

Diagnostic study of the Volta Basin fisheries

Part 2 Livelihoods and poverty analysis, current trends and projections



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Cover page: Small-scale fishers' canoes on the Bagré Reservoir – Burkina Faso.
Photo credit: C. Béné.

Acronyms:

AEJ	African Easterly Jet
BFP	Basin Focal Project
CPRs	Common Pool Resources
CPWF	Challenge Programme on Water and Food
DFID	Department for International Development
FAO	Food and Agriculture Organization
GEF	Global Environment Facility
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
IDAF	Integrated Development of Artisanal Fisheries
ITCZ	Inter Tropical Convergence Zone
LA	Livelihood analysis
MDGs	Millennium Development Goals
NEPAD	New Partnership for Africa Development
PEV	Poverty Exclusion Vulnerability
SFLP	Sustainable Fisheries Livelihood Programme
TEJ	Tropical Easterly Jet
UNEP	United Nations Environment Programme
WARM	Water Resources Management Study

Introduction and background

The Volta Basin Focal Project

The Basin Focal Project for the Volta (BFP-Volta) is a research project funded by the Challenge Programme on Water and Food (CPWF)¹. Its aim is to provide an in-depth analysis of issues related to water in the Volta Basin through three main thematic issues: water-poverty, water availability/use and water productivity. The overall objective of the BFP-Volta is to contribute to the main goal of the CPWF, that is, to alleviate poverty through better management of water in order to enhance agricultural productivity and environment conservation².

Objective and scope of the present report

In this context, the WorldFish Center has been commissioned by the BFP-Volta to produce a report focusing more specifically on the fisheries resources and the link that may exist between poverty and those fisheries in the Volta basin. The present document is the second part of this report³. Its main objective is to conduct a socio-economic and poverty analysis of the fishing communities living in the Volta Basin, based on an assessment of the current situation and potential future changes.

More specifically the report will be articulated around the following two questions:

- Amongst the poor (and poorest) living in the Volta Basin, are there households that are engaged in the fishery sector, and if so what is, or are, the reason(s) of their 'poverty'?
- Which solutions in relation to the water management and watery resources can be proposed to improve the livelihoods and living conditions of these poor fishing households in a durable way (horizon 2050)?

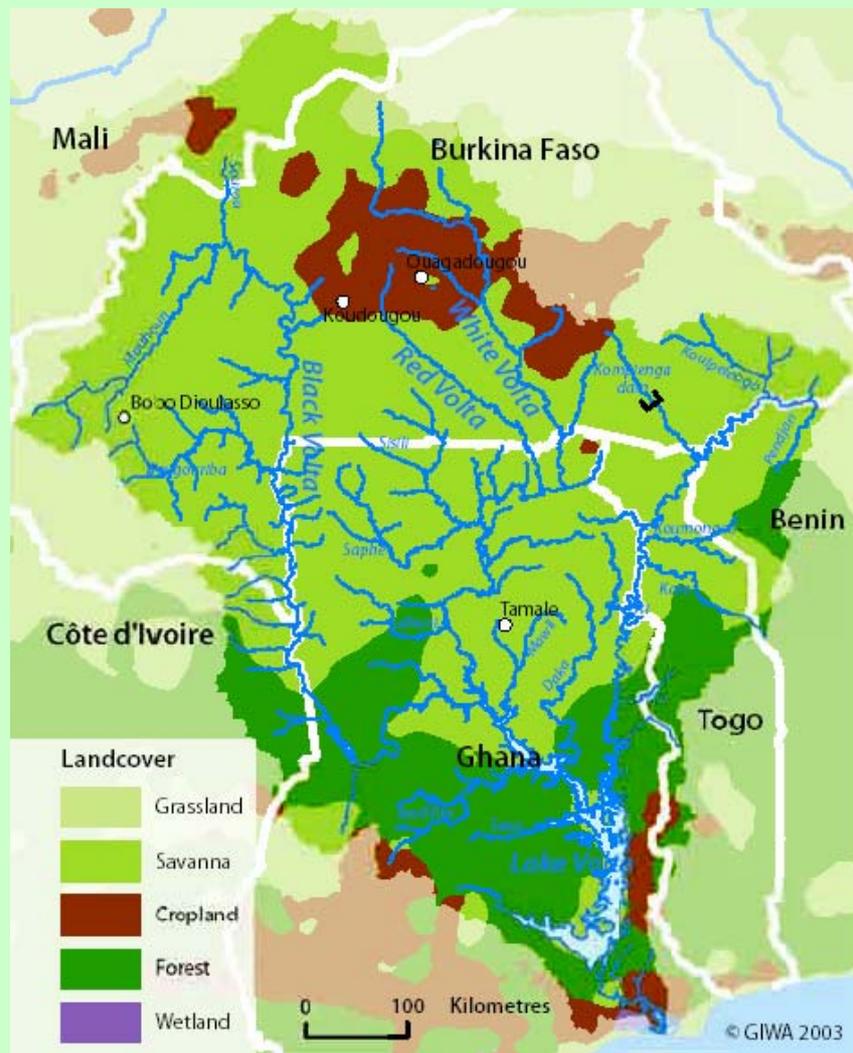
To provide element of answer to these questions, the report will address the following specific objectives:

- Characterize the current activity of fishing in the basin, its socio-economic importance and the degree of poverty of the actors,
- Identify among the fisheries stakeholders, the poor or vulnerable social categories, and to analyze the reasons of this poverty,
- Analyze the trends and risks at the time horizon 2025-2050, notably with respect to climate change,

¹ www.waterandfood.org/

² A more detailed description of the general approach, methodology and specific objectives of the BFP-Volta can be found in the document "Challenge Programme on Water and Food Basin - Focal Project for the Volta Proposal" downloadable at http://www.waterforfood.org/fileadmin/CPWF_Documents/Documents/Basin_Focal_Projects/BFP_Proposals/VoltaPropApril2006vf.pdf

³ The first part of the report was an overview of the fisheries resources in the Volta Basin. Béné C., 2007. Diagnostic study of the Volta Basin fisheries Part 1 - Overview of the Volta Basin fisheries resources. Report commissioned by the Focal Basin Project – Volta, WorldFish Center Regional Offices for Africa and West Asia, Cairo Egypt, 30 p, available at <http://www.waterandfood.org/research/basin-focal-projects.html>

Map.1. The Volta Basin

Source map: Abe et al. 2004

- Propose solutions to improve the living conditions of the categories of disadvantaged fisher-folk, under the current situation as well as under the climatic change scenarios or changes related of water management at the basin scale.
- Identify knowledge gaps and research questions.

Commensurate with the relatively high densities of fisherfolk around Volta Lake itself, much of the published data on fishing livelihoods comes from this area. However, where possible, the analysis will include the situations of the other waterbodies of the basin, i.e. hydropower reservoirs, rivers, floodplains, and the numerous small-scale seasonal ponds that are scattered throughout the basin. Through its analysis, the report will essentially concentrate on two countries within the basin: Ghana and Burkina Faso⁴, but it is thought that the main conclusions can also apply to

⁴ Together these two countries cover more than 83% of the total basin surface.

a large degree to the other inland fishing communities living in the other part of the basin in Togo, Benin, Cote d'Ivoire and Mali (**Map 1**).

Before moving to the rest of this document, a series of caveats are worth mentioning. First it is notorious that small-scale fisheries are generally marginalized in national statistics, especially in developing countries, and largely overlooked by scientific literature (as compared for instance to farming systems, water management and even climate change). Consequently, very little socio-economic data is generally available on fisheries, and the Volta basin is no exception to this situation. This data-poor environment has restricted the level of our analysis and –perhaps more problematically- has forced us to rely on the conclusions of a relatively small number of documents, with very little opportunity to cross-check these sources. Furthermore, some of these critical documents are essentially participatory assessments –thus reflecting the *perceptions* that specific informants have about issues at a certain point in time. As with all social data collection, selection of, and responses by, informants may be biased in a variety of ways (see Cooke and Kothari, 2001) and therefore, any conclusions even from participatory assessments (which frequently claim greater validity, though not generalizability, than survey methods) must be accepted as *a reality*, and not necessarily *the reality*. While it is acknowledged that people act based on perceptions, the paucity of data sources (such as conventional quantitative socio-economic surveys, or indeed other participatory assessments) makes it difficult to either test these studies' claims or to achieve validity through a triangulation of data sources.

Second, there is a tendency in a large part of the fishery literature to assume that fisheries, and in particular small-scale fisheries in developing countries, are characterized by a Malthusian dynamics (“too many fishers chasing too few fish”) leading to the systematic scenario of over-exploitation of the resource and economic impoverishment for the fishers. This view is usually reflected in the two famous adages “fishers are the poorest of the poor” and “fishery is the last resort activity” (see e.g. Smith 1979, Panayotou 1982, Bailey et al. 1986, Bailey and Jentoft 1990). While there is little doubt that small-scale fishers are rarely amongst the richest parts of society (although there are clearly exceptions to this –see e.g. Kremer 1994 or Neiland et al. 1997), this systematic association between fisheries and poverty has contributed to create and maintain a ‘paradigmatic trap’ where poverty in fishing community is taken for granted and no real analytical effort is made to go beyond the simplistic Malthusian explanation. As a consequence very little literature provides real analysis of the causes and nature of poverty –when it does indeed occur- in fisheries.

Articulation and organization of the report

The overall organization of the report closely follows the articulation of the specific objectives identified above. In the first section we will conduct a *livelihood analysis* of the Volta Lake fishing communities by documenting and assessing the socio-economic importance and contribution of the fishery sector to the livelihoods of the local population. A particular effort will be paid to adopt a multi-sectoral view when analyzing the data, recognizing that for a large part of the population, fishing is only one economic alternative within the diversified matrix of activities that constitute these local populations' livelihoods.

The second section will be a *poverty analysis*. The objective of this part of the report will be to identify and describe in greater detail the causal factors and underlying mechanisms that push or maintain certain groups of fishing households in poverty. The section will start by discussing briefly the advantages and drawbacks of some of the conventional approaches to poverty alleviation proposed in the agricultural literature. We will show why these concepts are not entirely satisfactory to analyze fishing communities' poverty. We will then revisit the data presented in the livelihood analysis, drawing upon the recent works proposed in the poverty literature that stress the importance of several key 'dimensions' of poverty, namely: chronic poverty, marginalization, and vulnerability.

The third section of the report will review and discuss the projected trends and risks that will affect the Volta basin through the 2025-year horizon. The starting point of this section will be an assessment of trends in population and economic growth, and will then review of the potential impacts of climate change on water availability, fish stocks, and livelihood security in the Volta basin. Overall, the analysis suggests that these various processes will interact with the pre-existing poverty levels among fisherfolk to further reduce their resilience and limit their abilities to achieve livelihood security.

Drawing upon these different analyses, the last part of the document will propose a series of recommendations to address and reduce these main issues. In particular, options at different scales (local, national and basin-wide) to improve the living conditions of the groups of most disadvantaged fisher-folk will be identified and their implementation discussed.

Livelihood analysis of the Volta Basin fishing communities

In this first section, the objective is to document and assess the socio-economic importance of the fishery sector and analyze its contributions in the livelihoods of the local population.

Concepts and approaches

To start with, we first recognize that livelihood options adopted by households usually result from a combination of deliberate (*ex-ante*) choices and unplanned (*ex-post*) reactions and adaptations to unpredicted shocks or changes. As such, livelihood strategies are household, time and locality dependent, and a large set of different livelihood alternatives are usually observed even within the same (fishing) community.

