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Fisheries governance, management and marginalisation in developing countries: Insights from Botswana

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Abstract: Globally, fish is a key source of food and nutrition security for all marginalized riparian communities. This is particularly so for Sub-Saharan Africa and South Asia. Indeed, debates about power relations on fisheries governance underscore issues bordering on the quality of life and livelihood opportunities for marginalized, riparian communities. The fundamental problems impeding the ability of fisheries resources in a developing country like Botswana to contribute to food and nutrition security are governance issues and poorly-thought out management approaches. This study reviewed relevant literature and key informant interviews to elicit secondary and primary data on the management of the fisheries sector. Despite its middle income status, Botswana is still faced with food and nutrition insecurity. These can be ameliorated by increased supply of fish, especially to marginalised riparian communities. However, the fisheries sector is maligned in terms of access to human and financial resources. Governance of the sector is also misaligned between food production needs and conservation imperatives. Consequently, poor physical infrastructure (due to low government support and investment) has limited the optimal performance of the sector in enhancing people' livelihoods. Key recommendations from this study include: (i) realigning fisheries legislation and governance, (ii) paradigm shift in management, (iii) increase funding for research and marketing, (iv) infrastructural development, (v) cultural shift in fish valuation, and (vi) participatory

ABOUT THE AUTHOR

Ketlhatlogile Mosepele's main research area is floodplain fisheries management and how fisheries resources can be leveraged for the benefit of riparian communities. These communities are socio-economically marginalized and prudent utilization of fish resources can add value to their livelihoods. This paper highlights one of the key challenges in floodplain fisheries management, where governance issues and flawed fisheries management approaches disenfranchise fishers from accessing fish resources.

PUBLIC INTEREST STATEMENT

This paper highlights the multi-faceted challenges facing fisheries management in developing countries, using Botswana as a case study. Fisheries governance of most freshwater fisheries is as at best haphazard and at worst fails to acknowledge the value of fish as a source of food and nutrition security in developing countries. Subsequently, there are opportunities lost by not integrating fish into the poverty eradication debate. This paper argues for a re-alignment of freshwater fisheries into the broader development debate, which entails (a) a re-alignment of fisheries legislation, (b) a paradigm shift in management of the sector, (c) increased funding for research and marketing, (d) infrastructural development, (e) a cultural shift in fish valuation and (f) a co-management regime of the sector with all stakeholders, especially fishers.

inclusion in decision-making. Ultimately, marginalisation can be reduced through devolution of power from the centre to the margins. This would contribute towards alleviating food and nutrition insecurity in the developing world.

Subjects: Environment & Agriculture; Food Science & Technology; Development Studies, Environment, Social Work, Urban Studies; Development Studies

Keywords: fisheries resources; governance; policy; power relations; marginalization

1. Introduction

Globally, fish is a key livelihood source for over 500 million people (Vadacchino, De Young, & Brown, 2011), and is a source of nutrition for approximately 3 billion people (FAO, 2009). At the continental scale, inland fisheries contribute approximately 0.33% to the gross domestic product (GDP) of sub-Saharan African (SSA) countries (De Graaf & Garibaldi, 2014). Moreover, fish exports from developing countries are equivalent to 50% of the total cost of their food imports (FAO, 2005). Indeed, fish and its products are some of the most traded commodities in the world; value wise, fish was the biggest exported commodity (of major agricultural products) by developing countries between 1989 and 2009 (FAO, 2012). Fish trade certainly plays a major role in employment creation, food supply, income generation and economic growth and development (FAO, 2012). It is not only a primary food source for most riparian communities around the world, but is also a source of economic security (Akpaniteaku, Weimin, & Xinhua, 2005). Globally, fish is a key source of food and nutrition security for marginalised riparian communities, particularly for SSA and South Asia (Heck, Béné, & Reyes-Gaskin, 2007). Sub-Saharan Africa has the highest prevalence of under-nourishment (FAO, IFAD, & WFP, 2014), and this makes food and nutrition security in this region a key issue of concern. Fish is a source of micro-nutrients like iron, iodine, zinc, calcium, Vitamin A and Vitamin C (Akpaniteaku et al., 2005; FAO, 2005; Roos, Wahab, Hossain, & Thilsted, 2007), which makes it a key component in the diet of children (aged <5 years) and women (especially pregnant women) (FAO, 2005). Contrary to marine fish production, which appears to have levelled off (Hosch, 2009), inland fish production is still increasing (FAO, 2012; Hosch, 2009). On the average, there is an additional 85 million people to feed annually, where fish constitutes a key source of nutrition to their nutritional needs (Akpaniteaku et al., 2005). It is on this basis that fish was declared an essential component of human food supply by the Food and Agriculture Organisation of the United Nations (FAO, 2005).

The SSA region is the poorest in the world where just under half of the population lives in extreme poverty (Table 1). In fact, as summarized in Table 1, the region is outperformed by all the other regions in the world in both economic and human indicators. This suggests, therefore, that there is a clear and urgent need to provide interventions aimed at assisting households in this region to gain food and nutrition security. Fishers and their households are among the poorest people in the world (Pauly, Silvestre, & Smith, 1989). As such, poverty issues, coupled with food and nutrition security, are of acute importance within these communities. Under-nutrition remains a fundamental challenge towards achieving human welfare and economic growth in the sub-continent (Benson, 2008). Ironically, it is within this environment that small-scale fisheries can uplift the socio-economic conditions of poor riparian communities around Africa. African inland fisheries, which are small scale in nature (FAO, 2008), play a crucial role in many rural economies across continental Africa (Bene & Neiland, 2003). As pointed out by the FAO (2008), products from small-scale inland fisheries in Africa are focused predominantly on the domestic market, and they are also a major source of nutrition for poor people. Moreover, these freshwater fisheries are a key source of high quality, but cheap protein in food insecure countries (Akpaniteaku et al., 2005).

Despite the critical role that fisheries play in developing countries (Heck et al., 2007) and its value as a key livelihood resource for marginalised riparian communities (FAO, 2005), African countries have the poorest catch statistics globally (FAO, 2012). An FAO (2012) report indicated that Africa had the second highest percentage (61%) poor submission after the Oceania which had 78%; Africa had no adequate submission for 2009. One can surmise from this observation that African countries, or

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Table 1. Summary of demographic, economic and human indicator statistics for 6 regions around the world

Indicator	Sub-Saharan Africa	East Asia and Pacific	Europe and Central Asia	Latin America and Caribbean	Middle East and North Africa	South Asia
Population	936	2006	272	588	345	1671
Population growth	2.7	0.8	0.7	1.1	1.7	1.3
GDP per capita growth (annual %)	2.8	8.8	3.2	1.3	−2.2	3.8
Proportion of population living on less than $1.25/day (%)	44	0.1	0.01	0.05	0.02	0.3
Life expectancy at birth, females (years)	58	76	76	78	74	68
Life expectancy at birth, males (years)	55	72	69	71	69	65
Extreme poverty (% population below $1.25/day)	48.5	28.1	0.7	5.5	2.4	31
Infant mortality rate (per 1,000 live births)	64	15	19	16	21	47
Under-5 mortality rate (per 1,000)	98	20	22	19	26	60
Access to safe drinking water (% population with access)	64	84	95	94	90	91
Access to basic sanitation facilities (% population with access)	30	65	94	81	88	40

Data source: FAO (2014).

least developed countries generally do not put enough resources into fisheries management. The WorldFish Center (2007) report showed that Zambia had accorded a low priority to data collection from its fishery, which would have seriously hampered the country's fisheries development strategies. Obviously, this observation may have been an understatement regarding the low value accorded fisheries in these countries. Fishery statistics, especially those summarizing fish catch and trade, are important towards better planning and management (FAO, 2008). Invariably, insufficient data create misconceptions about the value/importance of this sector to (national) planning officers who then fail to see the importance of the sector in national development planning processes. Moreover, small-scale fisheries have a marginal contribution to the macro-economic landscape of most African economies (Welcomme, 1998) as compared to other sectors like agriculture (Bene, 2006) or tourism (as in the case of Botswana). Therefore, modest contributions of small-scale fisheries to national GDPs have led to the marginalisation of this sector in national development planning.

