Uganda, Zambia, Zimbabwe	12
Low development	Benin, Burkina Faso, Burundi, Congo DR, Congo Rep., Ethiopia, Gambia, Guinea, Mali, Mauritius, Mozambique, Rwanda, Senegal, Togo, Zanzibar	Algeria, Angola, Cameroon, Central African Republic, Equatorial Guinea, Eritrea, Gabon, Lesotho, Liberia, Libya, Morocco, Namibia, Niger, Seychelles, Sierra Leone, South Africa, Sudan, Swaziland	33

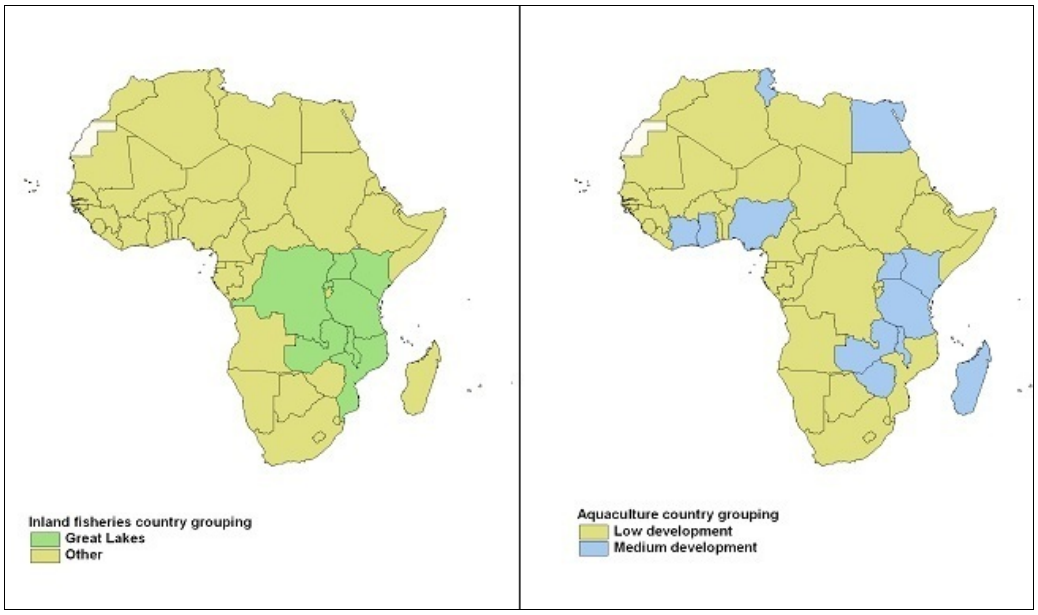


Figure 14. Inland and aquaculture groups of countries

8.2 Calculation of weighted average employees per tonne used in the extrapolation

The range of data on employment provided by sampled countries was more restricted than that for ex-vessel prices. This allowed applying specific weighted averages on the number of employees per tonne of fish caught/produced by grouping of countries for the extrapolation of employment data. Data by subsector and group of countries are presented in Tables 40-42.

Table 40. Employees per tonne of fish caught in inland fisheries

Inland fisheries group	No. fishers per tonne		No. processors per tonne	
	Males	Females	Males	Females
Great Lakes	0.71	0.02	0.19	0.37
Other	1.21	0.08	0.08	0.24

Table 41. Employees per tonne of fish caught in marine fisheries

Marine fisheries group	Subsector	No. fishers per tonne		No. processors per tonne	
		Males	Females	Males	Females
Arab countries	Artisanal	0.76		0.43	0.02
	Industrial	0.95		0.03	0.01
Canary Current	Artisanal	0.22	0.00	0.02	0.09
	Industrial	0.05		0.06	0.12
Guinea Current	Artisanal	0.38	0.00	0.17	0.60
	Industrial	0.08		0.56	0.22
Benguela Current*	Artisanal	0.66		0.26	0.20
	Industrial	0.29		0.02	0.04
Agulhas+Somali Current	Artisanal	1.30	0.03	0.79	0.11
	Industrial	0.09		0.01	0.01

* The weighted average values from all sampled countries were applied to the Benguela Current group.

Table 42. Employees per tonne of fish produced in aquaculture

Aquaculture group	Males per tonne	Females per tonne
Medium and high development	0.61	0.01
Low development	1.04	0.75

8.3 Calibration of the extrapolation

The extrapolation was calibrated by comparing extrapolated values and real values for sampled countries. The calibration coefficients were obtained by plotting the extrapolated employment against the real employment for the sampled countries (Figures 15-18). The calibration coefficient was then estimated as 1/correlation coefficient. The calibration coefficients obtained (Table 43) were then applied for correction[8].