A commonly used framework for analyses of fisherfolk sub-populations is to differentiate fisher households according to their degree of labour-involvement in fishing activities, and based on the conventional FAO classification: professional, part-time and occasional fishers. However, such a division merges households that may have completely different livelihood strategies, and for whom fishing activities may play a completely different role within the overall range of activities undertaken by different household members. This loss of socio-economic differentiation among

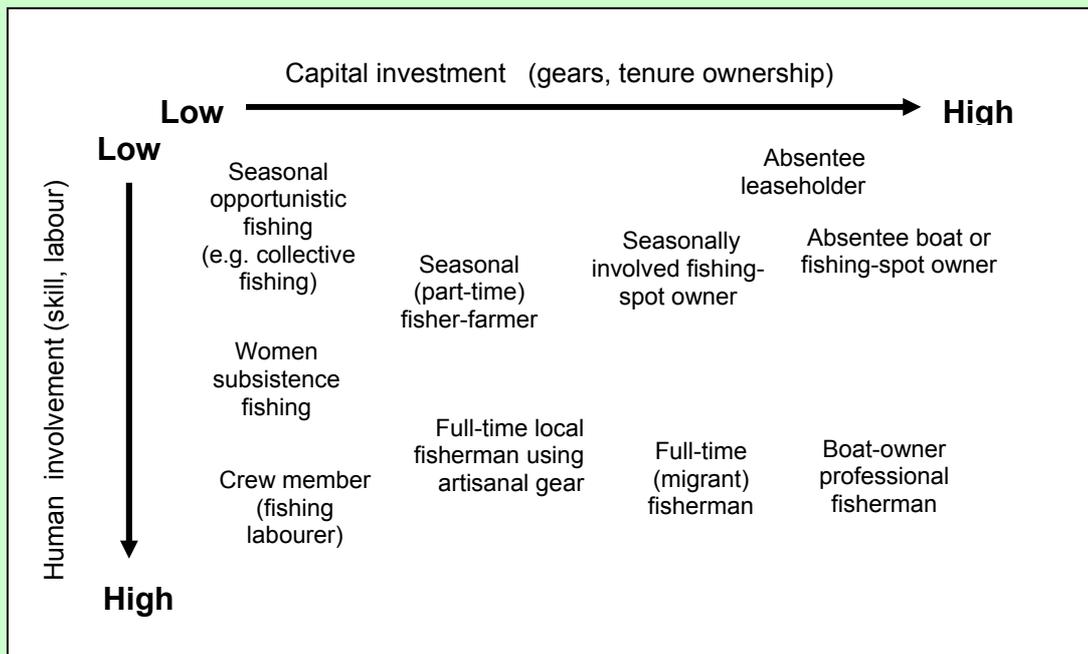
fishing households can be analytically disabling, particularly when poverty is the primary concern.

Using a livelihood analysis (LA) approach could help to show how the contribution of fishing to household livelihoods is not simply a function of the time (labour) investment shared between the different members of the household but rather a function of the combination of fishing assets they have at their disposal (including the status of the local ecosystem and its fish stocks), and the rules and other socio-institutional mechanisms that govern the access and use of those assets. Through this LA perspective, it is, therefore, necessary to ‘widen’ the approach through which the place of fishing activities in households’ livelihood is analysed. This can be done by combining the index of human involvement (investment of labour and/or human assets, e.g. skills) adopted in the conventional approach with an index of ‘capital’ investment (physical and financial assets).

Using this approach, a new two-dimensional framework can be built up, which captures the very wide spectrum of contributions that fishing may offer as part of household livelihood strategies (**Fig.1**). These strategies may range from low human (labour) involvement combined with low capital investment, to a highly intensive labour activity and/or highly capital-based activity. Between those two extremes, a continuum of combinations better reflect the diversity of ways in which thousands of people include fishing activity as part of the overall range of activities they undertake to sustain their livelihoods.

To ensure that our livelihood analysis accounts for, and reflects, this variety of livelihood strategies in the Volta Basin, we considered three different types of communities living along the shores of three different types of water-bodies and *a priori* characterized by different degrees of dependence on fisheries.

- The fisherfolk of Lake Volta. Volta Lake in Ghana is the water-body with the largest concentration of part-time and full-time fishing communities in the basin. These fisherfolk are essentially individuals and households who mainly (but not exclusively) rely on fishing and fishing-related activities (such as fish processing and fish-trading) to support their livelihoods.
- The farmer-fisher communities of other (medium-to-large) irrigation reservoirs. In addition to Volta Lake, a few medium to large scale reservoirs have been created over the last three to four decades in the Volta Basin –essentially for irrigation purposes. These reservoirs represent potentially important fishing opportunities, and fishing and fish-related activities are now part of the local farming communities’ livelihoods. Lake Bagré in Burkina Faso is one of these irrigation reservoirs and data from this area will be used to illustrate this second type of ‘fish-dependent’ rural communities.
- The Volta basin also includes several hundreds of small-scale reservoirs, seasonal ponds, streams and tributaries of the Volta River. Many of these water-bodies dry up during the dry season (October-May), with the exception of the Mouhoun (Black Volta). They primarily offer subsistence fishing potential for the farming communities living in their vicinities, as well as full-time ‘professional’ fishing livelihoods for a small number of migrant fishers.

Fig.1. Variety of livelihood strategies based on fishing activities

Source: Modified from Béné 2004

Contribution of fisheries to the livelihoods of the Volta Lake population

Macro-economic importance of the fisheries

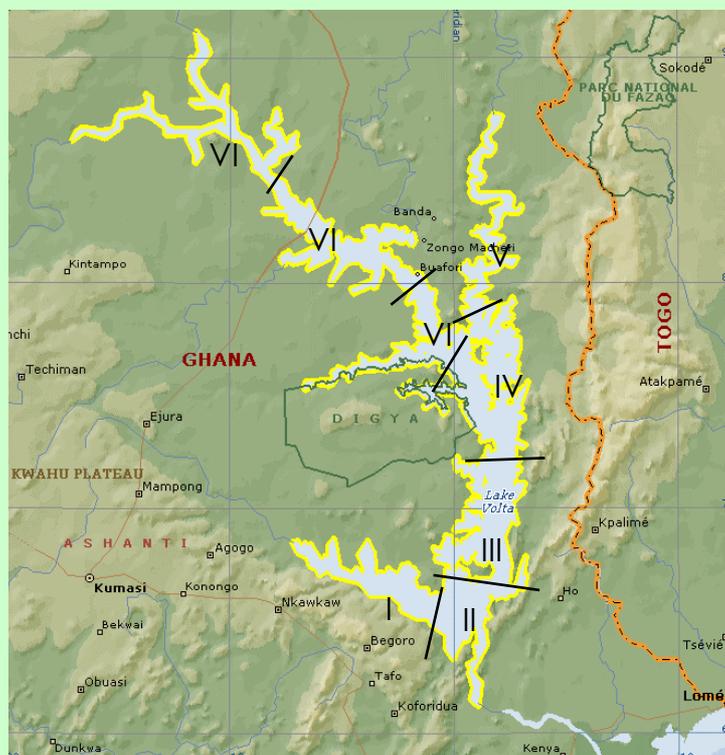
There are no precise estimates of the number of households who depend on fishing along the shores of Volta Lake, but several figures have been proposed. In the mid-90s, the Integrated Development of Artisanal Fisheries (IDAF) programme estimated that some “300,000 fisherfolk depend[ed on the Volta Lake fishery] for their livelihood, of whom about 80,000 [were] fishermen and some 20,000 fish processors/traders” (IDAF-Yeji Terminal Report, 1993). While it is not clear how the first figure (300,000) was estimated or how the category of ‘fisherfolk’ was defined, it is probable that the 80,000 (full-time?) ‘fishermen’ and a large part of the 20,000 fish processors/traders come from the same households, making the total number of fishery-depend households less than 100,000, probably around 85 to 90 thousands.

In the late 1990s, the IDAF completed a more comprehensive survey (Braith, 2000). This time it was estimated that 1,232 villages along the lake’s shores were ‘fishing villages’ and the figure of 71,861 fishers was extrapolated from the sub-sample of villages surveyed. Here again the document is not clear on what a ‘fisherman’ is, and whether this number includes: only full-time fishers? farming households that are temporary involved in fishing? In any case, the figure of 71,000 fishers then became the reference for many subsequent documents.

It is only in 2003 that a more in-depth analysis of the ‘fishing communities’ of the Volta Lake was implemented through the Sustainable Fisheries Livelihood Programme (SFLP) and in particular a poverty profiling exercise (Pittaluga et al.

2003.a) was conducted in two out of the eight strata of the Lake: strata II and III which are located in the southern part of the lake –see **Map 2**. Given the general paucity of socio-economic data on fisheries (see comment above), the information presented in the rest of this section mainly relies on this poverty profiling report, except where indicated otherwise.

Map 2. Map of Volta Lake



Source map: Encarta®

A complete description of the resource-base and its potential and actual production levels has been presented and discussed in Report No.1 (WorldFish 2007). Estimates of Volta Lake's fishery potential range from 40,000 to 271,000 tonnes, while actual production varies between 29,000 tonnes in 1991 (Braimah 2000) to 251,000 tonnes (unpublished data) in 2000. In other words, a high level of uncertainty characterizes the estimates regarding the actual and potential productivity of Volta Lake which effects our ability to estimate the economic value of the fishery.

Quoting Braimah's 2001 report, Pittaluga et al. stated (2003.a, p.20) that the *total first sale value* of the fishery in 2000 was 352 billion Ghanaian cedis⁵. This would represent a value of US\$ 160 million (US\$1 = 2.200 cedis (¢) for that year). A few years earlier, de Graaf and Ofori-Danson (1997, p.28) estimated the *total potential value* of the fishery to be around US\$ 30 million for a potential production of 150,000-200,000 t. In another document Braimah (2003, p.12) mentioned *an actual value of ¢85 billion* for the 28000 t of the 1998 catch. Note that these three estimates were all made in the same time period. By dividing these respective estimates by the

⁵ Note however that we were no able to find this 352 billions figure quoted by Pittaluga et al in the copy of Braimah's report that we used for our present analysis.

reference figure of 71.000 fishers, we arrive at: a first sale value of US\$ 2250 per fisher per year based on Pittaluga et al.'s estimate, a potential value of US\$420 per fisher per year according to de Graaf and Ofori-Danson, and a sale value of US\$ 540 per fisher per year according to Braimah (2003) (Table 1).

Table 1. Different estimates of Volta Lake's commercial values as presented in the literature

Source unit	Actual (a) or potential (p) landings (tonnes per year)	Year considered	Total FSV ⁽²⁾ (US\$ million)	Revenue per fisher (US\$ per year)	Profit per fisher (US\$ per year)
Pittaluga et al. (2003.a) ⁽¹⁾	29.000 (a)	2000	160	2250	
Braimah (2003)	28.000 (a)	1998	38.5	540	- 93
de Graaf and Ofori-Danson (1997)	150.000 – 200.000 (b)	na	30	420	

Notes: (1) quoting Braimah 2001 – (2) FSV: first sale value

These estimates, in so much as they vary greatly, are also quite inconsistent. Compare for instance Pittaluga's and Braimah estimates for an almost similar landing volume.

Finally, it is important to notice that those figures are estimates of first sale values (that is revenue derived from sale, not including costs). Braimah (2003, p.12), using the number of boats in 1998, estimated that the cost of operating during that specific year was €99.5 billion, thus generating overall a loss of €14.5 billion for 1998, that is US\$-93 per fishers.