Small scale fisheries are a major source of rural employment; rural revenue generation; and means of food and nutrition security; and a major source of livelihoods for riparian communities (Andrew et al., 2007; Béné & Friend, 2011). However, fisheries management in developing countries is bedevilled by structural and philosophical problems, which invariably impinge on the sector's ability to provide goods and services. Thus weak governance structures and poorly defined management paradigms have contributed to the marginalisation of the fisheries sector in some landlocked countries, including Botswana. Inefficient and incoherent management paradigms at different scales impede optimum utilisation of fisheries resources. For instance, the placement of fisheries departments within national ministries (in most countries of the South) plays a key role in determining access to financial support from national governments. Due to the wrong placement of the fisheries sector in Botswana, it has faced competition from other sectors that either have more political support (cattle industry), or contribute significantly to the national economy (e.g. wildlife, tourism). Rather than address pertinent issues on sustainable utilisation of fisheries resources for the benefit of the riparian communities, the sector is saddled with contradictory management philosophies

pitting production-oriented strategies against conservation objectives. In sum, the fisheries sector has been marginalized in national planning and development priorities due to the rigidity and unresponsive nature of current legislative framework to pertinent fisheries management issues. This has led to the failure of government to take full advantage of emerging opportunities for the benefit of the local populace. For example, there is failure to (i) manage the Lake Ngami fisheries effectively for the benefit of the local community; (ii) develop the full (aquaculture) potential of several large dams in southern Botswana (by stocking them with *Limnothrissa miodon*, hence developing a new fishery in Botswana) for the benefit of the local populace; (iii) empower women fishers (especially in the Okavango Delta) whose sector contributes significantly to household food and nutrition security; (iv) adopt dynamic management paradigms that account for the dynamism and heterogeneity of small-scale fisheries; (v) appreciate that small-scale fisheries are the vanguard of poverty eradication and nutrition security in impoverished riparian communities; and (vi) streamline poverty eradiation measures into the management of these fisheries. The lack of a national fisheries policy and the perceived non-contribution of the fisheries sector to the national GDP have resulted in poor government support for the development of this sector in Botswana.

1.1. The problem

The fundamental problems impeding the ability of fisheries resources in Botswana to contribute to food and nutrition security are governance issues and management approaches. The institutional framework for capture fisheries and aquaculture development in the country falls within the purview of the Ministry of Environment, Wildlife and Tourism, under a wildlife management philosophy which is oriented more towards conservation and less on sustainable utilisation of the fish resource for food security. Prior to this, the fisheries sector was managed from the Ministry of Agriculture, under a food production oriented policy. In both respects, the sector has always been managed under departments whose management philosophies are incongruent to fisheries. This, in our view, is one of the fundamental problems facing the fisheries sector in Botswana; the sector has been wrongly placed within departments whose mandates are sometimes in conflict with fish utilisation for sustainable development. Moreover, we argue that the placement of the fisheries sector (both now and in the past) forces it to compete for resources against well-established sectors which have immense political support (e.g. wildlife and cattle). Consequently, this has resulted in limited financial support from the government, leading to the under-development of the sector, which in turns impedes its contribution to food and nutrition security. While the Botswana government has used sectoral approaches to embark on poverty eradication, which includes strategies addressing fisheries development, these however have not been streamlined to unleash the potential of the sector, due to lack of a national fisheries policy. Moreover, unlike other sectors which have nationally organized groups (e.g. Botswana Guides Association, Botswana Farmers Association, Hotel and Tourism Association Botswana, etc.) that government consults regularly for local and national planning strategies; the fisheries sector has none of these. Thus, the fisheries sector may have been marginalised in local and national planning.

Another key issue impeding fisheries development in Botswana is related to management approaches in the fisheries sector. Classical fisheries management approaches are used to manage Botswana's fish resources (Mosepele, 2008, 2014). We argue that implementation of these has contributed to decreased fish catches. This has led to the blockage of fisher households' access to nutrient-dense fish species, and contributed to a general food and nutrition insecurity within the poor riparian communities. Currently, fisheries management in Botswana is done on an ad hoc basis, where managers that are not trained in fisheries management use classical approaches of command and control. This management approach is easily adaptable to the Department of Wildlife and National Parks philosophy which is used in wildlife management. The paper therefore intends to analyse fisheries governance and management approaches constituting impediments to development of the sector; and analyse key stakeholders' perspectives on fisheries governance in Botswana.

2. Materials and methods

2.1. The study area

The Okavango Delta (Figure 1) is a flood pulse driven system (Wolski, Masaka, Raditsebe, & Murray-Hudson, 2005), and is one of the largest inland Deltas in the world (McCarthy & Ellery, 1995). It is the largest water body in Botswana (Merron, 1993) which supports the main fishery in the country (Mosepele, 2000). While four reservoirs (i.e. Gaborone, Bokaa, Letsibogo and Shashe dams) in southern Botswana (see Figure 1) support small-sale commercial fisheries (Mmopelwa, 2004), there is currently no fishing in the rest of the (16) dams. Gill nets are the only fishing gear used in the dams (Mmopelwa, 2004), while a variety of other fishing gears are used in the Okavango Delta (Mmopelwa, Mosepele, Mosepele, Moleele, & Ngwenya, 2009). There are approximately 71 different fish species in the Delta (Ramberg, Hancock, Lindholm, Meyer, & Ringrose, 2006), which range in size from very small species like *Barbus bifrenatus* (4.5 cm maximum size) to the *Clarias gariepinus*, which is the largest species (~1.5 m long) found in the Delta (Skelton, 2001). The Delta supports a small-scale commercial (Mosepele & Ngwenya, 2010) and subsistence fishery (Ngwenya & Mosepele, 2008). This fishery is a key source of food security (Mosepele, Ngwenya, & Bernard, 2006) and employment (Mmopelwa, Raletsatsi, & Mosepele, 2005) in the Delta's fishing communities. Prior to the promulgation of new fishing regulations in the Delta, fishers used different fishing gears to exploit the assemblage of diverse species (Mosepele, 2008). In the past, women basket fishers used mosquito nets to exploit nutrient dense small-sized cyprinids (Mosepele, Mmopelwa, & Mosepele, 2003), which were consumed at the households level (Ngwenya & Mosepele, 2008) and which possibly contributed to the high nutritional status of children from fishing households (Nnyepi, Ngwenya, & Mosepele, 2007). However, mosquito nets, which were used to exploit these species, are now prohibited in the Delta (Botswana Government, 2008).

Fishers use these different fishing gears and methods as a coping strategy against spatio-temporal variability in fish catchability as a consequence of the Delta's flood pulse (Mmopelwa et al., 2009). Mosepele (2008) highlighted that some of the Delta's fishing practises are an expression of the culture of some of the fishing communities. Mosepele, Mmopelwa, Mosepele, and Donald (2007) observed that fishers used indigenous traditional knowledge (ITK) to target and exploit their preferred fish species in the Delta. Approximately 65% of the population of Ngamiland (the region where the Okavango Delta is situated) depend on the Delta's fishery (Mosepele, 2001).

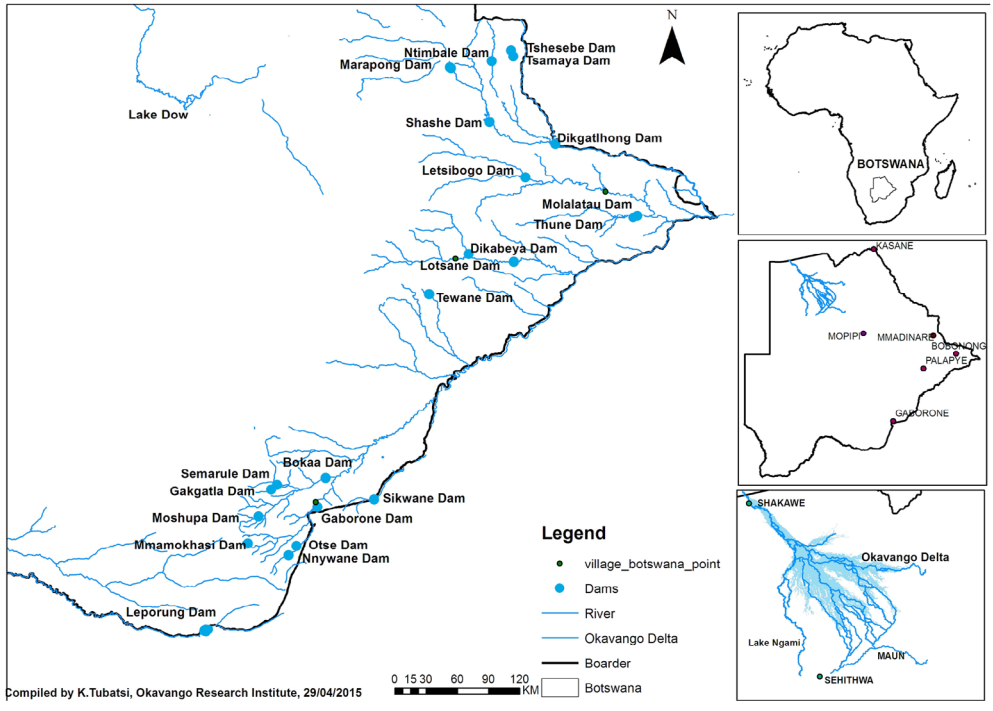

Figure 1. Map of Botswana showing all the major water bodies (i.e. both natural water systems and man-made dams) in the country.