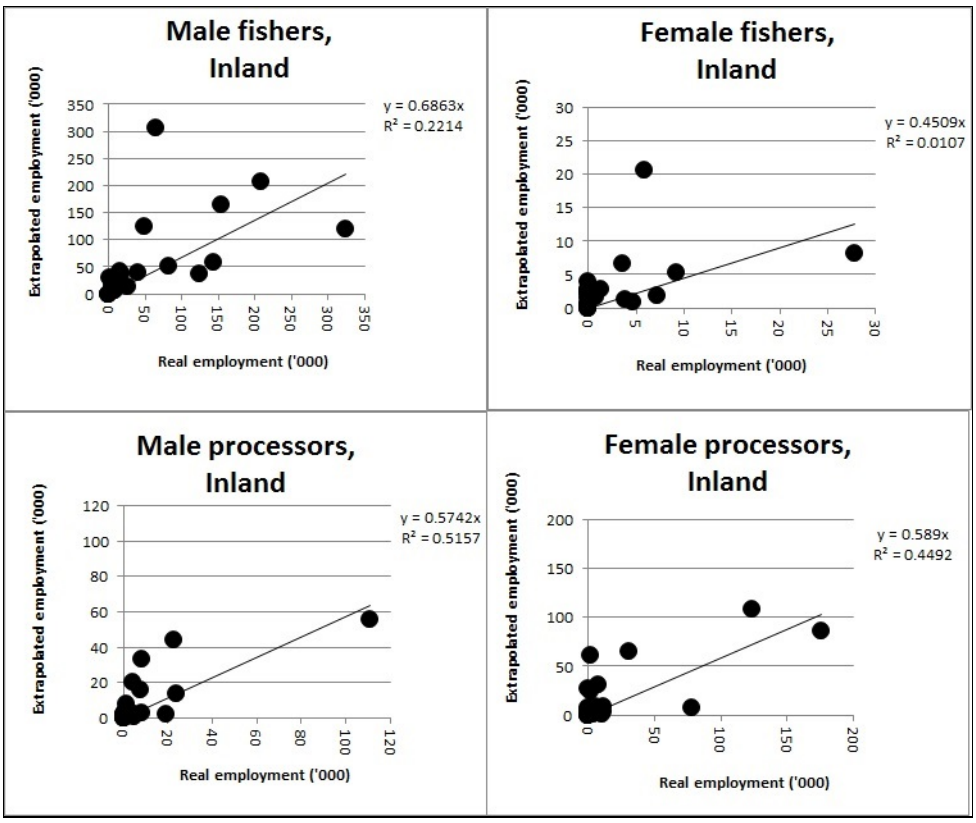


Figure 15. Calibration plots for inland fisheries

[8] Except for female aquaculture workers

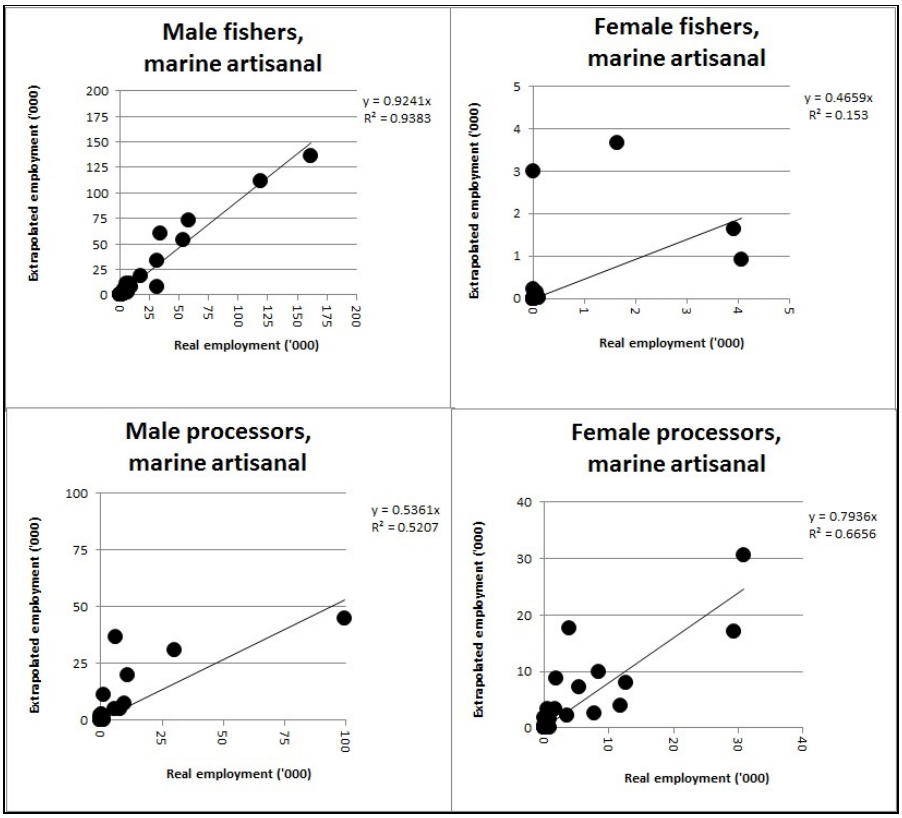


Figure 16. Calibration plots for marine artisanal fisheries

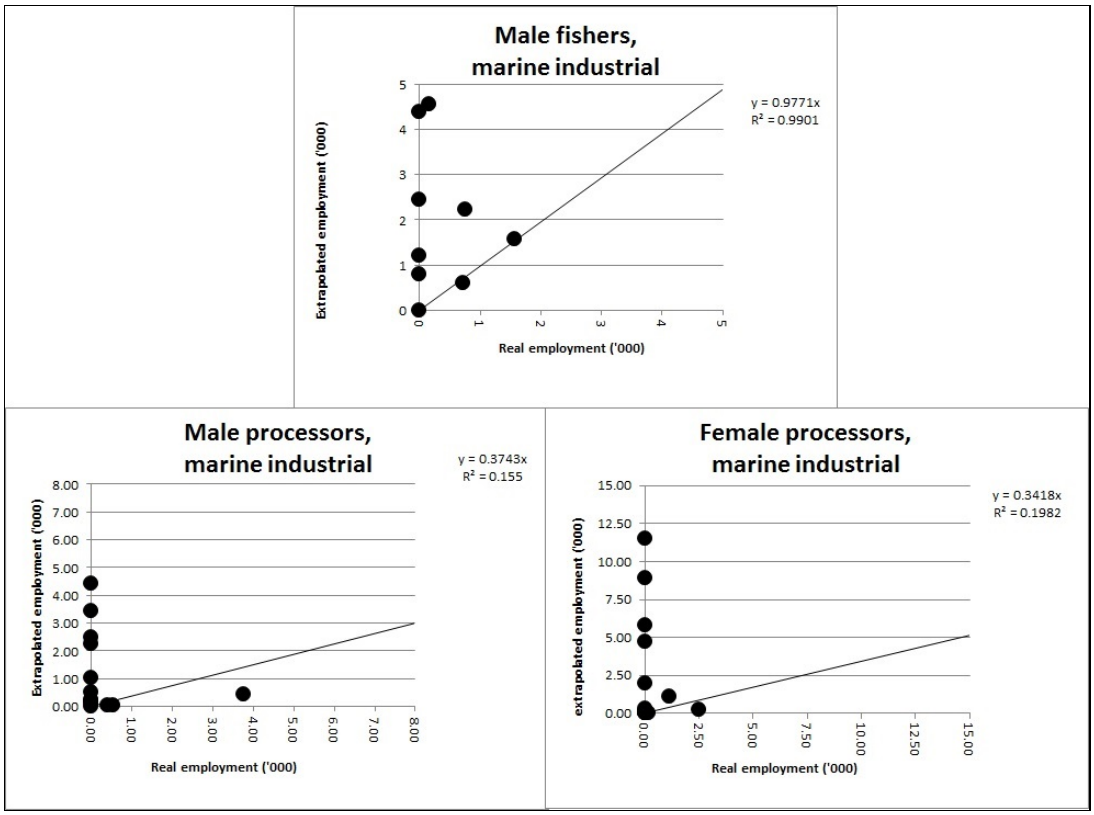


Figure 17. Calibration plots for marine industrial fisheries

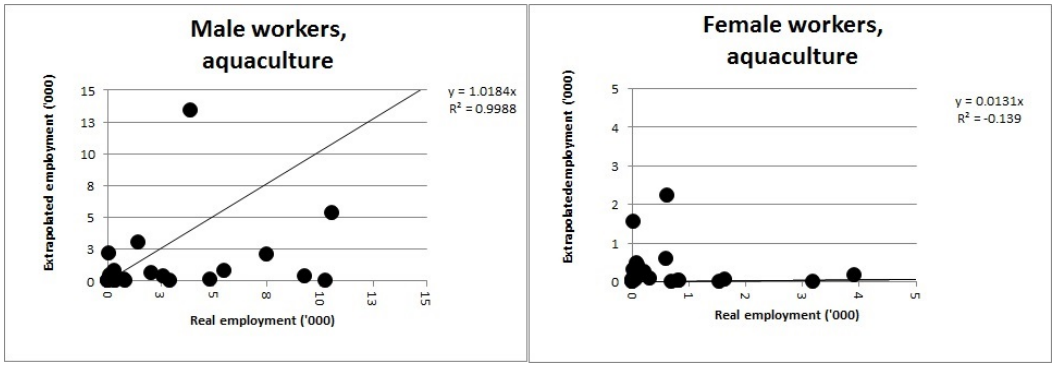


Figure 18. Calibration plots for aquaculture

Table 43. Calibration coefficients used in the extrapolation of employment

Type of employment and subsector	Calibration coefficient
Male fishers inland fishing	1.46
Female fishers inland fishing	2.22
Male processors inland fishing	1.74
Female processors inland fishing	1.70
Male fishers marine artisanal fishing	1.08
Female fishers marine artisanal fishing	2.19
Male processors marine artisanal fishing	1.87
Female processors marine artisanal fishing	1.26
Male fishers marine industrial fishing	1.02
Male processors marine industrial fishing	2.67
Female processors marine industrial fishing	2.93
Male aquaculture workers	0.98