Fishing activities

Fishing is a year-round activity on the Lake however, individual fishing methods and targeted species vary greatly during the year. The major fishing season is from June to September (the rainy season) when fishers' set gillnets in the off-shore areas. The lean season occurs between November and April/May (the dry season) when the lake is receding and fishers set gillnets in the inshore areas. These gillnets, along with cast nets, lines and traps were the principal fishing gears used in the early periods (Bazigos 1970, Coppola and Agadzi 1975). More recently, other gears have been introduced including drive-in gear (*wangara*), bamboo-pipe fishing, *nifa nifa* (surrounding nets combined with pot traps), *acadja* (fish aggregating devices made of tree branches and bushes) and beach seines (*adranyi*) (Braimah 1989, 1991). Fishers set and operate these different gears using canoes. Of the 24,000 canoes enumerated in 2000 on Volta Lake, the large majority (95%) are non-motorized plank canoes operated on average by three men (Braimah 2000).

The introduction of purse seines (also called winch nets) on the lake since the mid-1980s was concomitant with the deployment of a new type of boat, called a winch boat. This boat has an operational desk that allows 10 to 15 crew members to stand together while manually working with a net that can be as long as 500 to 800 m and 20 to 30 m deep (Ofori-Danson 2005). Although it is difficult to estimate the exact



Photos 1 : Women fish traders buying fish landed on the shore of Volta Lake.

landing share that this type of boat represents (due to the high uncertainty concerning the total landing figure), it is usually admitted that these boats are quite efficient and probably have been estimated to represent a significant part (65-70%) of the total catch (IDAF 1990). These boats on the other hand represent only 1.8% of the total fleet, employ about 5% of the fishers (Braimah 2000), and are described as being largely owned by migrant fishers who originally come from the Atlantic coast (pers.comm. Ofori-Danson).

Fish marketing

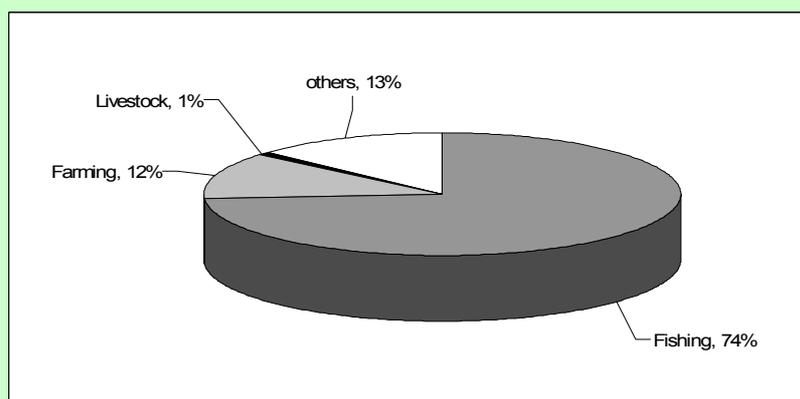
Most fishing villages do not have their own markets and depend on a few larger lakeside towns for the commercialization of their catch. As a consequence, a large number of fishing communities channel their products through market towns outside their administrative boundaries. While a few markets are accessible by paved roads (Asuogyaman, Jasikan and Kpando) most roads in rural areas are unpaved and in the wet season their conditions make fish trading very difficult.

Fresh fish

Fresh fish is landed on a daily basis and is either sold for cash or given on credit to wives at a lower price than normal (10-20% lower). Another portion of the daily fish catch is sold to other women fish processors and traders (cf. Photos 1). In some areas, however, there are no discounted prices for relatives, and fishers' wives purchase fresh fish at the same prices as other women. In other cases, especially on market days, fishers may sell of their own fresh catch.

Processed fish

The principal processing methods are smoking, salting, sun-drying, fermentation and drying. Processing is done predominantly by fishers' wives and relatives, who sell the processed fish on a weekly basis at a local market, and give the revenues from sales to their husbands.

Fig.2. Source of income in the Volta Lake fishing communities

Source: Pittaluga et al. 2003a

Overall, it is estimated that 30% of fish caught is sold by local fish traders (middle-women): 15% by the young and small scale fish traders at the beach, and another 15% sold by the wives of fishers directly to distant fish traders at the fish markets. About 40% is purchased by wholesale fish traders (Pittaluga et al. 2003a).

Wholesale fish trading

The large proportion of the fish landed is sold on a wholesale basis. Wholesale traders travel to fishing villages to purchase processed fish and return to the lakeside market within 2-3 days with the fish already prepared for the journey to the urban centre. At times, fish is handled by multiple intermediaries before arriving to urban markets.

The volume of fish bought by the distant fish traders (not the local middle women who can grant credit and other services) is a function of two dominant variables: financial and social assets. Successful older traders can count on confidence and trust among providers of fish. This facilitates their purchase on credit which is then paid on subsequent visits. Additionally, there are some wholesale fish traders who own a number of fishing winch-net and gillnet fishing boats and who hire fishers to work for them and who take the complete fish catch.

Fishing as the main activity of a diversified livelihood strategy

Fishing is not the only activity in which households engage. Agriculture, livestock and non-farm activities (e.g. petty trade) are all part of a multi-activity livelihood. Fisheries related activities, however, provide a substantial contribution to the households' livelihoods, and are the primary income generating activity for most families in the area, contributing over 70% of revenue on average (**Fig.2**)⁶. This figure, of course, reflects the fact that fishing is a major activity for the community along the shore of the lake. What the figure does not show however is the 'dynamic' role of fishing income, and in particular the fact that, as shown in other parts of West Africa (e.g. Neiland et al. 1997), capital from fishing may be a crucial input for success and resilience in other activities (e.g. farming, petty trade).

⁶ Pittaluga's report does not indicate if these estimates are for individual households or for the community as a whole.

Agriculture

Farming, jointly with fishing, constitutes the most important occupation in fishing communities of Volta Lake. It is carried out by men, women and children alike, and it is predominantly subsistence-oriented although some surplus may be sold. In addition to simple ownership (purchased) or usufruct rights (granted by the traditional chiefs), land can also be rented or obtained under share-cropping agreements. An increasingly common arrangement, the produce from share-cropping (locally called Abosa), is divided up on the basis of a 2 to 1, or 3 to 1, ratio between farmers and landlords. The most common farming technique is slash and burn, usually implemented using rudimentary technology such as hoe and cutlass. The low level of technology intrinsically limits the total possible area to be cultivated.

Some crops are grown by both men and women. These include cassava, maize, groundnuts, cowpea and rice, and they are mostly rain fed or grown in inland valleys. Yams and sugar cane are normally grown by men, while sweet potatoes and rain fed vegetables are usually grown by women'. Cassava and maize are the most widespread staple food crops in the area, although cassava is the more important and is cultivated in almost all communities since it constitutes the main staple of the people around Lake Volta.

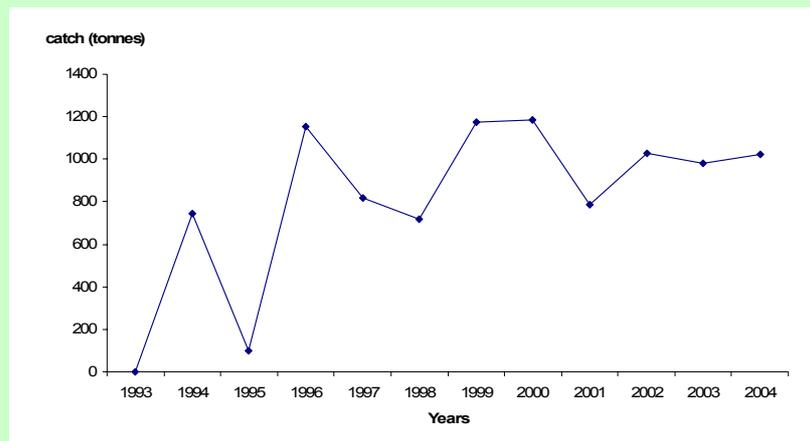
Irrigated agriculture is undertaken on a limited scale only in some districts and only by well-off families. It is usually done by men who cultivate vegetables on a large scale (okra, pepper, and tomatoes) for commerce.

Based on participatory assessments, Pittaluga et al. (2003.a) reported that 53% of the communities interviewed mentioned a "slight decrease" in crop yields over the last five years, and 28% reported a "substantial decrease". Only two communities (6%) perceived a "slight increase" in crop yields. Finally, irrigation is not commonly practiced with 87% of the communities responding that there is no access to irrigation pumps. As a result, only few families (in about 13% of the communities) manage to do irrigated farming.

Interestingly, the same survey indicated that employment opportunities in the agricultural sector had shown a slight decrease over the past five years, while interviewees agreed that the fisheries sector has absorbed a growing number of people, with 37% of the communities surveyed showing a considerable increase in employment opportunities. Reportedly, many children from other areas or countries are hired by fishers.

Livestock rearing

Animal rearing is another important activity found throughout the lake area in fishing communities. Chickens, turkeys, ducks and guinea fowl of local breed, are found in most compounds. Small livestock (sheep and goats) are also grown, whereas pigs and large livestock are found only in a few villages and are usually the property of the wealthiest members of communities. Among cattle holders, one also finds Fulani tribesmen who are traditionally pastoralists and gain grazing rights from local landowners. These are not however engaged in fishing but leave in these fishing communities.

Fig.3. Production of the Bagré reservoir (open in 1994)

Source: Anon. 2005

Non-farming activities

Fishing communities along Volta Lake are conscious that they cannot live of fishing alone. Diversification of income-generating activities was recognized by many as an important way to improve livelihoods. In addition to agriculture, the primary form of livelihood diversification practiced was petty trade (selling drinks, cooked food (*gari* –processed cassava), cigarettes, sugar and other essential supplies). Cash can be used for these trades, although most of the items are exchanged for fish. Artisans are not very common in the lake communities.

Contribution of fisheries to the livelihood of the Bagré reservoir population

Located in the South of Burkina Faso (250 km from Ouagadougou), the reservoir of Bagré was filled in 1992. The main purpose of this 25000 ha reservoir is the production of hydro-electricity and irrigation, and increased fish production has been an added benefit for local communities since 1994. Planners originally expected nearly 30,000 hectares to be cultivated for rice production after the construction of the dam, but to date only 6,000 ha are under cultivation (Anon 2005). Since 1994, the average fish catch has been 975 tonnes, mainly of small tilapia (**Fig.3**), while the potential is estimated to be around 1500 t.

Farming and livestock

Bagré region is one of the most populated areas in Burkina Faso and had a local population estimated to be around 160,000 people in 2000. Part of the high population density is due to migration by people from other parts of the country since the creation of the reservoir (about 10,000 people settled there since 1994). The primary activity around the lake is subsistence farming, mainly rain-fed agriculture carried out by both men and women, using rudimentary tools and animal traction. Women also engage in gardening during the dry season. Millet, sorghum, maize, rice, groundnuts, are the main crops cultivated during the rainy season while onions, tomatoes, carrots,



Photo 2 : Fishing on Bagré reservoir is operated using mainly gill nets, cast nets, and hooks from pirogues

aubergines and cabbages are grown in the dry season in women garden (Anon 2005). Yield is usually low. Tractors and chemical fertilizer are rare and can be afforded only by wealthiest households.

Animal rearing is another important activity for the population around the lake. Seventy-eight percent of the households raise small livestock (chickens, turkeys, ducks) and 58% own cattle (Pittaluga et al. 2003.b). Oxen are essential for animal traction, however there are high mortality rates amongst livestock as access to veterinary extension is inexistent.

In addition to farming and livestock, non-farm activities are widely adopted. In particular petty trade involves a large number of women in the community (either full-time or part-time) and concerns a large variety of products (restoration and selling of cooked food, home-made drinks/alcoholic beverages derived from agricultural products or wild fruits, retailing of gardening products). It is estimated that 63% of the women in Bagré area are involved in some form of petty trade.