Map: Courtesy of K. Tubatsi, ORI GIS Lab.

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Table 2. Summary of fish trade data (in Botswana Pula and US$) for Botswana between 2013 and 2016 where values in () indicate % value of exports vs. imports

Year	Total fish imports (BWP)	Mean imports (BWP)	Total fish exports (BWP)	Mean exports (BWP)	Total net value (BWP)	Mean net value (BWP)	Total net value (US$)	Mean net value (US$)
2013	30,700,323	2,558,360	575,831	47,986	30,124,492	2,510,374	2,846,723	237,227 (1.9)
2014	32,001,008	2,666,751	2,279,592	189,966	29,721,416	2,476,785	2,808,633	234,053 (7.1)
2015	32,940,255	2,745,021	8,781,981	731,832	24,158,274	2,013,190	2,282,924	190,244 (26.7)
2016	31,777,725	3,972,216	12,221,433	1,527,679	19,556,292	2,444,537	1,848,043	231,005 (38.5)
Total (BWP)	127,419,311		23,858,837		103,560,474			
Total (US$)	12,040,949		2,254,627		9,786,322			

Note: Data were obtained from Statistics Botswana, where data for 2016 included only the first 8 months of the year.

Total net fish imports into Botswana were valued at just under US$10 million between 2013 and 2016 (Table 2), which translates to approximately US$3.3 yr^{-1} or approximately US$ 200,000.00 $month^{-1}$. Fish exports have increased incrementally over the 3 year period as summarized in Table 2. The ratio of exports vs. imports increased from approximately 2% in 2013 to approximately 38% in 2016.

2.1.1. Analytical methods

The paper employed critical review of relevant literatures and key informant interviews to elicit primary data on the management of the fisheries sector in Botswana. Secondary data on human development indicators were sourced from various FAO and World Bank repositories. ANOVA in STATISTICA (Statsoft, 1999) was then used to assess the level of difference among variables where level of significance was set at 95%. Primary data sources include key Fisheries officials in the Department of Wildlife and National Parks. An interview guide was used to elicit information from the officials in relation to fisheries governance in Botswana. Key informants included current and retired local fisheries managers/officers in Gaborone and Maun (the two main administrative centres where senior fisheries officials live and work). Secondary data on the human development indicators were derived from various sources such as the FAO and World Bank.

3. Literature review and theoretical underpinning

3.1. Botswana's socio-economic profile

Botswana is a landlocked, semi-arid, middle income, sparsely populated, southern Africa country (see Figure 1) with a total population of approximately 2 million people (CAADP, 2013). Its GDP was estimated at approximately US$15 billion in 2012, with a per capita GDP of about US$15,000 in 2013 (Table 3) which, according to Akyeampong and Fofack (2013), is one of the highest in Africa. As summarized in Table 3, the prevalence of under-nutrition (at 27% in the years 2012–2014) is a challenge in Botswana. About 25% of the country's population is under-nourished. Also, almost a third of the children under the age of 5 years in Botswana are stunted. Arable farming is a risky enterprise due to unreliable rainfall (Botswana FSUS Team, 1994), suggesting that the sector cannot be a sustainable avenue to food and nutrition security. This probably accounts for the relatively high prevalence of food inadequacy in the country (see Table 3). Fish constituted approximately 12% of the food export (the import bill in the 2010/2011 period), also suggesting that increased fish production in the country can reduce the deficit between food imports and exports.

Protein, energy, malnutrition and micronutrient deficiencies are some of the common nutrition problems in Botswana (CAADP, 2013). Cereals (maize, sorghum and millet) and pulses constitute the main diet in Botswana with an infrequent consumption of micro-nutrient dense foods, which has

Table 3. Summary of economic, food security and human development indicators for Botswana where the time period is in ()

Indicator					
GDP [Million US$][1]	5.788 (2000)	9.931 (2005)	11.113 (2008)	13.747 (2010)	14.537 (2012)
Per capita GDP [US$][2]	8.802(1995)	10.226 (2000)	11 433 (2005)	13.286 (2010)	15.176 (2013)
Protein supply (gr/caput/day)[2]	68 (1990–1992)	68 (1995–1997)	67 (2000–2002)	58 (2005–2007)	64 (2009–2011)
Animal protein supply (gr/caput/day)[2]	29 (1990–1992)	26 (1995–1997)	26 (2000–2002)	23 (2005–2007)	25 (2009–2011)
Food inadequacy prevalence (%)[2]	35 (1990–1992)	41 (1995–1997)	49 (2000–2002)	45 (2005–2007)	39 (2012–2014)
Prevalence of anaemia among pregnant women (%)[2]	41 (1990)	37 (1995)	35 (2000)	34 (2005)	32 (2011)
Under-nutrition prevalence (%)[2]	25 (1990–1992)	30 (1995–1997)	36 (2000–2002)	32 (2005–2007)	27 (2012–2014)
Stunted children aged <5 years (%)[2]	35 (1996)	29 (2000)	31 (2007)	-	-
Number of under-nourished people (millions)[2]	0.4 (1990–1992)	0.5 (1995–1997)	0.6 (2000–2002)	0.6 (2005–2007)	0.5 (2012–2014)
Food exports (excluding fish)[millions US$][3]	98.8 (1996)	113.6 (2001)	40.0 (2006)	104.9 (2011)	-
Fish imports [millions US$][3]	6 (1995)	11 (2000)	8 (2005)	13,(2010)	-
Food supply(kcal/capita/day)[3]	2,214 (1996)	2,154 (2001)	2,150 (2006)	2,285 (2011)	-

Source: 1 = http://databank.worldbank.org/data/views/reports/tableview.aspx?isshared=true.

2 = http://www.google.co.bw/url?url=http://www.fao.org/fileadmin/templates/ess/foodsecurity/Food_Security_Indicators.xlsx&rct=j&frm=1&q=&esrc=s&sa=U&ved=0ahUKEwi9ntGEqK7UAhUNrRQKHbYdC4IQFggfMAE&sig2=OBGx-Q31-mHdilyuzvzqmQ&usg=AFQjCNEcEIeoibnfQlU2r7QtrdfJZ7qrOg.

3 = http://faostat.fao.org/CountryProfiles/Country_Profile/Direct.aspx?lang=en&area=20.

resulted in a high micronutrient deficiency (CAADP, 2013). This, therefore, suggests that macro-economic indicators are not necessarily a good indicator of food and nutrition security at the household level (Bene, 2006). It is instructive to note that food self-sufficiency in some countries may not necessarily translate to households' level food and nutrition security (Bene, 2006; FAO, 2005). Despite its robust economic growth, Botswana's relatively high poverty level (nearly 20%), coupled with a high Gini co-efficient (0.61) belie its middle income status (ADB, 2009). While protein availability in Botswana might be higher than the SSA average (Figure 2), we argue that animal protein is generally expensive (FAO, 2005) and might therefore be unavailable to poor riparian communities. Clearly, fish is a source of cheap protein to poor riparian communities (FAO, 2005), that Despite its stable food security status as claimed by CAADP (2013), optimized utilization of natural resources is critical for Botswana because veritable food price volatility is a major concern. We therefore argue that if Botswana (like any developing economy) was to optimise its natural resources, this would certainly balance its national current accounts and reduce expenditure on food and nutrition sources.