8.4 Calculation of employment for non-sampled countries

Numbers of male/female fishers and processors by subsector for non-sampled countries were obtained by applying the following formulas:

*Extrapolated employment = Catches/Production*Employees per tonne ratio*Calibration coefficient*

9. EMPLOYMENT IN FISHERIES IN THE WHOLE AFRICA

9.1 Employment by subsector

In the African continent, the fisheries and aquaculture sector employs about 12.3 million people. Table 44 summarizes total figures and shares by subsector and within subsectors. Half of the 12.3 million people employed in the fisheries sector are fishers, 4.9 million (42.4 percent) are processors and 0.9 million (7.5 percent) work in fish farming. More than half of the fishers (55 percent) are employed in inland fisheries whereas the largest share of processors (42 percent) is in marine artisanal fisheries followed by 30 percent in inland fisheries and 28 percent in industrial fisheries.

Table 44. Employment by subsector

	No. of employees (thousands)	Share subsector (%)	Share within subsector (%)
Total Employment	**12,269**		
Total Inland Fisheries	4,958	40.4	
Fishers	3,370		68.0
Processors	1,588		32.0
Total Marine Artisanal Fisheries	4,041	32.9	
Fishers	1,876		46.4
Processors	2,166		53.6
Total Marine Industrial Fisheries	2,350	19.2	
Fishers	901		38.4
Processors	1,448		61.6
Aquaculture workers	920	7.5	

Significant regional differences can be noted, with higher percentages of processors in West and Southern Africa and lower percentages in East Africa (Figure 19).

The share of processors in the inland fisheries subsector was significantly lower than in the marine artisanal fisheries subsector (Table 44). As already explained for the extrapolation of the GVA, this may be partially explained by lower quantities of inland catches entering the processing value chain as more fish is sold directly by fishers at the landing site or self-consumed by the fishers in the sampled countries.

The results on employment have to be viewed with caution as they are based on data reported by the 23 sampled countries but extrapolated for the remaining 31 African countries. Not all the “employees per tonne” factors applied were robust enough, owing to scarce data available from some sampled countries. Collection of data on employment is responsibility of national statistical offices and fisheries and aquaculture departments and, to avoid that the extrapolated figures being considered and quoted as real official values, figures on employment by each non-sampled country have not been included in this second version of the publication.