Fishing and fish processing

Fishing around Bagré is year-round activity, using primarily gill nets, cast nets, and hooks from pirogues (cf. **photo 2**). Pittaluga et al. (2003.b) estimated that approximately 500 full-time fishers (mostly young males) were still operating in 2003 (against 724 when the fishery opened in 1994) located in 16 villages and/or fishing camps around the reservoir. In addition, 300 female fish processors and about 20 fish traders (also women) operate from these fishing communities. Altogether, this corresponds approximately to only 3.8% of the total population living around the reservoir. These authors note, however, that about 70% of the people interviewed declare that at least one member of their household is involved in occasional fishing. It seems, therefore, that although a relatively small number of young males are engaged in full-time fishing, a much larger number of households are diversifying their farming activities through seasonal fishing activities (although this may primarily be for household consumption rather than sale). Field evidence tends to

corroborate this hypothesis as Pittaluga and his co-authors note that many fishing gears are observable in every village.

The largest part of the landed fish is processed by frying, sun-drying or smoking and is sold locally or in the nearest urban markets. Fish trade can be a remunerative business. The most successful fish traders sell their products as far away as Ouagadougou or even to markets at the Togo border (50 km away from Bagré). Fish processing is primarily conducted by women in both villages and fishing camps where fish is landed, and involves around 40% of local women. However, not every woman has regular access to fish, which remains essentially under the control of the fishers' wife/partners and the most successful fish traders. Cases of fish-for-sex are allegedly occurring in some places. Pittaluga *et al.* (2003.b) further report that faced with increasing competition amongst fish processors and decreasing profits, a growing number of women are now turning away from this activity and are instead investing in gardening (tomatoes, onions, maize).

Fisheries in small-scale water-bodies and river-floodplain systems

In the rest of the Volta basin, it is estimated that a few thousands professional full-time fishers operate along the major rivers (Mouhoun ex-Black Volta, Nakambé ex-White Volta) and the other small water bodies (seasonal ponds and small floodplains). The majority of them are migrant fishers from other countries (Mali, Nigeria, Senegal, Ghana). They own their own fishing gears and pirogues and migrate on rivers and other water-bodies to follow the resources. There are also a few autochthonous (i.e. local resident) professional fishers but they are less mobile and may in fact be also involved in farming activities.

Apart from these professional fishers, there is no real 'fishing tradition' amongst the population of the basin⁷, in the sense that no ethnic group has specialised in aquatic resource use, unlike in other inland regions of West Africa such as the central delta of Niger (Kassibo 2000). One of the reasons for this is probably the diffuse nature of the resource (i.e. the absence of any stable and constant high concentration of the resource in particular water-bodies), and the economic context (subsistence economy). Instead, aquatic resources have always been one component of an integrated (multi-activity) livelihood strategy (Seidel 1997, Morand et al. 2005).

As part of this diversified livelihood, fishing is frequently operated on an occasional and collective basis by the whole community (men and women) during fishing festivals, once crop harvesting and other agricultural tasks have been completed or just before the rain season or flood, when fish is the most concentrated in the ponds. These collective fishing -frequently associated with migrations to and/or from spawning migrations by potomadromous fish- usually take place in the receding part of the floodplains and seasonal ponds (**Photo 3**). Traditional authorities play a central role in their organization and implementation, and fishing methods may include the construction of fish barriers and/or the use of plant-based fish poisons. In addition to these community fishing festivals, fishing is also practiced by individuals, small

⁷ Except of course on the shores of the permanent large reservoirs such as Volta Lake, as discussed above.



Photo 3 :
Collective fishing
undertaken by
groups of women
in seasonal ponds

groups or households (mainly for subsistence) on a more constant or at least seasonal basis by those households living near isolated part of rivers and/or floodplains. The fishing gear in both cases is quite rudimentary, essentially basket-traps, spears and sometimes hooks. Women are generally highly involved in this type of fishing activities where house-consumption is often the main objective. As such, the contribution of these ‘traditional’ fishing activities to the household and community food and nutritional security is often crucial in areas where access to market is not always easy, but unfortunately very poorly documented.

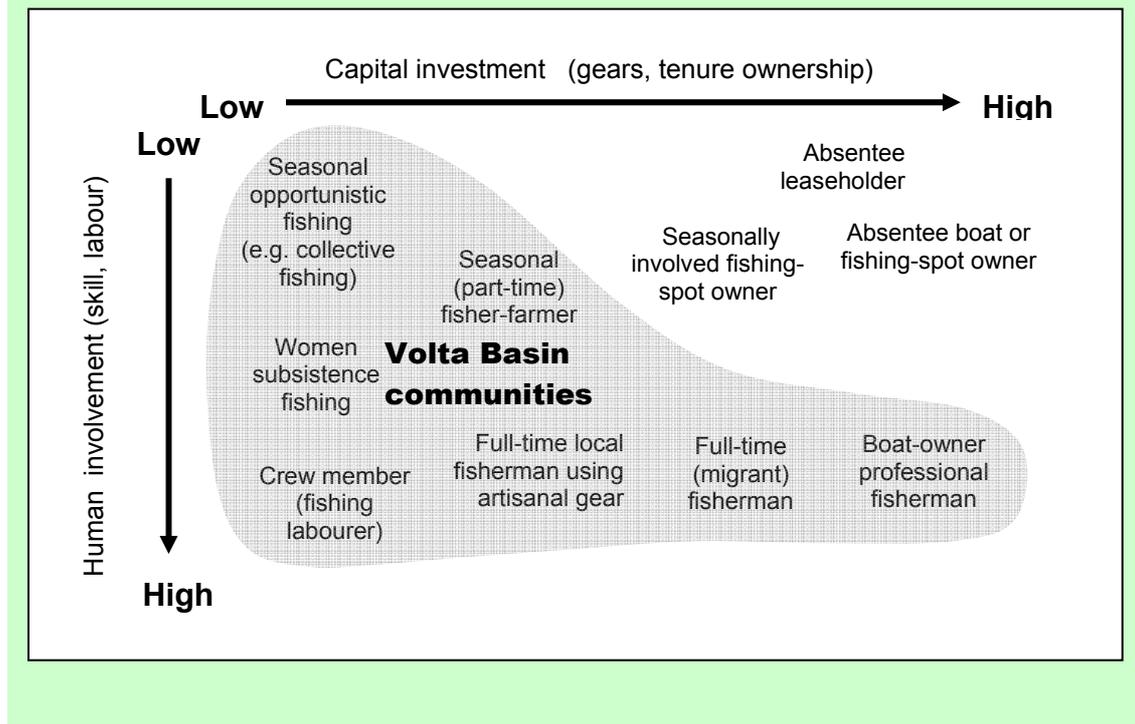
Livelihood analysis: Conclusion

We may summarise the results of the livelihood analysis presented in this section by revisiting Fig.1 and highlighting fishing livelihoods described for the Volta Basin (**Fig.4**). It appears immediately that the livelihoods encountered in the Volta basin cover a wide range of potential alternatives, suggesting that fishing plays an important role in many different rural communities of the basin and not simply for those living on the shores of Volta Lake. Note however that the framework does not capture the fish-related activities such as fish trading and fish processing which are particularly important for women.

The actual importance of fishing in the livelihood of the local population of the Volta Basin is poorly documented and rarely appropriately quantified. For those who live close to a water-body in the basin, it is likely that a more in-depth socio-economic analysis would reveal the many components of household life (economy, food and nutritional security, maternal and child health, education) that depend on fish (Heck et al. 2007).

To conclude this first section, the following points should be stressed.

For the part of the basin where full-time fishers operate such as the Volta Lake, but also the medium-size reservoirs (e.g. Bagré, Kompienga, Douna, Mogtedo, Donsé,

Fig.4. The different fishery livelihood strategies encountered in the Volta Basin

etc.), and along some parts of the Mouhoun and Nakambé rivers), there is no question that fishing is a critical component of the livelihoods of the local populations.

What our analysis shows, however, is that this contribution is not limited to those communities that are described as being inhabited by full-time fishers. In fact, where precise quantitative analyses have been conducted, research shows the central role that fishing usually plays in the economy and livelihoods of the entire community, even though these may be erroneously described not as full-time fishers but ‘simply’ farmers-fishers (e.g. Lae and Weigel 1994, Neiland et al. 1997, Sarch 1997, Béné et al. 2003, Meush et al. 2003, Neiland et al. 2004, Garaway 2005, Morand et al. 2005). In particular, recent research (Allison and Mvula 2002, Russell 2007, Béné et al. unpublished data) shows that even for farmers, fishing can be the primary source of (cash) income and may act as a ‘bank in the water’ to finance a large part of the household economic activities (purchase of farming input such as seeds, fertilizers, agricultural tools or even farming labour), or to pay for health expenses and child education fees.

This finding is not really surprising as fishing along rivers or other water-bodies is subject to seasonality but can be conducted all year round, thus generating cash (and food) on an almost daily basis. This represents a major advantage over a large number of agricultural activities that generate cash only at widely spaced intervals, essentially once crops have been harvested. In other terms, the contribution of fish and fishing activity to the livelihood of rural population is not correctly represented by counting the number of full-time fishers that operate in the area. As is the case in many parts of the Volta basin where fishing is not the primary activity for a large number of households, the presence of rivers and hundreds of small-scale water-bodies (including the numerous irrigation reservoirs) allows several thousands of households

to complement their farming activity with seasonal fishing (both financially and nutritionally).

Having advocated for the recognition of the central role played by fishing in household livelihood does not mean, however, that fishers are systematically better off than non-fishing households. Fishers are a highly heterogeneous assemblage of actors. In many cases, they are indeed 'poorer' than some part of the community. But they are not necessarily the 'poorest of the poor' and when they are 'poor', analysis shows that their poverty may have different attributes, causes and solutions than that of poor farmers. Some dimensions of this 'poverty' are related to their own specific way of living (mobility means lack of access to land, and poor enrolment in governmental/NGO development programs; the health effects from living in close proximity to water-borne diseases), while others simply reflect the overall destitution that affect rural communities, in particular in Africa where several decades of structural adjustments have left rural areas with only very few, if any, infrastructures, roads and public services. In some other occasions, fishers may be those who have lost their previous jobs or their assets. This question of 'poverty' in fishing community is the subject of the next section of this document.

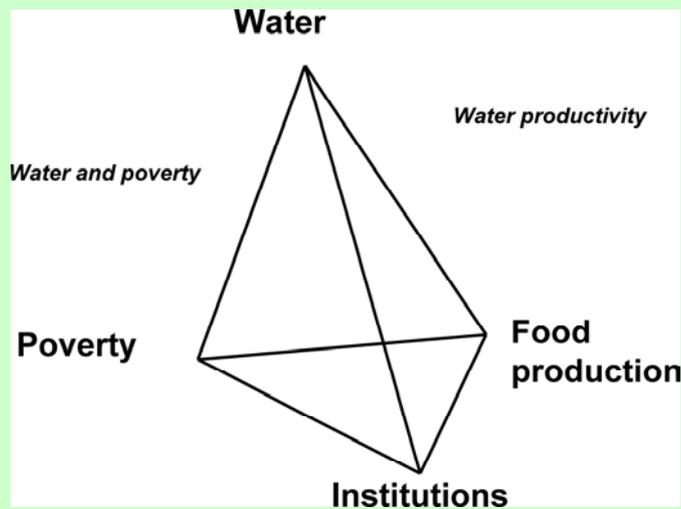
Poverty analysis of the Volta Basin fishing communities

The purpose of this second section is to identify and describe in greater detail the causal factors and underlying mechanisms that drive certain groups of fishing households into poverty - or certain poor households into fishing. Our overall objective is to explore and better understand the links that exist between poverty and fisheries in the Volta basin.