3.2. Fisheries governance and food security

According to Friend (2009), one of the key concerns facing the freshwater sector is "its lack of influence both within the fisheries world, and in the broader development policy arena". Possibly, this explains why it does not qualify to be a full ministry in most countries does not qualify to be a full ministry even when it has a significant contribution to national economies (Pauly, 1997). Therefore, freshwater fisheries are generally managed through a small government department in the ministry of agriculture which lacks political clout (Pauly, 1997). There are some regional parallels in southern African regarding fisheries governance, which highlights the challenges facing fisheries governance and food security in the region. The fisheries sector in Zimbabwe is managed under the Zimbabwe Parks and Wildlife Management Authority (ZPWMA), which is a department in the Ministry of

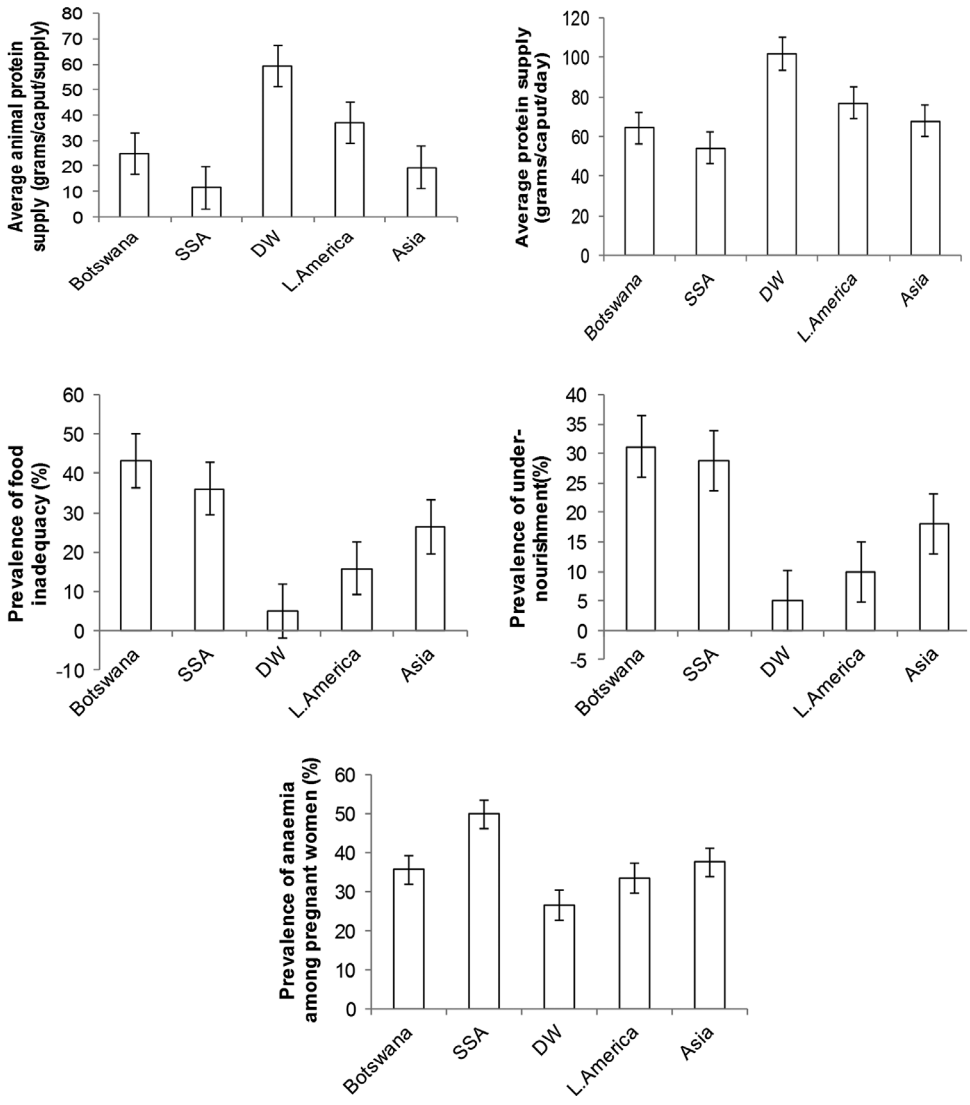

Figure 2. Comparison of several human development indices between Botswana and other regions of the world.

Environment and Tourism (The WorldFish Center, 2007). There is a similarity in this structure and that of Botswana, where the fisheries sector is managed under the Department of Wildlife and National Parks, in the Ministry of Wildlife, Environment, and Tourism. In essence therefore, small-scale fisheries (like in the Botswana case) are under constant threat from unpredictable institutional and policy environments (Welcomme et al., 2010), which invariably undermines their ability to succour food and nutrition security to riparian communities.

The WorldFish Center (2007) study on six countries shows that while on the one hand fisheries resources are managed under a department in Zambia and Malawi, the sector is managed within a full ministry in Mozambique and Namibia. On the other hand, they are managed under divisions within the Wildlife Departments in Botswana and Zimbabwe. Thus it is noteworthy that Mozambique and Namibia, which operate fisheries ministries, also have well developed marine fisheries. It is also instructive to note that the only two countries with well-developed national fisheries policies are these two countries–Namibia and Mozambique. Lack of a national fisheries policy in Zimbabwe has resulted in lack of optimal utilization of numerous reservoirs constructed all over the country to enhance fish production (The WorldFish Center, 2007). Similarly, the lack of a national fisheries policy in Botswana has hampered the development of this sector (Mosepele, 2008). Indeed, fisheries agencies within national ministries can play a key role in the relationship between governance and food

security. It follows therefore, that fisheries sectors in countries where fisheries agencies have a more superior and well defined role are better funded than in countries where fisheries departments have relatively lesser roles within government ministries. Poorly funded fisheries agencies and lack of sufficient financial support invariably results in a catch 22 situation for marginalised inland fisheries. Welcomme (2007) observes that lack of financial support and trained manpower degrades the ability of fisheries agencies to collect sufficient data that can contribute to an adequate valuation of the fishery. Poor data leads to a chronic undervaluing of the sector, which then results in continued disinvestment in the sector (FAO, 2008). A comprehensive valuation of the fishery allows for a better appreciation of the value of inland fisheries in the socio-economic growth of poor communities.

Legislation and placement of fisheries agencies naturally contribute to the level of political recognition and financial support that such institutions are accorded by the national governments. Wrong placement of a fisheries agency within inappropriate government apparatus will automatically result in their marginalization in national planning priorities. Given this scenario, we argue that limited access to political influence and good will would prevent any fisheries sector from reaching its full potential in a given geo-political clime. Pauly (1997) argues that there is usually a dearth of well-trained officers in fisheries management in countries where fisheries sectors lack political patronage. Poorly resourced fisheries agencies in developing countries create management hardships for fisheries managers (Dudley, 1994). This invariably affects the ability of the sector to contribute to food and nutrition security.

3.3. Fisheries management and food security

Small-scale, inland freshwater fisheries are characterized by diverse fishing gears, exploiting multi-species assemblages (Dugan, Delaporte, Andrew, O'Keefe, & Welcomme, 2010), just like in the Okavango Delta (Mosepele et al., 2003). Currently, classical fisheries management techniques are assiduously used to manage most inland fisheries in SSA (Mosepele, 2014). Some of the key classical management approaches used in Botswana include gear and fishing method restriction and fishing seasons (Mosepele, 2008). Generally, inland fisheries in the developed world place more emphasis on recreation and preservation, while provision of food is the main focus in the developing world (Cowx et al., 2004; Welcomme et al., 2010). Perceived as a social safety net, fisheries management for poor community people is a matter of life and death (Mosepele, 2000). However, classical management approaches are incongruent to the nature and dynamics of inland fisheries (Mosepele, 2014), which are characterized by diverse fishing gears, exploiting multi-species assemblages (Dugan et al., 2010). These classical management approaches as applied in the Delta affect the ability of fish to secure food and nutrition security to impoverished riparian communities in several ways: First, classical management curtails cultural fishing practises, which can result in loss of culture. Second, this management approach curtails the utilization of indigenous traditional knowledge in resource management, which could result in resource degradation due to lost indigenous knowledge. Third, classical management curtails the exploitation of nutrient dense cyprinids which in turn could lead to nutrition deficiency, especially among women and children under the age of 5 years. In most cases, managers and practitioners without any basic training in fisheries develop management approaches that are not based on any fundamental fisheries philosophy.

One of the key fishing practice that is currently prohibited in the Delta is drive fishing (Mosepele, Kolding, & Thethela, 2015). This fishing method, which is common in floodplain fisheries like those in the Zambezi (Imai, 1987; Kolding, 1996), involves the practice where fishers beat the water to scare fish into their nets. Mosepele et al. (2007) found out that this fishing method is more efficient than others, even though it is practised for only a few months in the Delta at low water levels. Prohibiting this fishing method would decrease fishing efficiency among small-scale commercial fishers (Mosepele et al., 2007), with a subsequent loss in revenue. This will also impact negatively on rural employment in the Delta (Mmopelwa et al., 2005). Moreover, since the Delta's small-scale commercial fisher is a major source of rural employment (Mmopelwa et al., 2005), reduced revenue by owners will result in job losses. Coupled with this fishing method prohibition is the reduction in total fisher numbers in the Delta due to the imposition of fishing licenses for gill ne fishers. Gill net fishing

licenses cost BWP200.00 (Botswana Government, 2008), and this is still out of reach of most fishers, especially those who fish primarily for subsistence, and who sell their surplus catch.