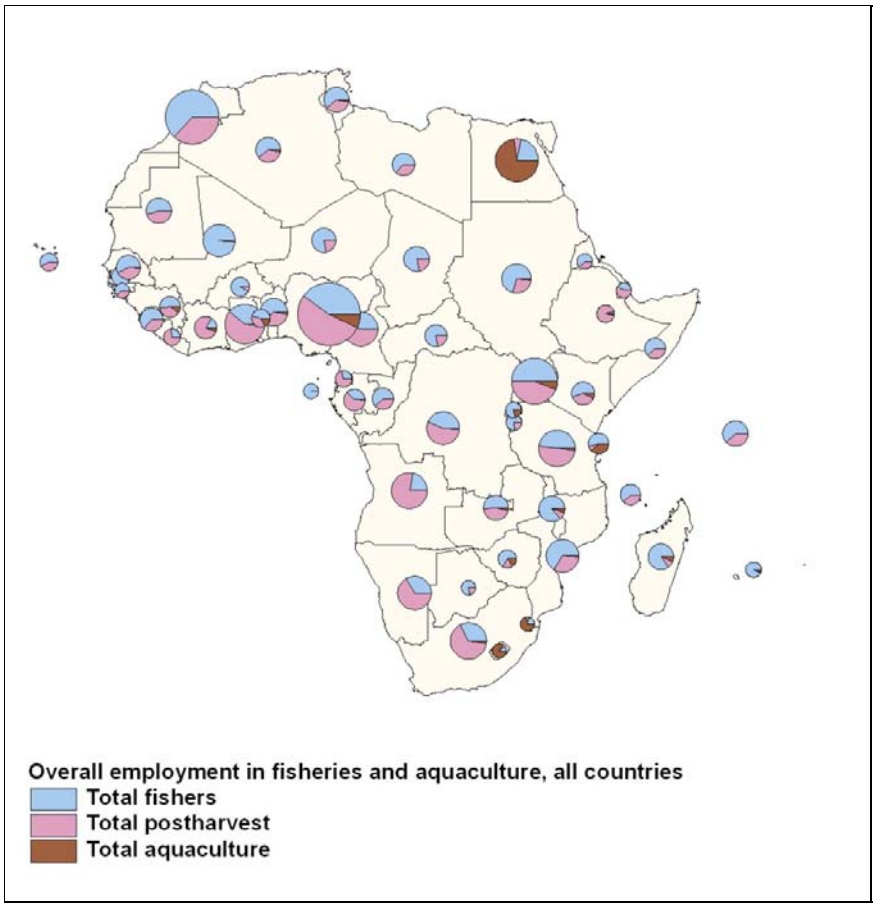


Figure 19. Employment by type of work
(size of pie indicates total employment)

9.1.1 Comparison with employment data from other sources

Employment data by country as calculated by this study for 2011 are compared in Figures 20 and 21 with official data reported and compiled by FAO for 2010 and published aggregated by continent in the 2012 issue of FAO's *The State of World Fisheries and Aquaculture* (FAO, 2012). Total numbers of fishers and aquaculture workers estimated by this study were significantly higher (1.6 and 6 times, respectively). However, FAO data on employment as published in the latest issue of *The State of World Fisheries and Aquaculture* (FAO, 2014) were revised substantially upwards (see Table 2).

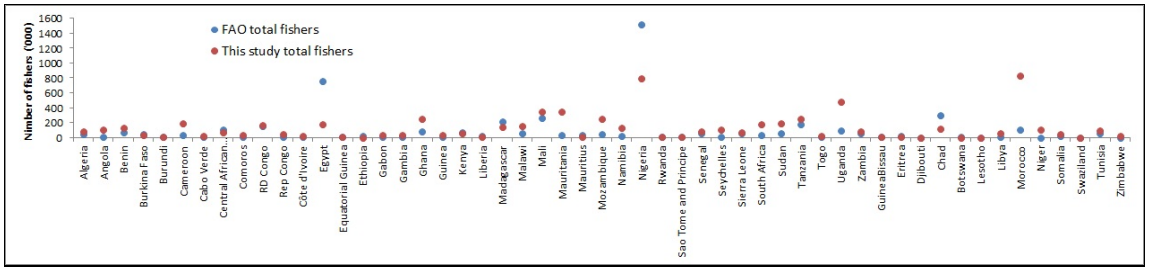


Figure 20. Comparison of total number of fishers in FAO data and in this study

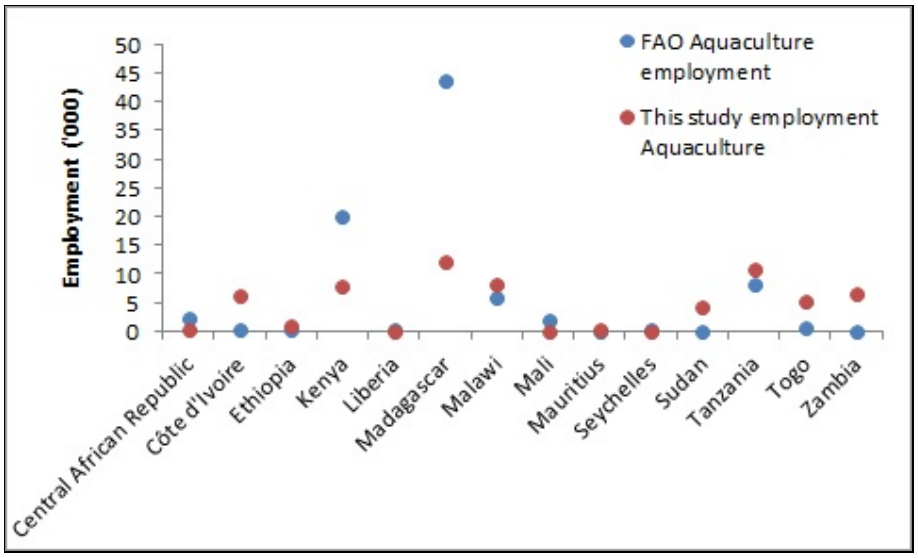


Figure 21. Comparison of total number of aquaculture workers in FAO data and in this study

The direct involvement of national experts from 23 countries helped this study to uncover information that in some cases had not been made available in the routine annual submission of employment data to FAO. On the other hand, the inclusion of Egypt, which alone contributes more than 70 percent of total African aquaculture production, among the sampled countries may have produced a positive bias in the figure for aquaculture workers.