Concepts and approaches

Several concepts have been proposed recently in the CPWF literature in relation to poverty and its links to water uses. The BFP-central secretariat, for instance, defines water poverty "as the poverty that can be modified by improved agricultural water management" (cited in BFP-Volta 2006). This definition, clearly, is inappropriate for our purpose, -but perhaps even more generally- as it tends to focus exclusively on the part of water that is used for agriculture. The BFP-Volta proposes a more inclusive definition in which water poverty is redefined as that "part of lack of well-being which is attributable to water within the poor communities" (BFP-Volta 2006). This definition is closer to the multi-sectoral approach adopted by the MDGs agenda as it includes not only water uses related to food production but also those related to sanitation and other domestic uses. It also allows include negative effects of water such as water-borne disease issues. As such, it is comprehensive but possibly not specific enough for the purpose of this report.

Another framework proposed recently in the CPWF literature is the water productivity poverty framework (**Fig.5**) which aims at investigating the potential effects that link poverty to (1) the ways water is used and managed, and (2), more

Fig.5. A possible framework to analyze water productivity poverty

Source: J. Lemoalle, pers. comm..

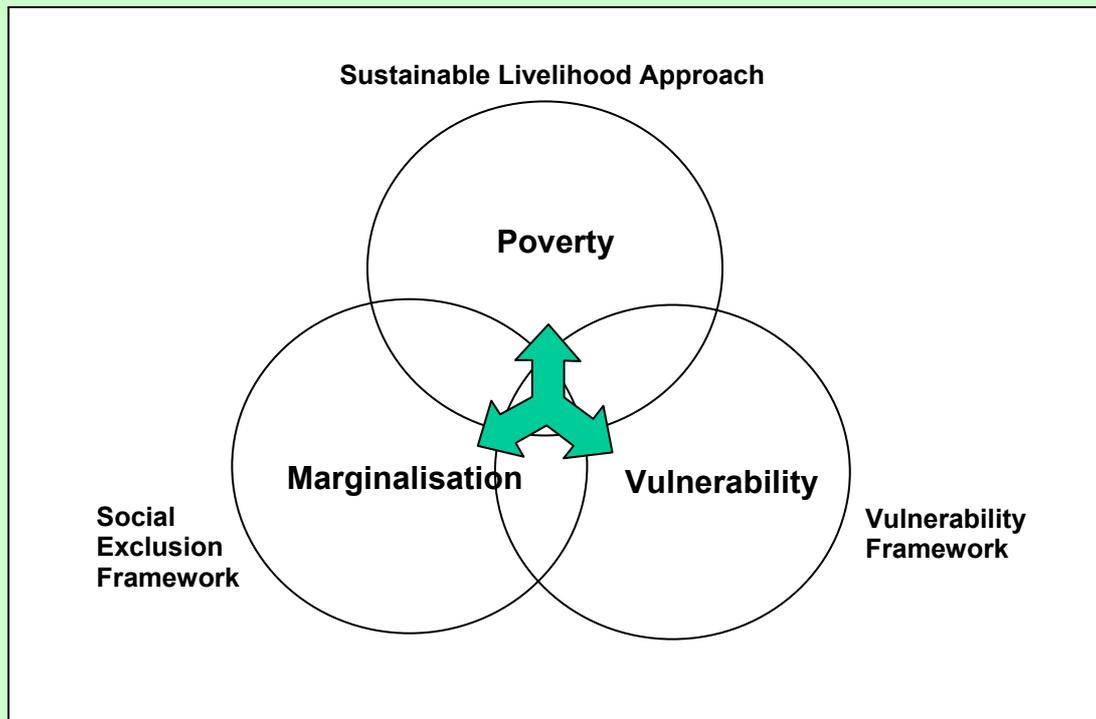
importantly, to the concept of water productivity. The underlying hypothesis is that improving crop-water productivity can reduce poverty.

In fisheries, conventional development strategies have adopted a relatively similar approach. For several decades, poverty was essentially perceived as the consequence of the inability of artisanal fishers to extract the rent of the fisheries in a cost-effective way due to inappropriate or unproductive fishing techniques and open-access management systems (Platteau 1989, Chauveau and Jul-Larsen 2000). Fisheries development interventions, therefore, were mainly conceived as a sectoral approach aimed at strengthening fishing rights and management institutions and at providing fishing communities with the means to improve their fishing productivity (e.g. through the provision of ‘modern’ fishing gears) (Neiland 2004).

Recent research on poverty in fisheries has shown, however, that poverty in small-scale fisheries is only loosely related to productivity *per se* and that many other ‘dimensions’ of poverty need to be considered. In particular, we know now that fisherfolks are not necessarily the poorest of the poor in monetary terms, but may, instead, be amongst the most vulnerable socio-economic groups in societies due to their particularly high exposure to certain natural, health-related or economics shocks and disasters (Allison et al. 2006).

Based on their experiences in sub-Saharan Africa, Allison and Béné have recently proposed a new framework that combines poverty with two other concepts which, they believe, are central in understanding the impoverishment process of fishing communities. These are vulnerability and marginalisation (**Fig.6**).

Vulnerability is a function of the risks to which people may be exposed, the sensitivity of their particular livelihood system to those risks, and their ability to adapt to, cope with or recover from the impacts of an external ‘shock’ to their livelihood system (e.g. Adger et al., 2004). In the case of fisheries, people may be exposed to physical risks (waves and high winds, accidents while hauling nets etc), climate-

Fig.6. The PEV framework (Poverty-Exclusion-Vulnerability)

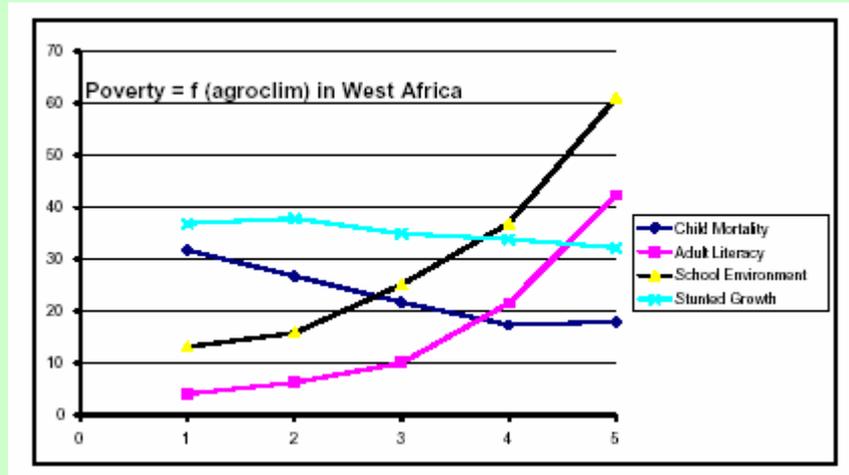
Source : Allison et al. (2006)

induced risks (rising sea levels, impacts of global warming on fish stock productivity), health risks (bilharzias, malaria), market risks (currency devaluations, increase in fuel prices) political and security risks (theft, conflict) among many others. Their sensitivity to fishing-associated risks will be related to their dependency on fisheries, and their adaptive capacity may depend on their ability to adjust to, or avoid risks (e.g. by drawing on assets such as savings or education and other livelihood activities).

Marginalization or social exclusion describes a process by which certain groups are systematically disadvantaged because they are discriminated against on the basis of their ethnicity, race, religion, sexual orientation, caste, gender, age, disability, HIV status, migrant status or where they live (DFID 2005, p.3). Discrimination occurs in public institutions, such as the legal system or education and health services, as well as social institutions like the household but also very often in the private sector, e.g. the labour market. Small-scale fisherfolk are often excluded from processes of development planning, either because they are mobile (including unregistered international migrants), living in marginal and remote areas, or simply because their role and contribution to the economy is poorly known and underappreciated.

The PEV (Poverty – Exclusion – Vulnerability) framework as defined above will be used in the rest of this section to identify the potential causes and origins of ‘poverty’ in the fishing communities of the Volta Basin. Prior to this, we also propose to review the conclusions already achieved by the BFP-Volta regarding poverty in the basin as they provide a useful background for our analysis.

Fig.7. Changes in human development variables (in %) ⁸ as a function of agroclimatic classes in West Africa (1 to 5, arid, semi-arid, dry sub-humid, moist sub-humid and humid).



Source: BFP-Volta 2006

Specific poverty context in Volta basin: the BFP perspective

Prevalence of water availability and rainfall

It is often stressed that poverty in Africa and the rest of the developing world is a matter of institutions, governance and infrastructures (e.g. NEPAD 2005). Some argue however that, in the specific case of West Africa, the biophysical environment and water availability also play critical roles in shaping poverty. It has been evidenced for instance that there is a strong correlation between several welfare variables and climate in West African countries (**Fig.7**). Such a relationship, which also applies within the Volta basin, involves underlying causal links between water and poverty.

In relation to, and reinforcing this particular conclusion, is the important fact that at the basin scale, the main activity of the population is rain fed agriculture, with rain being a major limiting factor for a large part of the basin –see third part of this document. Consequently, the time and space distribution of rain governs the distribution of cultivated crops as well as crop yields variability.

Poverty analysis at the basin level, the case of Ghana and Burkina Faso

In Burkina Faso and in Ghana, the national plans for poverty alleviation (CSLP 2004, GPRS 2003) give an overview of poverty in the two main countries and present their plans for poverty alleviation. In both documents, poor communities are characterized by growing and deepening poverty, with low income, malnutrition, ill health, illiteracy and insecurity. The observation is that most the poverty is found within the rural communities that practice food crop farming.

⁸ In the graph, the correlation between stunted growth and agroclimatic variables is low because of the common scale used in the chart (percentage).

Table 2. BFP-Volta poverty analysis

Poverty factors	State variables	Explanatory variables (1 st level)	Explanatory variables (2 nd level)
Insufficient access to food	<ul style="list-style-type: none"> ▪ low income (MPI), ▪ % <5 underweight, % malnourished, ▪ temporary emigration ▪ pluri-activity 	<ul style="list-style-type: none"> ▪ low agriculture productivity, low water productivity ▪ low cattle productivity, ▪ food crop agriculture (as main activity) ▪ lack of irrigation 	<ul style="list-style-type: none"> ▪ climate (ETP/rain) ▪ soil quality/suitability ▪ lack of inputs (fertilizers, investments) ▪ land tenure ▪ competition cultivation/cattle
Health/ literacy	<ul style="list-style-type: none"> ▪ General health, ▪ prevalence of malaria, onchocerciasis, schistosomiasis 	<ul style="list-style-type: none"> ▪ proximity to surface water, ▪ environment prone to disease (surface water, floodplain) ▪ adult and children literacy and risk perception 	<ul style="list-style-type: none"> ▪ access to health care
Household water	<ul style="list-style-type: none"> ▪ Source, distance, durability of source ▪ kitchen garden ▪ water quality (blue green algae) 	<ul style="list-style-type: none"> ▪ surface and underground resource availability ▪ safe water accessibility (boreholes, wells) ▪ market gardening 	<ul style="list-style-type: none"> ▪ geology of basin, ▪ increased urbanization
Vulnerability	<ul style="list-style-type: none"> ▪ dependence on droughts ▪ variability in crop production ▪ household cattle 	<ul style="list-style-type: none"> ▪ Rainfall variability ▪ small scale (reservoir/dug out) and large irrigation 	
Environment	<ul style="list-style-type: none"> ▪ extension of wetlands; ▪ aquatic weed coverage 	<ul style="list-style-type: none"> ▪ hydrological regime change 	<ul style="list-style-type: none"> ▪ number of small reservoirs

Source: BFP-Volta, 2006

Based on the general information generated by these analyses and additional information gathered from the literature and local stakeholders Lemoalle and his colleagues, in their background research to develop their approach for the BFP-Volta identified a set of direct (first level) and indirect (second level) variables describing and contributing to water poverty (as defined as above) in the rural populations of the Volta basin (BFP-Volta 2006). They presented these direct and indirect variables in a table (which we reproduce in **Table 2**) under five main headings, with the state variables that describe the situation, and the correspondent first and second level variables that explain it.