Ill-informed management decisions have also contributed to curtailing some of the most productive fisheries in the Delta. Due to command and control imperatives of classical management approaches, the Botswana government has currently placed a moratorium on fishing in Lake Ngami due to perceived over-fishing in the area. It is noteworthy that Fox (1976) found out that peripheral lagoons in the Delta's seasonal floodplains are more productive than the upper Delta. One possible reason for this observation is that manure from large herbivores (e.g. livestock, wildlife, etc.) during the dry season contributes to high primary production when these lagoons are inundated with water. The same logic suggests that Lake Ngami, which is subject to drying periodically, is one of the most productive areas in the Okavango Delta. After undergoing a dry spell for close to 20 years, the lake rebounded in 2004 whereupon its fish community rapidly built up (Mosepele, Mosepele, Wolski , & Kolding, 2012). Mosepele (2013) found out that total fish production from the lake in 2013 was 355 tons which translated into revenue of approximately BWP2 million yr^{-1}. This suggests that the fishery is a significant player in the rural economy of Sehitwa community. Standing as a major landmark in the history of Botswana's rural economy, a significant export fishery had already developed by 2014, where traders came from the Democratic Republic of Congo (DRC) and Zambia to purchase fish from the lake fishers. This then suggests the lake was not only a source of rural employment for the local community, but suddenly had the potential to contribute to a reduction in Botswana's food import bill at the national scale.

Generally, one of the key problems affecting inland fisheries development is lack of capacity development, which is illustrated by lack of market access by fishers (Macfadyen & Huntington, 2004). However, the opportunity for sustainable rural development, and enhanced socio-economic benefits to the riparian community through the fisheries, was destroyed when the Botswana government banned fishing in Lake Ngami (The Botswana Gazette, 2015) due to perceived overfishing. Rather than place a ban on fishing, the introduction of an appropriate legislation at the national scale would probably have assisted fishers in accessing international/regional markets for their produce. Recently, government banned export of dried fish as a management tool for the Lake Ngami fishery. Again, this is evident in misguided fisheries management decisions that contribute to food and nutrition insecurity.

3.4. Marginalisation and marginality

Due to the devolved nature of small-scale inland fisheries, they are often found in remote areas, which are far removed from the centres of political power (Pauly, 1997). Moreover, inland fishing is usually practised by ethnic groups that have poor political representations at the national level (Andrew et al., 2007; Béné & Friend, 2011). We argue that power and politics thus render these fisheries politically weak, and increases marginality of the sector. As a result of lack of a strong political voice, fisheries resources have limited interests at the national scale, and are not regarded by mainstream bureaucrats as vehicles for poverty eradication and food security. The combination of weak institutions governing fisheries resources and management approaches that are incongruent to the nature of these resources enhances the marginality and marginalisation of this sector in developing countries (Béné & Friend, 2011). Hence, while a country like Botswana might have high human development indicators, and strong economic indicators, the reality at the local scale is much more different. As argued by Pauly (1997), marginality of the fisheries sector creates mental maps of remoteness and perceptions of low status, primarily because of the low socio-economic status of fishers in most developing countries. Invariably, government planners and bureaucrats undervalue the sector, not because of its existential value, but rather due to its association with "low status ethnic groups". From the The WorldFish Center (2007) perspectives, this systemic marginalisation of the fishery sector has resulted in the neglect of the fishery sector from national and regional planning processes.

Generally, assessing the value and contribution of small-scale inland fisheries is a big challenge to most countries (Friend, 2009). The FAO (2012) report outlined some of the knotty issues in small scale fisheries, which make them difficult to assess. These include (i) their diffused nature with numerous landing sites and various fishing methods; (ii) fishing effort, which is seasonal and with many

people involved in these fisheries; (iii) many small-scale fisheries, which are subsistence in nature; (iv) locally traded fisheries products, which do not enter the formal market chain; (v) an abject lack of resources to collect adequate data; and (vi) activities peripheral to fishing activities, which can greatly affect fish abundance. The diffused nature of these fisheries makes data collection difficult (Bayley, 1988), which severely hampers management decisions that need real time data to develop the sector. As highlighted by Bayley (1988), marginality of the sector results in undermining its contribution to the national economy and under-reporting in national accounts. However, the value of the small scale fishery sector lies not necessarily in its contribution to the national GDP, but rather in its contribution to food and nutrition security. Moreover, small scale fisheries are traditionally energy efficient, have low capital investment, and are critically important for the immediate needs and long-term security of developing countries (Bayley, 1988). However, the lack of appreciation of the socio-economic value of small scale (inland) fisheries has resulted in insufficient attention given to the needs of the sector (FAO, 2008). We argue that these attributes mask the "real" value of small-scale inland fisheries, which periodically results in their marginalization in national planning.

4. Results and discussion

4.1. Botswana human development indicators

Our analysis of World Bank data for some economic, food security and human development indicators revealed that Botswana faces many challenges in food and nutrition security (see Figure 2). The CAADP (2013) report highlights that these challenges are much more severe in rural areas than urban centres in Botswana. ANOVA analysis carried out on World Bank data revealed that there are significant differences in Botswana's human development indices and those of the rest of the world (Figure 2). While protein supply in Botswana is significantly higher than that of the rest of the SSA (Table 4), it is still significantly lower than those of the rest of the world regions (i.e. Developed World, Latin America, and Asia). Moreover, under-nutrition and food inadequacy were significantly highest

Table 4. Summary of ANOVA analyses comparing selected human development indices between Botswana and some areas from the rest of the world

Human development index	Test	*DF*	*F*	*p*
	Botswana vs.:			
Supply of protein	Sub-Saharan Africa	39	119.53	0.00
	Developed world	39	2,096.09	0.00
	Latin America	39	110.64	0.00
	Asia	39	9.71	0.00
Supply of animal protein	Sub-Saharan Africa	39	1,118.49	0.00
	Developed world	39	5,689.25	0.00
	Latin America	39	200.07	0.00
	Asia	39	46.44	0.00
Prevalence of food inadequacy	Sub-Saharan Africa	45	40.02	0.00
	Developed world	45	2,380.72	0.00
	Latin America	45	600.97	0.00
	Asia	45	237.15	0.00
Prevalence of under-nourishment	Sub-Saharan Africa	45	7.16	0.01
	Developed world	45	1,620.67	0.00
	Latin America	45	550.38	0.00
	Asia	45	198.44	0.00
Prevalence of anaemia among pregnant women	Sub-Saharan Africa	43	356.53	0.00
	Developed world	43	177.41	0.00
	Latin America	43	6.14	0.02
	Asia	43	4.69	0.04

in Botswana than in any other region of the world, including the SSA region (Table 4). The relatively poor macro-economic indicators of Botswana present a clear and urgent need for the country to explore the feasibility of its fish resources are a potential source of food and nutrition security.

4.2. Potential fish production

Stocking new species in reservoirs is a key management policy to enhance their productivity (Welcomme, 2007). We believe that this is one option that the Botswana government should take to enhance fish production country-wide, thereby contributing to food security. Total surface area covered by the 20 main reservoirs in Botswana is approximately 34 ha (Table 5). While the biggest is Dikgathong dam at approximately 10 ha, the smallest dam is 0.05 ha. We used relationships from Kolding and Zwieten (2006) to estimate the minimum fish potential that these dams can produce, while Brummet's (2006) relationship was used to estimate the maximum potential fish yield from these dams. Therefore, total potential fish yield from these dams ranges between 11–51 tons yr^{-1} (Table 5). We argue that given a comprehensive fisheries policy, these dams can be stocked with *L. miodon* (*kapenta*). This is a small pelagic clupeid which has the potential for fast growth (Guillard, Darchambeau, Mulungula, & Descy, 2012) that can utilise the pelagic zone in these dams. Rather than produce for the export market, we argue that these dams should produce fish for local consumption as an intervention against food and nutrition insecurity. We also argue that poverty eradication strategies should streamline fisheries development into those interventions by assessing the aquaculture potential of these dams. Our argument for aquaculture production in these dams' is based on regional experiences (e.g. Itezhi-Tezhi dam in Zambia, Lake Kariba in Zambia and Zimbabwe, Cahorra Bassa in Mozambique, etc.), albeit at a smaller scale.