According to the World Bank (2012), the fisheries sector in Africa employs 25.4 million people, of whom 7.4 million are small-scale fishers, 0.4 are industrial fishers and 17.6 work in post-harvest. These figures were estimated by applying global catch rates per fisher[9] to data from only four African countries (Ghana, Mozambique, Nigeria and Senegal) in which fisheries is an important and traditional activity. Comparing estimates from the two studies, it can be noted that in the World Bank study the number of fishers is higher but not excessively (+27 percent) than in this study, whereas the number of employees in post-harvest is more than three times greater.

In the World Bank study, the employment in post-harvest was estimated through the following global post-harvest/fishers ratios: 2.0 for inland fisheries, 2.7 for marine artisanal fisheries, and 3.56 for marine industrial fisheries. This method to estimate employment is rather coarse, owing to the fact that the ratio between fishers and processors has very large differences at the global level as well as in different regions of Africa (see Tables 40-42). However, this aspect and the low number of countries used in the World Bank study can only partially explain the large difference in the estimates of total post-harvest employment between the two studies.

9.2 Employment by gender

Women make up more than one-fourth of the workforce in the African fisheries sector (Table 45). The great majority of women are employed in post-harvest (91.5 percent), 7.2 percent work as fishers (mostly in inland fisheries with no women reported in marine industrial fisheries) and only 1.3 percent work in aquaculture. A graphic representation of female employment can be seen in Figure 22.

[9]Global catch rates per fisher: 0.6-0.8 tonnes/year in inland fisheries; 2.5 tonnes/year in small-scale marine fisheries, and 25.7 tonnes/year in marine industrial fisheries.

Table 45. Employment by gender

	Males (thousands)	Females (thousands)	Females (%)
Grand Total	**8,917**	**3,352**	**27.3**
Total Inland Fisheries	3,632	1,326	26.7
Fishers	3,143	227	6.7
Processors	489	1,099	69.2
Total Marine Artisanal Fisheries	4,041	961	23.8
Fishers	1,861	15	0.8
Processors	1,220	946	43.7
Total Marine Industrial Fisheries	1,328	1,021	43.5
Fishers	901	0	0
Processors	427	1,021	70.5
Aquaculture workers	876	44	4.8

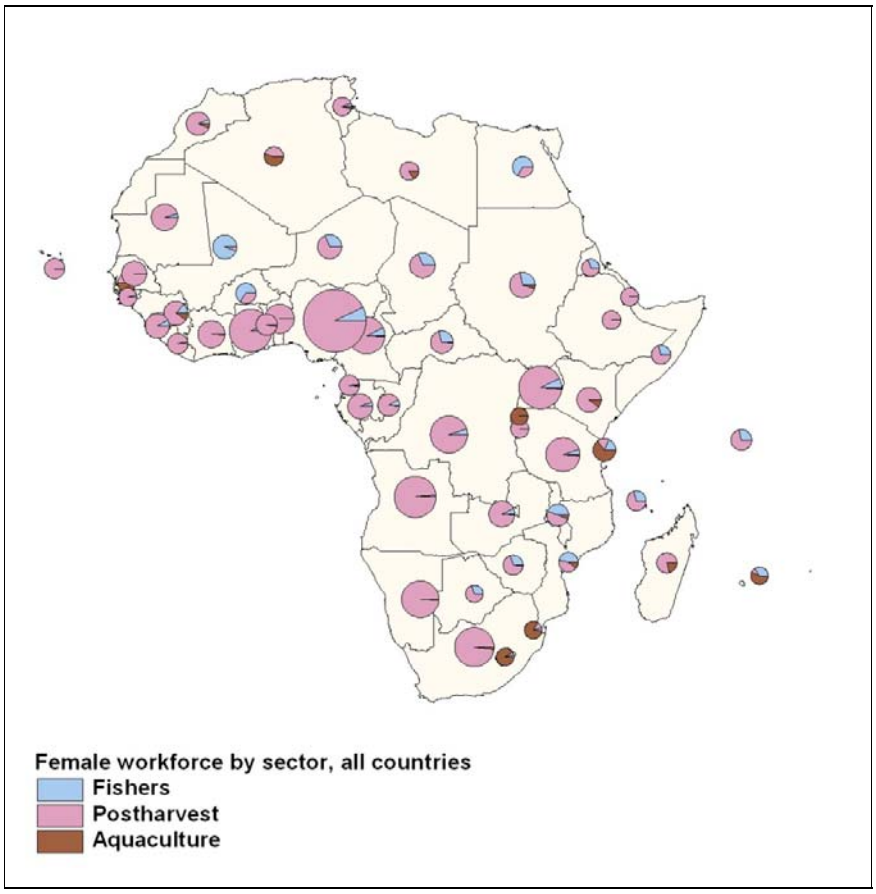


Figure 22. Female employment by type of work
(size of pie indicates total female workforce)

10. CHALLENGES ENCOUNTERED AND RECOMMENDATIONS

The results of the study provide an overall picture of the sector, underlining the importance of fisheries and aquaculture in Africa. However, during the course of the study, several challenges were encountered, mainly related to the availability of some data, including:

- The fish prices, provided by the countries as first-sale value for fisheries and aquaculture, seemed high in some instances and it may be that a mix of ex-vessel prices and market prices was reported for some countries;
- Information available on the economics of fishing and aquaculture, which is essential for the estimation of value added, is very limited in most of the countries;
- Very few data are available on post-harvest and this may have caused a possible underestimation of the value generated by post-harvest;
- In the questionnaire, data on licensing of local and foreign fleets were requested. However, as data on foreign fleets were reported only by a few countries and in a scattered form, it was decided to exclude them from the results and to attempt an estimation of the value of fisheries agreements between Distant Water Fishing Nations (DWFNs) and African States through other sources.

These challenges were acknowledged by the NFFP workshop (Brussels, Belgium, 31 October - 1 November 2013) held to discuss the methodology adopted and validate the preliminary results of the study. The workshop made a series of suggestions to the study team on how to deal with doubtful data which are reflected in this final version of the study, and some general recommendations on what should be done to improve socio-economic data on fisheries and aquaculture in Africa. The major recommendations were:

- This study at the continental level required considerable time and efforts, and it is doubtful that it can be repeated at regular intervals. Therefore, institutional mechanisms should be developed at the national and regional level to compile socio-economic data, similar to what was done in the present study;
- A similar study could be carried out at the level of Regional Fishery Bodies level, also with the purpose of refining the methodology;
- Improvements in national data collection systems should be linked to the "*Pan-African Strategy on improvement of fisheries and aquaculture data collection, analysis and dissemination*", which was elaborated in the AU framework in parallel with this study;
- Data on the economics of fishing operations and the processing sector collected at the national level should also include information on the production cost of the different types of fishing in order to compare Value Added Ratios at the regional level and establish standards, as well as detailed data on volumes and values in the post-harvest value chain;
- Statistical staff in national and regional institutions should be trained in the collection and analysis of data needed to estimate the contribution of the fisheries and aquaculture sector to GDP and employment;
- Access to information on fisheries agreements with DWFNs and on fishing operations by foreign fleets should be facilitated;
- Working group(s) on fisheries and aquaculture statistics should be constituted at the continental and/or RFB levels to share knowledge and establish standards, linking this process to the "*Pan-African Strategy on improvement of fisheries and aquaculture data collection, analysis and dissemination*";
- Liaisons between AU and FAO in the field of fishery statistics should be strengthened.

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APPENDIX 2. EXCHANGE RATES

Table 46. Reference year and exchanged rate for sampled countries

Country	Reference year	National currency per US Dollar
Benin	2010	0.002080
Burkina Faso	2008	0.002130
Burundi	2008	0.000846
Congo, Dem Rep of the	2008	0.001800
Congo, Republic of	2011	0.002200
Côte d'Ivoire	2009	0.002130
Djibouti	2010	0.005690
Egypt	2011	0.175000
Ethiopia	2011	0.054167
Gambia	2011	0.037118
Guinea	2010	0.000180
Kenya	2011	0.011429
Madagascar	2011	0.000470
Malawi	2012	0.004545
Mali	2010	0.002080
Mauritius	2010	0.032600
Mozambique	2011	0.028000
Rwanda	2011	0.001690
Sao Tome and Principe	2011	0.000053
Senegal	2010	0.002080
Tanzania	2011	0.000630
Togo	2010	0.002080
Zanzibar	2011	0.000630

Source: http://www.xe.com/

APPENDIX 3. OVERALL GDP AND GDPA FOR ALL COUNTRIES

Table 47. Overall GDP and GDPA by country

Country	Reference year	GDP (US$ millions)	GDPA (US$ millions)
Algeria	2011	198,735	13,744
Angola	2011	104,332	9,692
Benin	2010	6,558	2,367
Botswana	2011	17,328	315
Burkina Faso	2008	8,351	3,413
Burundi	2008	1,612	812
Cameroon	2011	26,410	5,206
Cape Verde	2011	1,889	196
Central African	2011	2,196	1,248
Chad	2011	10,450	1,424
Comoros	2011	610	283
Congo, Dem Rep of the	2008	11,933	7,328
Congo, Republic of	2011	13,240	448
Côte d'Ivoire	2009	23,043	6,020
Djibouti	2010	1,129	49
Egypt	2011	231,222	32,232
Equatorial Guinea	2011	16,139	421
Eritrea	2011	2,609	379
Ethiopia	2011	30,247	14,031
Gabon	2011	24,146	1,170
Gambia	2011	1,225	231
Ghana	2011	39,200	10,040
Guinea	2010	5,233	1,226
Guinea Bissau	2011	914	523
Kenya	2011	34,059	9,700
Lesotho	2011	2,443	214
Liberia	2011	1,147	609
Libya	2011	62,360	1,163
Madagascar	2011	9,844	2,866
Malawi	2012	5,966	1,800
Mali	2010	9,400	4,128
Mauritania	2011	4,443	690
Mauritius	2010	9,714	405
Morocco	2011	100,257	14,036
Mozambique	2011	12,823	3,885
Namibia	2011	12,641	1,022
Niger	2011	6,381	2,530
Nigeria	2011	245,229	80,225
Rwanda	2011	6,377	2,044