According to Lemoalle's analysis, the main cause of poverty is insufficient access to food, with a number of variables to describe it, including the temporary emigration by some (male) member of the household, as well as (often female) pluri-activity that helps in collecting needed currency. The main explanatory variable associated to this situation is a low productivity related with environmental factors (as highlighted above in Fig.7) but also some institutional factors as land tenure insecurity issued from traditional arrangements that do not favour long-term investment (by fertilizer or irrigation).

Poor health is also identified by these authors as a key issue, being a direct result of poverty (lack of access to sufficient food or to sufficient health care), but also as a result of poor knowledge of good practices in sanitary behaviour and risk

understanding, leading for instance to extended schistosomiasis (bilharzia) prevalence.

Variables such as the origin and accessibility of safe drinking water (number and density of wells or of pumps) are also presented as important issues. Available wells and boreholes are largely insufficient for the population needs and in the case - common to several parts of the basin- where groundwater resource distribution is restricted, some alternative solutions will have to be found. Accessibility and reliability of water is therefore a pre-requisite for poverty alleviation, as well as for human health. Water quality is also thought to be a central factor, although this has been questioned by some recent participatory research (Hope 2006)⁹. Finally, where small reservoirs are too distant, the development of kitchen gardens is critical.

Interestingly, the concept of vulnerability is also mentioned in Lemoalle's BFP-Volta analysis. In the present case these authors refer specifically to the vulnerability of people engaged in rain fed cultivation. They argue that this vulnerability comes from the variability of rainfall, either between years or within a season, and leads to severe food shortage as a consequence of drought. In these circumstances, household cattle are usually used as an insurance (safety nets) against food shortage and drought. Livestock safety-net role, however, can be rapidly limited as drought also affects animal fodder.

Finally, Lemoalle's poverty analysis recalls that aquatic environments in the basin provide a number of valuable services to the local population (essentially as a base for common pool resources). The extension of wetlands and their variation is usually a good indicator of the status of these aquatic resources. In the present state of development, the establishment of the conditions for sustainable use of these resources is critical. Pollution and the extension of aquatic floating weeds such as water hyacinth are possible dangers for their conservation as in the Oti River and the Oti branch of Volta Lake. But changes in their hydraulic regime are the most widespread threat.

A couple of comments ensue from this comprehensive analysis. First the poverty factors and the associated explanatory variables identified by the BFP-Volta team reflect the multi-sectoral approach underlying the definition of water-poverty adopted by these authors. Factors such as water-borne diseases or accessibility to boreholes for domestic needs are highlighted, in agreement with what one would expect from this MDGs-related definition. Water productivity is however also central to their analysis. As a consequence the analysis strongly emphasizes the issue of water availability and subsequently the low productivity issue, in line with the conventional water-productivity-poverty framework as represented in Fig.5 above¹⁰. It is interesting to note for instance that vulnerability is mainly related to climate and water availability.

⁹ Based on participatory assessment, Hope (2006) shows for instance that increasing water quantity is more strongly associated with increasing welfare than water quality improvements and that "Convenience" strongly influences household choice of water source with the highest welfare improvement associated with access to a "house tap".

¹⁰ For instance as explained elsewhere in the BFP-Volta document, the objective is to "find and compute reliable indicators of poverty at the appropriate scale that will be relevant in locating poverty hot spots, and explanatory variables that will help us to understand the causes of poverty (among them water availability and water productivity variables)" (BFP-Volta, p.12- emphasis is ours).

One could argue however that high exposure to water-borne disease is another ‘dimension’ of that vulnerability.

From the perspective of this present document, the question is now: “where do fisheries stand in this framework and how to make the analysis more ‘pro-fish’ to reflect fisheries specific poverty issues?”

Poverty analysis of fishing communities in the Volta Basin

Through the Sustainable Fisheries Livelihood Programme, Pittaluga and his colleagues conducted two participatory Poverty Profiling analyses in the basin, one for the fishing communities of the Southern part of Volta Lake (2003.a) already mentioned and one for the farmer-fishers of the Bagré reservoir (2003.b)¹¹. These are the only two documents available¹² which provide adequate information on the ‘poverty’ status of fishing communities in the basin. No similar document was available unfortunately for the third type of fisheries described earlier in this document -the small water-bodies and river-floodplain fisheries.

Summary of the existing literature

From the two poverty profile documents, three wealth groups were distinguished. Using the informants own terminology, those are the “very poor”, the “poor”, and the “better off” for the Volta Lake case and the “poor”, the “less poor” and the “better-off” in the Bagré case¹³. These wealth categories offer a good first insight into the communities and help identifying some of the key elements determining wealth differentiation.

Volta Lake poverty profile

The Very Poor

People in the poorest group on Volta Lake are usually individuals who sell their labour force in the fisheries or agricultural sectors. They may be peasant fishers or farmers and have no or little ownership of means of production. This group includes single parents or widows, the unemployed, the disabled and sick. The very poor often have large families and have access to inadequate quantities and quality of food. They possess no livestock, and usually have neither savings nor access to financial resources. In certain areas, access to land exacerbates the poverty status of this group.

¹¹ This second document also included a poverty profiling of the Kompienga farmer-fisher community.

¹² Morand et al (2006) provide an enlightening overview of small-scale fisheries in West Africa where they also address the question of poverty dynamics in fishing communities. But the nature of their analysis (a regional review) makes it too general and thus difficult to apply specifically to the Volta Basin fisheries.

¹³ A fourth group, “the poorest”, has also been identified, but the persons interviewed pointed out that no household around Bagré belong to this group. Households in this group are those who have no access to means of production (land, farming utensil, fishing gear, or finance), have no savings, and don’t access formal or informal credit. When they are active, these persons hire their labour for agriculture tasks. They have no livestock or poultry and usually very low diversification in their activities. They are usually excluded (or exclude themselves) from local community’s decision making processes. These households do not always have more than one meal per day, can’t afford having access to health system and sending their children to school.

In various cases, the analysis showed that these poorest people are highly indebted, and are forced to hire children out as labourers for money. According to the perceptions of the informants interviewed during the fieldwork, the very poor account for roughly 50% of the population living in fishing communities on Volta Lake (Pittaluga et al. 2003.a).

This group can be further broken down into:

- *Families who have no means of production and productive capital.* The main source of livelihood is hiring of their labour for fishing, farming and processing of fish on a day to day basis. Others rent boat and nets on daily or weekly basis, but are just able to pay rent either in cash or in kind.
- *Families who possess only very poor fishing equipment.* This category depends solely on fishing for livelihood as the income generated is not adequate to capitalize other income generating activities. Triangulating these data with figures from Braimah's 2001 report, one can infer that this group includes approximately 70% of the very poor fishing households.
- *Peasant farmers.* They are only able to cultivate very small landholdings (0.4 to 0.6 ha) and lack the necessary inputs (fertilizers, equipment, etc.). Farming activities remain at subsistence level and rarely enable these families to cover all primary necessities. From time to time they would work as temporary labour force on other people's farms.

The Poor

These poor are individuals or families who have some fishing and farming equipment. They may possess or have access to a non-motorized fishing boat with about five gillnets -just enough for a fishing crew of two. Such fishing activities usually yield a limited income. Nevertheless, they can manage to save some small capital to hire labourers for the cultivation of moderate size farm lands (0.8–1.2 ha). Those households are also often involved in petty trading, for example shops, although they often operate on borrowed capital. They are able to invest some capital in small livestock and poultry, which in these areas function as a form of savings. In hard times, livestock and poultry are sold and constitute a mechanism to cope with crises. These families usually have decent/adequate food, cassava meal with adequate corn dough and some fish. People belonging to this group can afford some health services and can often cater for larger family sizes; finally some are members of small scale irrigation co-operatives. Overall this category includes 35% of the whole community.

The Better Off

People belonging to this category are usually farmers or fishers who possess an array of means of production, including canoes with outboard engines, large landholdings as well as hired manpower. They used hired fishing labour and land subsequent amount of fish every day. They can maintain large polygamous families and can often send their children outside the community to Senior Secondary School or even higher level of education. They can generate substantial amounts of revenue, and hardly ever need to borrow money. People belonging to this group are proprietors of cattle, normally do manage to save money, and can afford decent health care. To this group belong also those families who operate road vehicular transport, lake transport, and have fuel depots. This group represents only 15% of the local population and –based on Braimah's data- probably 1.2% of the fishing communities.

Bagré reservoir poverty profile

The poor

Around Bagré reservoir, the poor have access to few livelihood options, with poor or rudimentary means of production, they are involved in subsistence agriculture but they are highly food insecure as their production rarely covers their food needs. They cultivate limited land surfaces (<1 ha), which usually do not belong to them. They have to sell their own production or livestock when facing unexpected/high expenses (illness, funeral, weddings, etc.) as they don't have any cash-savings. They own some poultry and manage to have also few livestock. Their activities are slightly more diversified than those of the poorest group¹⁴, in particular in terms of agriculture, fishing and petty trade. Overall, this group usually constitutes the labour force for the two more healthy categories. It is also the group where the large majority of the fishers are, along with the (female) fish processors. They represent about 10% of the population around Bagré¹⁵ (Pittaluga et al. 2003.b).

The less poor

Households in this group have generally access to more land (1 to 10 ha) which they own for the large part. They have plough and use fertilizers. Farming is still mainly for subsistence but they also grow few cash crops (cashew nuts, onion, tomatoes). Fishing also constitutes another important source of revenue as most of the households in this group own their own fishing gears (cast-nets, gill-nets, hooks and even pirogues). They usually manage to cover their own food needs, although they remain vulnerable to major shocks (e.g. drought). They have bicycles and even sometimes small motorbikes. They have small livestock, poultry and few bovines. According to Pittaluga et al, this is the largest group around Bagré as it is estimated that 85% of the population are “less poor”.

The better-off

In this group, households have relatively productive means of production. The farms are usually more than 10 ha. Animal traction, even sometimes tractors and chemical fertilizers are common. Productions entirely cover the household food requirements. This group can pay for health expenses and children education up to university level as they manage to have decent savings. The activities are remarkably varied: rain fed and dry season cultures, livestock, fishing, trade, etc. They have motorbikes and sometimes cars. They are amongst the influencing people in the villages. Very few fishers or fish processors are amongst this category, with perhaps one or two exceptions amongst the most successful fish-traders. Overall, this group represents only 5% of the community.

Revisiting the data - first level analysis

Still some unanswered questions

Not too surprisingly, we observe that the largest part of the population of the Volta Lake is in the poorest group (the “very poor”) and that a ‘pyramidal’ shape

¹⁴ See footnote 13.

¹⁵ Our figures (10% poor, 85% less poor, and 5% better-off) are different from Pittaluga et al.'s figures (12%, 77%, and 11% for the same groups) as we recalculated these proportions taking into account the size of the population in each of the 5 villages included in their analysis.

characterizes the overall community of the lake (the “poorest” representing 50%, the “poor” 35% and the better off 15% of the total community). More surprising is the shape of the socio-economic ‘pyramid’ in Bagré. In particular while the fact that the better-off are only 5% is not totally unexpected, the fact that the “poor” are fewer (10%) than the “less poor” (85%) is more unconventional for rural society in developing country. It is worth noticing however that the “poor” is the group in which one finds the large majority of the full-time fishers operating around the Bagré reservoir, together with the fish processors. In contrast, the “less poor” is the groups of the indigenous farmers-fishers. Let’s recall that in this area the full-time fishers and their family (including the majority of the fish processors) are a minority –less than 5%¹⁶-, with a large proportion of them being new comers. It may therefore be that the social structure presented by the informants (mainly indigenous households) reflects their own perception of what their community ‘should’ look like: who would easily admit that a new comer is ‘doing well’ or better than a local family? This distorted view of the ‘reality’ may explain why the group of the “less poor” are farmers-fishers and is larger than the group of the “poor” full-time fishers.