Table 5. Total surface area and potential fish production of the main water reservoirs in Botswana

Dam	Area (m^2)	Area (HA)	Kolding and Zwieten (2006)	Brummet (2006)
Dikgathong	97,383.61	9.74	3,077.32	14,607.54
Letsibogo	46,225.42	4.62	1,460.72	6,933.81
Gaborone	44,689.91	4.47	1,412.20	6,703.49
Shashe	43,245.24	4.32	1,366.55	6,486.79
Lotsane	29,699.49	2.97	938.50	4,454.92
Ntimbale	18,757.72	1.88	592.74	2,813.66
Bokaa	16,601.81	1.66	524.62	2,490.27
Thune	9,494.84	0.95	300.04	1,424.23
Mogobane	5,681.01	0.57	179.52	852.15
Nnywane	4,424.7	0.44	139.82	663.71
Semarule	3,867.83	0.39	122.22	580.17
Moshupa	3,674.62	0.37	116.12	551.19
Marapong	2,480.84	0.25	78.39	372.13
Mmamokhasi	2,438.5	0.24	77.06	365.78
Molalatau	1,856.65	0.19	58.67	278.50
Leporung	1,353.06	0.14	42.76	202.96
Tewane	1,130.63	0.11	35.73	169.59
Tshesebe	1,123.26	0.11	35.50	168.49
Sikwane	1,066.51	0.11	33.71	159.98
Gakgatla	829.11	0.08	26.20	124.37
Otse	609.77	0.06	19.27	91.47
Tsamaya	491.61	0.05	15.53	73.74
Total			10,653.19	50,568.92

Based on Mhlanga and Mhlanga's (2013) observation, the artisanal fisheries in Zimbabwe's small dams is key to the provision of cheap and high quality nutrients for local communities. It is in view of this that Botswana's small dams can be used to achieve food and nutrition security for local communities. Mhlanga and Mhlanga (2013) also pointed out that the benefits of developing fisheries in small dams include (i) an enhancement of household livelihood options for local communities as well as provision of protein at household level; and (ii) surplus fish, which are sold could boost national fish production and contribute to national food security. This is consistent with studies from elsewhere which incorporate culture of small fishes as a key policy intervention against food and nutrition insecurity amongst impoverished households (Thilsted et al., 2016). Therefore, household food security becomes the key imperative for polyculture systems using small sized fish species (Rai, Thilsted, Shrestha, Wahab, & Gupta, 2014).

4.3. Fisheries policy, socio-economic development and food security in the Okavango Delta

Fisheries policy is an instrument meant to guide and govern the sustainable use of fisheries resources. For instance, the Common Fisheries Policy (CFP) of the European Union (EU) typifies an instrument developed to ensure the sustainable management of fishing stocks as well as enhance the economic benefits, which the sector confers on people's livelihoods and well-being. Nonetheless, the EU policy has been adjudged inadequate because of its "biological, economical, legal and political shortcomings" (Khalilian, Froese, Proelss, & Requate, 2010). Thus a comprehensive fisheries policy would holistically address environmental, economic and socio-politico-cultural dimensions of fisheries resources management. Lack of a national fisheries policy suggests that management of fisheries resources in relation to socio-economic development and food security in Botswana has not been adequately addressed. Historically for example, in its push for the promotion of fishing activities within the Delta, the fisheries sector through its entrepreneurship development initiatives ensured the distribution of production inputs such as boats, factory manufactured fishing nets to local fishers (Nengu, 1995). Over the years, Financial Assistance Policy (FAP), LG 17, Pilot Component, Agricultural Extension 10 (AE10) are some of the government instruments that were put in place to assist local fishermen acquire fishing equipment (McCarthy & Ellery, 1995).

Although limited, government assistance has contributed to improvements in livelihoods activities of rural households in grassroots communities. Some of the major constraints limiting the optimal performance of the sector in enhancing people's livelihoods and food security are poor physical infrastructure ranging from storage to marketing facilities. According to a key informant who is an official of the government's Fisheries Division:

> Production equipment (such as traditional canoe, nets, cooler boxes, life jackets, containers, etc.) is provided for community people to drive fishing activities and by that means empower them for the purpose of poverty alleviation. The sector is implementing rural entrepreneurship development for community people. Local Enterprise Authority (LEA), which is another government agency, and the Fisheries sector were once mandated to seek avenues for the marketing of fisheries products. In the original plan, the two sectors were to develop a physical market where farmers could sell their products. But this plan was aborted as local fishers now prefer to liaise directly with buyers from other southern African countries, particularly the Zambians. (A Fisheries Officer, Maun)

> A good number of those engaged in fishing have created employment for themselves and others who, in turn, have generated income and food security for their families… Fish has been proven to provide high nutritional benefits for growing children as well as adults. However, those who benefit from the sector are still relatively few when compared to the available fisheries resources…. Some of those engaged in fishing activities are also sometimes engaged as canoe paddlers (locally known as *polers*) in the tourism industry… (A top Fisheries official, Gaborone)

Highlighting the role which the Fisheries Division could play in the socio-economic development of rural households and how its current placement could be to the sector's advantage, one top Fisheries

official situated fishing activities within the context of poverty alleviation and food security strategies in Botswana. He re-joined:

> ...In terms of funding the sector is currently situated in one of the Ministries that receive the highest attention from the government. What remains to be done is that the Fisheries sector needs to take advantage of the current arrangement and set a clear role for itself in the economy. At the moment, the country faces the challenge of how to eradicate poverty. Ironically, fishing is traditionally known to be a poor man's vocation. This makes it fit well within the realm of food production, income generation and generally raising the standard of living of poor beneficiaries [in rural communities]... (A top Fisheries official, Gaborone)

Botswana's fish resources are managed under the Fisheries Protection Act 42 of 1975, Fish Protection Regulations of 2008 and the Statutory Instrument of 2015, the latter which exclusively prohibits fishing activities in Lake Ngami also in north-western Botswana. At the moment, the Wildlife Policy and the Wildlife Conservation and National Parks Act of 1992 are undergoing a review process. As the Fisheries sector has been severed from the Ministry of Agriculture (MoA) and moved to the Ministry of Environment, Wildlife and Tourism (MEWT), the main objective of the review is to incorporate Fisheries activities in the existing Wildlife policies. While the governance of wildlife within the MEWT has been largely that of conservation, fisheries policy options under the MoA were production oriented and focused more on access to natural resources and achievement of sustainable livelihoods in rural households. Clearly, the coordination of the Fisheries sector by the Department of Wildlife and National Parks (DWNP) under the aegis of the Research Division of the MEWT may probably have highlighted the currently skewed nature of the political economy of fisheries resources management in the Okavango Delta and generally in Botswana. One of the top officials based in Gaborone pointed out that:

> Prior to 2003, the Ministry of Agriculture was extension-driven and through that means had spread the message of sustainable utilisation of resources, perhaps due largely to its broad mandate on food production. However, since the transfer of the Fisheries sector to the Department of Wildlife and National Parks (DWNP) under the newly established Ministry of Environment, Wildlife and Tourism (MEWT), the focus has somewhat shifted to conservation and preservation for tourism purposes. Hence there has been a corresponding increase in law enforcement which is on a collision course with the traditional utilisation principles of natural resources...

> As to whether the existing Fisheries management practices are adequate for achieving food security in rural communities in the Okavango Delta, and in what sounds contradictory to the yearning for achieving sustainable livelihoods and food security amongst community people, one official in Maun office affirmed that:

> ...the existing management practices are no longer relevant; while they still address subsistence fishing, community people are beginning to move towards pure commercial fishing... Besides, the sanction on fishing violations is weak; both fishing license and penalty attract only BWP200.00, respectively, regardless of whether or not an individual harvests fish for commercial purposes.

While we probed further, the official indicated that sustainable management of fisheries resources is predicated on realistic sustainable management of the resources as, according to her, some fishermen engage in unwholesome practices (e.g. the use of chemicals), which are detrimental to the survival of aquatic life in the delta. In her opinion, stiffer sanctions are the only options for achieving conformity with the existing fishing rules and procedures on sustainable management of resources. That said, all the six officials interviewed both in Gaborone and Maun offices agreed that there were lapses in the existing policies governing the management of fisheries resources. Besides, the existing structure of Fisheries governance is believed to be lop-sided in terms of command and supervisory roles. While some officials were of the opinion that law enforcement is given priority over and above livelihood activities of the community people, some believed that there was no proper monitoring due to poor logistics and staffing. One official in Gaborone thus remarked:

> ...The current structure [of the Fisheries sector] is fuzzy and not ideal for maximising the potential of the activities of the sector... the fisheries monitoring activities suffer as a result of poor logistics and staffing problems... The current structure of the administration of the Fisheries sector is almost non-functional; the Fisheries head office is based in Gaborone, with the regional offices shouldered with the responsibility of managing the water bodies based [in other distant locations] like Maun [a distance of about 1,000 km from Gaborone], Kasane, Shakawe and Mmadinare. Nonetheless, the overall coordinator of the Fisheries activities is based in Maun... My understanding is that the Fisheries [sector] has lost its divisional status; its various activities [are now] diffused in other divisions and units... The specialisation and mastery of skills, institutional memory of the various specialised areas and general passion for the sector are bound to be lost in the current arrangement...