Sao Tome and Principe	2011	264	42
Senegal	2010	12,858	2,144
Seychelles	2011	1,014	23
Sierra Leone	2011	2,897	1,642
Somalia	2011	1,067	699
South Africa	2011	408,237	10,057
Sudan	2011	56,015	13,717
Swaziland	2011	4,090	306
Tanzania	2011	23,615	6,538
Togo	2010	3,173	1,158
Tunisia	2011	46,332	4,101
Uganda	2011	19,271	4,507
Zambia	2011	19,219	3,749
Zanzibar	2011	762	208
Zimbabwe	2011	8,865	1,388
TOTAL		**1,909,514**	**288,392**

Source: United Nations Statistical Division (2013).

APPENDIX 4. DEFINITION OF PARAMETERS USED IN THE EXTRAPOLATION

Average ex-vessel price: is the average price (US$/kg) fishers obtain for selling their fish, estimated as the weighted average from the sampled countries for the whole of Africa. It is used to estimate the Gross Product Value obtained through fishing: *Annual landings in kg*ex-vessel price*

Average farm gate price: is the average price (US$/kg) fish farmers obtain for selling their fish, estimated as the weighted average from the sampled countries for the whole of Africa. It is used to estimate the Gross Product Value obtained through aquaculture: *Annual production in kg*Farm gate price*

Value Added Ratio fishing/aquaculture: is the average Value Added Ratio for fishing/aquaculture, estimated as the weighted average from the sampled countries for the whole of Africa. It is used to estimate the Gross Value Added for fishing and aquaculture: *Gross Product Value*Value Added Ratio*

Fresh fish ratio: is the ratio on how much fresh fish is sold by fish-mongers to total landed fish. It is used to estimate the total quantity of fresh fish sold by fish-mongers: *Total quantity of landed fish*Processing ratio fresh fish*

Artisanal processed fish ratio: is the ratio of how much artisanal processed fish is produced for each kilogram of landed fish. The processing ratio artisanal processed fish is used to estimate the total quantity of artisanal processed fresh fish produced: *Total quantity of landed fish*Processing ratio artisanal processed fish*

Industrial processed fish ratio: is the ratio indicating how much industrial processed fish is produced for each kilogramme of landed fish. It is used to estimate the total quantity of industrial processed fresh fish produced: *Total quantity of landed fish*Processing ratio industrial processed fish*

Price fresh fish: is the average price (US$/kg) fish-mongers obtain for selling their fresh fish, estimated as the weighted average from the sampled countries for the whole of Africa. It is used to estimate the Gross Product Value obtained from fresh fish: *Annual quantity of fresh fish produced in kg*Price fresh fish*

Price artisanal processed fish: is the average price (US$/kg) artisanal processors obtain for selling their processed fish, estimated as the weighted average from the sampled countries for the whole of Africa. It is used to estimate the Gross Product Value obtained from artisanal processed fish: *Annual quantity of artisanal processed fish produced in kg*Price artisanal processed fish*

Price industrial processed fish: is the average price (US$/kg) industrial processors obtain for selling their processed fish, estimated as the weighted average from the sampled countries for the whole of Africa. It is used to estimate the Gross Product Value obtained from industrial processed fish: *Annual quantity of industrial processed fish produced in kg*Price industrial processed fish*

Value Added Ratio processed fresh fish: is the average Value Added Ratio for fresh fish, estimated from the sampled countries for the whole of Africa. It is used to estimate the Gross Value Added for fresh fish: *Gross Product Value processed fresh fish*Value Added Ratio processed fresh fish*

Value Added Ratio artisanal processed fish: is the average Value Added Ratio for artisanal processed fish, estimated from the sampled countries for the whole of Africa. It is used to estimate the Gross Value Added for artisanal processed fish: *Gross Product Value artisanal processed fish*Value Added Ratio artisanal processed fish*

Value Added Ratio industrial processed fish: is the average Value Added Ratio for industrial processed fish, estimated from the sampled countries for the whole of Africa. It is used to estimate the Gross Value Added for industrial processed fish: *Gross Product Value industrial processed fish*Value Added Ratio industrial processed fish*

Value Added licensing: is the average Value Added (US$/tonne) of landed fish, estimated from the sampled countries for the whole of Africa. It is used to estimate the Gross Value Added obtained from local licensing: *Annual quantity of landed fish in tonne*Value Added licensing*