It may however be also the case that, indeed, these full-time fishers are not doing so well, a hypothesis that is substantiated by the fact that the current number of full-time fishers (approximately 500) is lower than it was in 1994 when the fishery first opened after the creation of the Bagré reservoir.

It is difficult to confirm or refute any of these two hypotheses, as no quantitative analysis had been carried out as part of the Bagré poverty profiling exercise. Whether the full-time fishers are actually poorer (in income terms) than the farmers-fishers is thus difficult to verify. Note however that this claim is in opposition with the view generally found in the specialized literature where it is assumed that full-time or migrant fishers are in general better-off (income-wise) than farmers-fishers (see e.g. Morand et al. 2005, p. 76).

Are fishers the “poorest of the poor”?

This last comment brings up another important conclusion highlighted by the poverty profilings, that is, the fact that the poorest households are not systematically, or not necessarily, fishers. Along the shores of Volta Lake for instance, of the 3 sub-groups that were identified as “the poorest”, one sub-group is indeed full-time fishers, but another sub-group is peasant farmers while the third includes ‘share croppers’ hiring their labour to fishing and/or farming. In Bagré, a similar conclusion holds. Amongst the group of the poor¹⁷ are found both farmers and full-time fishers. Therefore the adage that “fishers are the poorest of the poor” does not seem to hold. In fact such a simple generalization cannot realistically reflect the complexity of the situation -in particular the specificity of the geographical locations and the huge variety of livelihood strategies adopted by households that depend partially or totally on fish-related activities.

¹⁶ See p.17 of this document.

¹⁷ We also recall that the informants at Bagré reservoir, although they defined and described a fourth group (the “poorest” –essentially the households that have no means of production at all) agree that no households around Bagré fall in this fourth category.

Diversification as a wealth determinant

The ability to diversify sources of income and the volume or type of activity seems to be a key factor in determining fisherfolk poverty status. In the Volta Lake for instance those who depend on fishing only are to be found predominantly in the very poor group. This group however includes two very different sub-groups of fishers, which may be important to distinguish: those who do not own boats and/or fishing gear and thus depend on others to access the resource under a share-cropping arrangement; and those who own fishing gears and boat, operating on a full-time basis. In contrast, households that are able to undertake other income generating activities on a small scale are in the “intermediate” group. Boats and fishing gears owners are also part of these intermediate group but those are then the fishers who have managed to diversify their livelihoods, partially relying on the income generated by their fishing activities to invest in farming (purchasing inputs and labour) or non-farming activities (e.g. trade). Finally the better off are people who have income generating activities of considerable volume, capital intensive, and high yielding such as cattle and grinding mills. Few of them are also involved in fishing. Those are the owners of the motorized winch boats (only 1.2% of the total fishers) who are able to operate into distant rich fishing grounds, using fishing labourers, thus making fishing a very lucrative source of livelihood. The owners of the very productive *acadjas* are also amongst these successful fishers. In addition, these families can also be involved in boat transport, grinding/corn mills and large livestock rearing, suggesting indeed that diversification is indeed a wealth determinant in these communities.

The role played by diversification seems also to be central in the case for Bagré where it was reported that the better-off households could be involved in a wide range of on and off farms activities. In other part of the Sahelian region (North Cameroon), studies have shown that the richest part of farmer-fisher communities is characterized by significantly more diversified portfolios than the other groups (Béné et al. 2003). Unfortunately, the absence of quantitative data does not permit to test further this hypothesis in the case of Volta Lake or Bagré reservoir.

The Malthusian syndrome

As mentioned earlier in this document, a significant part of the literature associates poverty in fisheries with depletion of the resource. When fish stocks are over-exploited by too many fishers (due to the open access nature of the fishery), catch per unit of effort decreases while fishing cost increases, reducing profit and irremediably driving fishers into income poverty. This is the Malthusian poverty scenario. With this in mind, it seems justified to raise the question of whether the resources of the Volta Lake and Bagré reservoir are, or not, depleted and whether this overexploitation situation can be part of the factors explaining poverty in the communities of these two fisheries.

Braimah 2003 recalls that the average yield of the Volta Lake decreased from 46.8 kg ha⁻¹ in 1976 to 32.6 kg ha⁻¹ in 1998¹⁸. This decline seems to be in agreement with the perception / discourse of the end-users. Pittaluga et al. (2003.a) for instance stressed

¹⁸ These figures of 46.8 kg ha⁻¹ and 32.6 kg ha⁻¹ are comparable to those of the two other largest reservoirs in Africa, Lake Kainji and Lake Nasser. Crul and Roest (1995) estimated the productivity of these reservoirs to range from 24 to 55 kg/ha/yr. Bagré reservoir's average productivity over the period 1994-2003 has been of 39 kg/ha/yr.

that 45% of people interviewed agreed that over the past five years fish catches have substantially decreased, while 49% reported a more moderate reduction. Only people from one community (6%) reported that fish catches have increased.

At the same time, however, the catch composition of the fishery did not appear to have changed over the period 1991-1998 (Braithair 2003, Figure 1 p.10). In fact 34% of the communities responded that fish sizes have remained stable over the past five years, 42% reported that fish size has on average somewhat decreased, and 24% said they have increased. Similarly, in 45% of communities people interviewed reported that the diversity of fish species caught over the past five years has been stable, while 34% reported a mild decrease. Only 6 communities (21%) reported a substantial decrease in the diversity of species caught.

Despite these rather inconclusive findings, the hypothesis of an overexploitation of the Volta Lake resource(s) has been systematically brought forward in the past literature (e.g. Agyenim Boateng 1989, Braithair 1995, de Graaf and Ofori-Danson 1997, Braithair 2000, 2003). It is interesting to note that this overexploitation had already been suggested more than 30 years ago by Cappolla and Agadzi (1976). This claim, if exact, means that the stock should have been diminishing for more than 3 decades, a conclusion that is not substantiated by the few landing time-series available.

We already discussed the issues related to this hypothesis of overexploitation of the Volta Lake in the first part of this report (WorldFish 2007), pointing out that, if indeed overexploitation occurs, it is largely disserved by a rhetorical ‘over-exploitation narrative’ adopted by a large number of scientists and policy makers, which eventually casts doubt on any estimates, including the more rigorous ones.

Beyond this unsettled debate, a more fundamental issue emerges, which is that this whole discussion has been (again) essentially driven by a rather productivist interpretation of what “poverty” in fishing communities is, assuming in particular that yield is the main driver of well-being in fishing communities. In the next section, we revisit some of these conclusions using the PEV framework. We will in particular explore some of the other social, institutional and economic mechanisms that may exist in the fishing communities of the Volta and Bagré lakes and affect the wellbeing of these households.

Poverty, Exclusion and Vulnerability in the Volta and Bagré communities

Let us first recall that the PEV framework stresses the importance of the mechanisms of exclusion and vulnerability as being some of the main drivers of poverty for fishing communities.

The different dimensions of fisherfolk vulnerability

Vulnerability of households (or group of households) can be defined as the combined effect of high exposure of these households to specific events, their sensitivity to

those events¹⁹, and their inability to cope with or recover from the impacts of these ‘shocks’ (Adger et al. 2004). Allison et al. (2006) argue that fishing households may appear to be more vulnerable than some other socio-economic groups in the same community or other communities. We propose to use this concept of vulnerability and the data generated by the existing literature to see to what extent this concept helps us ‘unfold’ further some of the mechanisms and processes that may drive part of (or the whole?) fishing community into poverty.

Disease prevalence

Table 3 presents the different diseases observed in the Volta Basin over the period 1980-1996. These include bilharzias, onchocerciasis, guinea worm, malaria filariasis and diarrhoea (GEF-UNEP, 2002).

All these figures seem to indicate that the populations of the whole basin (and not simply the fishing households) are highly exposed to diseases. We note however that a large part of those infections are water-borne diseases (as was already pointed out by Lemoalle in 2006), reinforcing on one hand the relevance of water-poverty as defined by the BFP-Volta team, but also –in direct relation to the point made above– stressing the fact that populations living in close proximities with water-bodies are likely to be more exposed to these water-borne diseases. In that respect, fishing households and/or communities are expected to be amongst these more exposed groups.

Table 3. Water-borne and associated diseases and their vectors in the Volta Basin

Sub Basin	Schistosomiasis	Onchocerciasis	Guinea worm	Malaria	Filariasis	Cholera	Diarrhoea	Yaws
Black Volta	+	+	+	+	?	?	+	+
White Volta	+	+	+	+	+	+	+	+
Oti -	+	+	+	?	?	+	+	
Lower Volta	+	-	+	+	+	?	+	+

Legend: + Disease and vector recorded; - Disease vector not recorded; ? No specific study undertaken. Source: (GEF-UNEP, 2002)

In those circumstances it may not be surprising to read that on the shore of the Volta Lake, a high incidence of bilharzias and malaria was observed throughout the year (diarrhoea was reported to be prevalent in 95% of the communities surveyed, equally affecting adults and children) and that around Bagré, diseases were identified as the first source of ‘crisis’ by the communities (Pittaluga et al. 2003.a and b). The most prevalent diseases there were malaria, bronco-pulmonary infections and gastro-enteritis. In some specific location, intestinal parasitoses were also observed due to the consumption of unclean water from the ponds.

Two additional elements may further exacerbate the degree of vulnerability of fishing households to acute health problems. First, the overall situation in terms of access to

¹⁹ Households can be sensitive with very different degrees to the same event even if they are all exposed with the same probability. For instance a whole village population is exposed to the same risks of drought, but some households may be more sensitive than others due for instance to the nature of their main activities. A schoolteacher is for instance expected to be less affected by the drought than farmers of the village.

health services of a large number of fishing villages around Volta Lake strongly reflects their geographical isolation. The absence of hospitals in these areas means that sick people have to be sent to the nearest clinic or hospital in transport boats. Medicines, furthermore, are available only from drug peddlers going from village to village. In Bagré, the situation may not necessarily be better (even if the area is not as isolated as some part of the Volta Lake shores) as the preservation of medications becomes rapidly a problem without electricity and cold storage.

In these conditions, fishers are especially vulnerable to this lack of provision to health services and medications as their access to these facilities is even more problematic than the rest of the local population. Seeley and Allison (2005) note for instance that this issue of lack of regular access to medication is probably one of the reasons why AIDS prevalence is so high in fishing communities. Beyond the specific case of antiretroviral therapy, it is clear that the migrant nature associated to frequent geographical isolation that characterizes fishing activity in a large number of situations is definitely a factor that affects the ability of these populations to access quality health services and thus makes them more vulnerable than other part of the population to health risks.

Another element may add to this sensibility of fishers to health problems. It is the fact that fishing is a relatively intense physical activity, in the sense that fishers often have to operate manually (non-mechanical) fishing gears or the (non-motorized) boat for hours on the lake under rough weather conditions. Sickness and/or the physical weakness associated to illness usually severely reduce the capacity of fishers to operate effectively onboard when they are sick²⁰, thus increasing further their vulnerability to disease.