Another top and experienced official in Maun pointed out that

> The Fisheries sector is now competing with the Wildlife sector for resources; there's no specific budget ear-marked for the former. There's no coordination of Fisheries at the national level; the sector's activities have become fragmented or compartmentalised and its operations are now confined to local offices while there is no coordination at the national level. By moving the Fisheries sector from the Ministry of Agriculture (whose mandate focuses more on food security and hence peoples livelihoods) to the Ministry of Environment, Wildlife and Tourism, Fisheries is no longer construes by the latter as an avenue for food production but now categorises it as a component of wildlife. In other words, fishes are now equated with or treated as game; the mentality of fish management has changed! Rather than place too much emphasis on law enforcement, it is important to underscore community involvement in the management of fishery resources.

Two things come to bear in the above viewpoints. First, the administration of fisheries resources lack proper coordination, which in turn reduces the positive impact of the Fisheries sector on the livelihoods and food security of riparian community people. Second, law enforcement in fisheries governance is prioritised over rural people's livelihoods activities in the Okavango Delta. The emphasis on fisheries regulations is thus implicated in government's desire to drive environmental conservation and by extension, tourism activities in the area. While the push for environmental conservation is plausible, this should not in any way constitute a barrier to people's livelihoods and well-being.

4.4. Advocacy for reforms in fisheries policy options

Policy reforms are intended to challenge the existing practice(s) in any or all (as the case may be) of the environmental, economic and socio-political frontiers within a given human society. A reform initiative connotes the 'deliberate efforts on the part of the government to redress perceived errors in prior and existing policy and institutional arrangements' (Grindle & Thomas, 1991). Thus a policy process entails the identification of possible policy options, policy formulation and implementation. In their analysis, Heredia and Schneider (2003) identified four basic factors which influence the administrative reform processes. These include "political perspective", "economic pressure", the "strategic choices of state reformers" and "international" influence. These viewpoints are somewhat similar to Grindle and Thomas (1991) observation that the choice of any policy is guided by "politics as usual", "personal interest" and a "crisis" situation. In sum both viewpoints suggest that there are extrinsic and intrinsic drivers of change in any polity. Acknowledged as plausible idea, international pressures on the need to conserve the Okavango Delta, and the potential and associated benefits accruing from eco-tourism may have influenced government policy direction in fisheries governance. While administrative reforms engenders significant change in power relations amongst stakeholders, those who win or lose in the process of a policy reform within a given geo-political entity, and the reason why the change is made would serve as the barometer for measuring the success or failure of any such reforms (Heredia & Schneider, 2003).

In the context of this study, the collision course on which environmental, economic and agricultural policies are headed may have produced a bad effect on a seemingly feeble Fisheries sector, which if otherwise have been well nurtured could produce a desirable result in rural people's

livelihoods and socio-economic well-being in the long run. Acknowledged that the fisheries sector has a minimal impact on the gross domestic product (GDP) of Botswana at 0.002% as at 2002, its contribution to the socio-economic life of the riparian communities in the Okavango Delta cannot be overlooked (FAO, 2007). Indeed, the political economy of natural resources in rural development parlance is about "who gains and who loses" (Chambers, 1983) in the process of accessing the common good. Given the current scenario, key informants interviewed during the study offered some advice on how to depart from the existing Fisheries policies. Key suggestions include (i) Fisheries autonomy; (ii) invigorated Fisheries research and extension; (iii) marketing; (iv) funding; (v) infrastructural development; (vi) cultural shift from beef to fish consumption; and (vii) participatory inclusion in decision-making. It is instructive to note that all key informants (100%) emphasised that the Fisheries sector should be autonomous (in terms of budgetary allocation and programme coordination) if only to achieve its primary goals of driving food security, employment creation and income generation, all of which are hallmarks of rural development. In developing new Fisheries policies, sector-specific areas such as capture fisheries (meant for food provision), sport fishing (for tourism purposes), aquaculture (smallholder fish ponds and small dams) would demand adequate attention in order to achieve a holistic reform. Specifically, a number of the Fisheries officials both in Maun and Gaborone offices commented thus:

> First, the [Fisheries] divisional status should be restored. This is necessary as the level of activities and geographical spread of fisheries related activities have increased tremendously. This is in line with the filling of Lake Ngami, Lake Dow, the construction of three additional sizeable dams (Lotsane, Thune and Dikgathong), which offer a huge potential in a semi-arid country [such as Botswana]. I need not overemphasize this aspect because there is a serious mismatch between the increased potential [of the Fisheries sector] and the reduction in the means to tap that potential. This means the government should embrace resuscitating the old fisheries stations. This should be complimented by a massive extension programme that entails rigorous training in sustainable fisheries utilisation, handling, and marketing... (An experienced Fisheries official in Gaborone)

One of the officials in Maun was emphatic on the need to *genuinely involve community people in the management of fisheries resources*; *and that the government would need to enhance the process of making riparian communities derive adequate benefits from Fisheries resources* (Personal Communication, 15 March 2015). In other words, community people are more likely to view themselves as true development partners if they are allowed "active" and "interactive" participations (Agarwal, 2001) in fisheries management. Pointing the attention of government to go a step further in ensuring improved community engagement in fisheries management, a female officer succinctly rejoined:

> As community people's compliance with regulations is presently a challenge (even though the development of the existing fisheries policy was [somewhat] consultative), they would need some guided advice to enhance the process of managing fisheries resources in a sustainable manner... Government needs to educate people about the role of fish consumption in food security—there is need to make a cultural shift from beef to fish consumption. (A female Fisheries Officer in Maun)

Informed by environmental pollution supposedly induced by the fishing activities at Lake Ngami, the fishermen one-year ban from the Lake through the enforcement of the Statutory Instrument of 2015 is already generating a ripple effect. Fishermen who relocated from Lake Ngami to other fishing areas are already having troubles with residents as the latter claimed that the fishermen constituted environmental hazards to their community (The Botswana Gazette, 23 April 2015). As a form of protest, community people are bound to break the rule if they perceive that they are not adequately involved in the governance of resources (Scott, 1993). Also, the advocacy for a cultural shift is particularly germane in the present context as "most people turn to fishing during lean economic years and then pursue other livelihood activities during good years, which makes the fishery a social safety net for most households" (FAO, 2007).

4.5. Conclusion

Food insecurity and poverty are inextricably linked (Bene, 2006; FAO, 2005) and poverty reduction has been at the core of Botswana's development strategy since independence (BIDPA, 2008; Seleka et al., 2007). Social justice, which is one of the four broad objectives of sustainable development, is the major driver of the national poverty reduction agenda in Botswana. This principle highlights that the socio-economic status of households can be enhanced through their participation in productive activities (BIDPA, 2008). Seleka et al. (2007) observed that the main sources of risk and vulnerability among the impoverished were covariate shocks (e.g. HIV/AIDS, drought, livestock diseases, etc.) and idiosyncratic shocks (e.g. illness, lack of education, orphan-hood, widow-hood, etc.). It was within this philosophical framework that government implemented various strategies aimed at combating food and nutrition insecurity in the country. It is worth noting that some of key human nutritional issues in Botswana are micro-nutrient deficiencies, which can be alleviated through mainstreaming fisheries into these food security initiatives.

According to BIDPA (2008), food production systems aimed at poverty reduction focused entirely on enhancing agricultural production. These included programmes like (i) the Arable Lands Development Programme (ALDEP), which provided production packages (e.g. draught power animals like donkeys, farm implements like ploughs, fencing material, fertilizer, etc.) to resource poor households; (ii) the Accelerated Rain-fed Arable Programme (ARAP), which provided several production packages (e.g. de-stumping, ploughing, planting, weeding, etc.) to all farmers engaged in rain-fed agriculture; and (iii) the National Master Plan for Arable Agriculture and Dairy Development (NAMPAADD) whose aim was to commercialize arable agriculture, irrigated agriculture and dairy production. The Botswana government implemented several social security safety nets (SSN) aimed at the poor and vulnerable to supplement these agricultural subsidy schemes. These include (i) food packages to the poor; (ii) supplementary feeding programmes for the vulnerable and primary school children; (iii) entitlement programmes (e.g. old age pension scheme); (iv) provision of food, clothing, education and protection to orphans; (v) assisting the terminally ill through home-based care; and (vi) labour-based drought relief programmes (CAADP, 2013; Seleka et al., 2007). Amongst these policies, strategies and programmes that have been launched in the country since 1991 to improve food security, only the National Programme for Food Security (NPFS) advocated for increased local fish production (CAADP, 2013). However, lack of a national fisheries policy, exacerbated by a concurrent policy failure, has not mainstreamed this food security strategy into national fisheries management objectives. Therefore, it remains an excellent policy initiative on paper, but completely vacuous in reality, and hence useless to the rural marginalised riparian communities to whom fish is a source of life.

Mosepele (2000) showed that increased fishing was one coping strategy adopted by riparian communities in the Okavango Delta during an outbreak of a cattle lung disease in the 1990s. Moreover, Nnyepi et al. (2007) revealed that children from fishing households had a better nutritional status than those from non-fishing households. One can therefore argue that fish and fishing is a key intervention strategy against food and nutrition insecurity in Botswana. Because of its arid climate, Botswana is a net food importer (CAADP, 2013) and implementing progressive policies aimed at enhancing fish production in the country and facilitating access by riparian communities will contribute significantly to food and nutrition security. Unfortunately, poor governance and inappropriate management approaches have impeded riparian communities' access to derive optimum benefits from the fish sector. As we have already highlighted, it is possible that "mental maps" in government bureaucrats and top policy makers about the fisheries sector could have contributed to this marginalization of the sector. Unfortunately, this marginalization has affected the livelihoods of the majority of riparian communities, who now have to depend on government hand-outs, thereby creating a dependency culture among the people.

Small-scale fisheries can make significant contributions to national economies by generating foreign exchange through international trade. Tax from small-scale fisheries can also assist countries to generate revenue which can then be ploughed back into poverty reduction strategies (FAO, 2005). It follows, therefore, that an export oriented fish market at Lake Ngami would not have only benefited

local fishers because of the market it provided, but this would have contributed to the government's tax revenue base. Fishers used income generated from the Lake Ngami fishery for household needs (Mosepele, 2013) which would uplift fishing households from poverty. The trickle down effects of this fishery in the village of Sehitwa would have undoubtedly contributed to its development. At its height, the fishery had attracted traders to the village due to the influx of money into the village from the fishery. All these economic activities would have contributed to food security, either through direct fish consumption, or from associated economic activities from the fishery sector.

Inland fisheries play a key role in poverty alleviation, especially in situations where people have institutionally restricted access to capital (e.g. bank credit) or other production factors (e.g. private land). The relatively free and easy access to the commons makes it easy for marginalized riparian communities to sustain their livelihoods (FAO, 2005). This, therefore, suggests that fisheries management should provide an enabling environment to allow poor communities a relatively unfettered access to fish resources as a poverty alleviation/reduction strategy. Experience from the Okavango Delta has shown that poor fisheries legislation has effectively deprived riparian communities' easy access to fish resources. We argue that this scenario is created by poor governance structures which have failed to appreciate the value of mainstreaming fisheries into poverty eradication strategies in Botswana.

4.6. Governance

Welcomme (1998) argued that the basis for planning inland fisheries rests on the value placed on the fishery in relation to national interest. This value is then elucidated within a national fisheries policy that provides the framework upon which management interventions are carved. We argue that fisheries management crafted without the benefit of a national policy then will not necessarily address core management issues of the sector. It is, therefore, within this environment that fisheries management in Botswana does not have focus and appears to be haphazard. Hilborn and Walters (1992) had advised that we can infer management objectives from interventions in a fishery. The Botswana situation is a bit complex because previously the fisheries sector was managed within the Ministry of Agriculture governed by the then agricultural policy, which placed emphasis on food production. At the time, fisheries management in Botswana was production oriented, which led to modest government support that effectively commercialized the fishery (McCarthy & Ellery, 1995). It was during this period (in the 1990s to early 2000s) that the fishery metamorphosed from a smoked/salted fish product for a relatively local market to a fresh/frozen product for a more nationalized market.

According to Welcomme (1998), the key elements of a national fisheries policy should include (i) the objectives of sector interventions related to the role of the fishery sector in relation to the national economy; (ii) the priority to be given to inland fisheries; (iii) the priorities regarding multipurpose use of both terrestrial and aquatic ecosystems and impact on the natural environment; (iv) the appropriate institutional framework for the administration of the fishery and for decisions regarding its management; (v) the degree of financial incentives and infrastructural support to be given to the fishery; and (vi) the framework for monitoring, surveillance and enforcement of the fishery.

What is needed is comprehensive legislation that mainstreams the fisheries sector into poverty eradication strategies. This initiative, coupled with a holistic national fisheries policy, can contribute to poverty eradication strategies in low income, food-deficient countries. Compared to other continents, African aquaculture production is very low (Akpaniteaku et al., 2005; The WorldFish Center, 2007). This is in spite of the abundant water sources in the continent. Lesotho's Katse Dam has a potential to develop a lucrative *kapenta* fishery, yet this potential has currently not been explored, even though it is one of the poorest countries in the world, with deep food and nutrition security challenges. While Botswana might be a semi-arid country, it has some water sources that can be used to develop a relatively vibrant aquaculture industry. Failure to optimise utilization of the several dams in south-eastern Botswana for fish production, and hence provision of food and nutrition security is a clear demonstration of how lack of a national fisheries policy has resulted in a general policy failure in Botswana.

5. Way forward

One key proposal of the FAO Advisory Committee on Fishery Research (ACFR) working group on small-scale fisheries is that they should not marginalized, but rather that their contribution to national economies and food security is recognized, valued and enhanced (FAO, 2005). This committee also recognized that the contribution of small scale fisheries to nutrition and food security and sustainable livelihoods and poverty alleviation in developing countries has never been acknowledged (Bene, 2006). This proposal needs to be adopted by state parties. Increased access to productive resources is a more reliable guarantee to food security than increasing the purchasing power of the rural poor (Akpaniteaku et al., 2005). Streamlining the fish sector into poverty eradication strategies will certainly increase the access of socio-economically marginalized riparian communities to productive natural resources. We concur that this management approach will certainly ensure access to food security of communities who are in acute need.

Contribution of fish to food security at the household level is experienced thorough direct food consumption from fishing activities (FAO, 2005), which in the Delta is realized through women basket and mosquito net fishing (Ngwenya & Mosepele, 2008). Indeed increased fishing is the main strategy used by fishing households during times of food scarcity in the Delta (Mosepele et al., 2006; Ngwenya & Mosepele, 2008). Therefore, debates about fisheries governance and management underscore issues bordering on the quality of life and livelihood opportunities for marginalized, riparian communities. If managed efficiently, small-scale freshwater fisheries can help most developing countries achieve some of the Sustainable Development Goals (SDGs). According to an FAO (2015) report, SDG's can be achieved through a reduction and elimination of hunger and malnutrition by 2030. This can be achieved through a comprehensive and holistic leveraging of fisheries resources within countries. The first two SDG's emphasize the need to "end poverty" and "hunger" (FAO, 2015; UN, 2016), which can be achieved through targeted intervention in rural development initiatives. One key vehicle of rural development, aimed at enhancing marginalized communities access to food resources, is small scale fisheries and aquaculture. This is particularly more urgent in Sub-Saharan Africa, where a UN (2016) reports highlights that poverty is more wide-spread and "40% of people lived on less than US$1.90 day^{-1} in 2012".

One aspect of sustainable fisheries development in developing countries is to curb marginalization of the sector. According to Pauly (1997), mainstreaming gender issues into fisheries management (through women empowerment) can contribute to reduced marginalization of the fisheries sector. This agrees with Ngwenya, Mosepele, and Magole (2012) who argued that women basket fishers in the Delta should be empowered to achieve sustainable fisheries management. After-all, women catch is consumed entirely at home (Ngwenya & Mosepele, 2008) and is hence a major source of food and nutrition security at the household level. Marginalization can also be reduced by devolution of power where fishers can contribute to the management paradigm. This agrees with the adaptive management model proposed by Mosepele, Mosepele, Mogotsi, and Douglas (2014) for the Okavango Delta, which eventually led to the development of a code of conduct.

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