Possibly, one 'positive' effect of being engaged in fishing is that fishers may have access to more regular source of cash (through the selling of their daily catch) than some other socio-economic groups in the same communities (e.g. farmers). This is the 'bank in the water' function as discussed earlier in this report, and field data confirm that households engaged in fishing activities use fish income to cover their health expenses (Russell et al 2007). Recent research suggests, however, that access to cash does not always reduce the sensibility of fisherfolk to health risks. It can in fact in some cases increase it through a high exposure to risks attached to a fisher 'life-style' characterized by alcohol and/or drug consumption and reliance on casual sex or prostitution (Allison and Seeley 2004, Kissling et al. 2006).

Food insecurity

Information from the Volta Lake tends to suggest that the local populations are not necessarily highly vulnerable to food insecurity. Cassava and maize are the main staple foods in the fishing communities. In 94% of the communities, cassava is consumed daily, while maize is eaten daily by most people in 71% of the villages (Pittaluga et al. 2003.a). On the other hand, meat and eggs are rarely consumed, although protein intake seems to be compensated by daily fish consumption, even if consumed in small quantities. Malnutrition among children is not common in the fishing communities of southern Volta Lake. In 83% of the community surveyed by

²⁰ In comparison somebody engaged in a less-physical job, such as petty trade, may still be able to maintain his/her activity even when she/he is not well.

Pittaluga and his colleagues, respondents reported very few cases of malnourished children.

In contrast, information collected by the SFLP team around Bagré reservoir indicates that only few households grow enough food to ensure their daily food/caloric needs, creating seasonal food insecurity and individual energetic deficiency (undernourishment) during these hard periods. Fear about food insecurity is therefore vividly entrenched in people's mind around Bagré as illustrated by the fact that 3 out of 4 of the main 'crisis' in this areas are related to food production failure²¹: more than 50% of the household declare that they have suffered from "food shortage", "drought" or "poor agriculture production" in the recent past. "Low fish catch" comes next with 45% of the households reporting suffering from low level of fish catch (affecting both fishers and fish processors/traders). Pittaluga and his colleagues (2003.b) note, however, that as far as protein and micro-nutrient requirements are concerned, the supply of the latter may be broadly satisfied by fish catch in the villages around Bagré. Similar conclusion seems to apply for vitamins A and C intake rates as vegetables and fruits can be found relatively easily in the area.

Land degradation

A third source of vulnerability -which, this time, does not impact communities' livelihood in the form of unexpected shocks, but rather as long-run effect- is the land degradation and associated loss of soil fertility which seems to affect all villages along the shores of Volta Lake. Sixty three percent of the communities surveyed claims for instance that land fertility has worsened over the past five years (Pittaluga et al. 2003.a). As a consequence 53% of the communities estimate that their crop yields have slightly decreased and 28% that they have experienced a substantial decrease. Absence of crop rotation has been advanced to explain this degradation: due to the scarcity of land and other problems associated with migrant farmers, the land is not left to fallow as it used to be. Data shows that even where fallow is practiced the proportion of land left resting tends to decrease. As a result of those changes, farmers become less resilient to other external shocks –such as drought spells. This tendency has also been observed around Bagré.

In the longer run, this process of land degradation will eventually affect fisheries and fish-dependent households, as more and more water will be pumped through irrigation to compensate for the lower natural soil fertility.

Diminishing Common pool resources

Data indicate that forests along Volta Lake are being heavily impacted by an ever-increasing wood extraction. The rate of deforestation is estimated at 0.25 to 0.2 km² per annum on average. Major causes of deforestation are reported to be related to household wood consumption and fish processing but other factors such as charcoal burning, farming practices, cutting of wood for fishing (*acadja* and bamboo pipe fishing), bush fires, and grazing by large herds of cattle from neighbouring Burkina Faso have also been reported (Donkor and Vlosky 2003). These different impacts have resulted in the elimination of nearly all Forestry Commission unprotected trees from the lake area. Overall 20 of the 35 communities surveyed reported that the situation of nearby forests worsened over the past 10 years.

²¹ The fourth one is disease, which was ranked 'first' by the communities in terms of frequency of crisis.

As far as wildlife is concerned, the traditional hunting system consisting in selective burning of areas cordoned off by hunters and their dogs is thought to increase pressure on the wildlife²². A significant number of key-informants reported that the number of wild animals has decreased and that wild life has not been available in their communities in the past five years.

Natural resources and common pool resources such as forest resources or wildlife are critical to the poor who usually rely on them and use them as safety nets during crisis periods (Johda 1992, Williams 1998, Beck and Nesmith 2001). The degradation of those main CPRs around Volta Lake means the disappearance of these safety nets and a subsequent increase in vulnerability for these households. While not affecting specifically or exclusively fishing households, the erosion of these CPRs may have indirect consequences for these fishing households by leading more of the poor of the same local community and/or other parts of the country/basin to turn to the lake's resources to compensate for the loss of forest and wildlife resources. In fact, recent information suggests that due to the general decline in the coastal fishery resources over the last decade, part of the Ghanaian coastal artisanal fishers are now migrating with their family to Volta Lake region (E. Abban pers. comm. April 2006), contributing to increase the pressure on the Lake's CPRs, thus certainly increasing further the vulnerability of the local fishing communities.

Lack of economic opportunities

Diversification of activities has long been recognized as one of the most widely adopted risk management strategy amongst farmers. Just as investors in financial markets diversify their asset portfolio to reduce risks, farmers traditionally grow a variety of crops and/or engage in several farm and off-farm activities in order to decrease the adverse impact of uncertain environmental and market conditions (Reardon et al. 1992, Dercon and Kryshman 1996, Moser 1998, Ellis 1998). This rule also applies to fishers. Fisherfolk that do not have the opportunities –or the skills and/or capacities- to diversify their livelihoods and depend exclusively on fishing to generate their income are very likely to be extremely vulnerable²³.

In this context it is important to notice that in the case of both Volta Lake and Bagré reservoir, the poorest are the households who do not have the capacities to diversify their activities. In Volta Lake those households included either individuals who sell their labor force in the fisheries or agricultural sectors as peasant fishers or farmers, or families who possess only very poor fishing equipment and have not enough income to capitalize and invest in other activities. The other sub-group in this very poor category includes farmers who are also unable to diversify their activities. Likewise, around Bagré, the poor are also those families who have very few livelihood options. A large number of them are involved in subsistence agriculture but the majority of the

²² Additionally, this practice often results in wider and uncontrollable bushfires that destroys large areas of forest. Bushfires, however, are also a consequence of farming practices, such as the traditional slash and burn techniques still widely utilized in the region. It is reported for instance that slash and burn agriculture is practiced along the lake by 37% of the communities' households (Pittaluga et al 2003.a).

²³ It can even be argued that because they don't control any part of the reproduction cycle of the resources on which they depend (the fish stock) fishers are actually probably more vulnerable than farmers with respect to 'crop' failure.

full-time fishers are also reported to be amongst those poor households, along with the fish processors.

Marginalization and exclusion

The second dimension of poverty highlighted in the PEV framework is the degree of marginalization that is generally observed in fishing communities in developing countries. This social and economic marginalization is often the consequence of their geographic and political isolation and results frequently in poor access to many public services (transport, health, education) and to other basic infrastructures and institutions such as markets or financial credits. The data from Volta Basin confirm this general diagnosis.

Geographic isolation

Large parts of the lake remain inaccessible throughout the year and lack marketing facilities. This is the case in particular of the Eastern region, as well as the numerous islands dotting the entire coastline (about 50) of the lake. In these places, getting to a major urban centre for market supplies or health treatments is indeed problematic. Other regions are only accessible during the dry season and become completely inaccessible during the rainy season. Paved roads are rare. For instance, none of the 34 villages included in Pittaluga survey are accessible by paved roads. All but one of the communities are accessible by water, although journeys on the lake are often difficult due to the presence of numerous tree stumps emerging from the water surface or submerged but dangerous to navigation.

Lack of public services and institutions

The remoteness of most fishing communities denies them access to basic services. In 49% of the villages visited, for example, the local population has never received any support visit from the agricultural extension agents and no services of the Fisheries and Veterinary Departments are available.

The consequences of the geographical isolation are also acute in terms of lack of access to adequate education or to credit facilities. Approximately 45% of the communities indicated that primary school units are malfunctioning. Even in the few schools available, inadequate staffing, lack of textbooks and equipment is lamented. As far as financial credit is concerned, the lack of formal credit facilities forces fishers to turn to informal credit providers, facing often an exploitive situation. Fish traders provide fishing inputs to fishers who in turn extinguish their credit by ensuring a constant fish supply to the creditor. Fishers are, in fact, under obligation to sell their catch to that particular fish trader until the credit has been extinguished. Fish is sold with a rebate that ranges between 10% and 25%. According to fishers' own estimates, the cost of credit obtained through this system can be up to 50% a month.

Fishers can also obtain credit from nets sellers. In that case, credits are granted for periods of time ranging from two to four weeks, and interest rates vary from 25% to 40% for the two-week credits, and approximately 47% for the whole month. Very few fishers use money-lenders to borrow capital. Those who do so have usually no other choices, considering that interest rates are very high (from 30% to 100% per month; 40% biweekly, or 10% daily in some places). These high interest rates make it too risky for individuals to invest in new activities or even to expand their own current activities, thus reducing drastically the overall productivity of the households. These

high interest rates also make households more vulnerable to economic (or crop) failures.

Ethnic discrimination and lack of social cohesion

Most of the fishing communities around the Volta Lake are composed of different ethnic groups. Segregation along tribal lines, and separate leadership for each ethnic group is the rule. This often constitutes a problem when village-wide activities (such as fishing) involving more than one group need to be organized and/or coordinated. The presence of a village chief, furthermore, is often a source of additional problem. Local people attribute it to the fact that the village chief stems from the autochthonous tribe that usually owns the land, and is accused of not accommodating the customs and traditions of the other ethnic groups who settled in the village. Thus, any attempt to enforce rules and customs proper of the autochthonous groups is met with resistance and suspicion by other groups. In addition, the village chief depends on royalties and taxes which are collected in an arbitrary and sometimes exploitative manner. This often complicates the interethnic interactions on the ground, and weaknesses in social capital are at the roots of many failed attempts to set up organized groups at the village level. In some cases, however, the lack of social cohesion stems from the other end, as village chiefs undermine the formation of groups that are believed potential threats to their authorities.

In sum, although traditional authority exists in all fishing communities around the Lake, growing mistrust between indigenous agro-pastoralists and migrant fishing populations have undermined the social cohesion of the community, reducing the capacity of the whole local community to build upon social capital and increase organizational and institutional capacities.

Access to land

Finally, lack of access to land is one of the major exclusion mechanisms usually greatly affecting fisher communities and increasing their vulnerability. This issue is widely encountered in the Volta Basin.

In Bagré for instance, land is traditionally controlled and distributed by chiefs according to systems of derived rights, such that all households receive at least a minimum of land. With greater demographic pressure, however, certain villages ended up with little to no surplus land. The most affected households were reported to be the migrant and in particular the migrant fisherfolk, which were then 'trapped' into a mono-activity-based livelihood.

Around the Volta Lake, land tenure has also been identified as one of the major bottlenecks against increased agricultural production (GEF 2002). In these regions, like in most part of Ghana, land ownership system is based on ethnicity. The land owners are the indigenous tribes and all others settlers have to request these indigenous populations to access land for farming or simply for their abode. Land is released for farming based on terms which hold only in a particular chieftaincy. Since the terms are not the same throughout the chieftaincies, the effect of land tenure is not uniformly experienced. Overall however, as far as fisherfolk are concerned, the land tenure system seems to be unfavourable as land owners prefer to lease land for cattle grazing rather than to fishers for farming. Combined to other factors reviewed previously (e.g., lack of access to capital and/or credit facilities), fisher households

have great difficulties to diversify their activities, and remain largely dependent on fishing activities, thus aggravating their overall vulnerability.

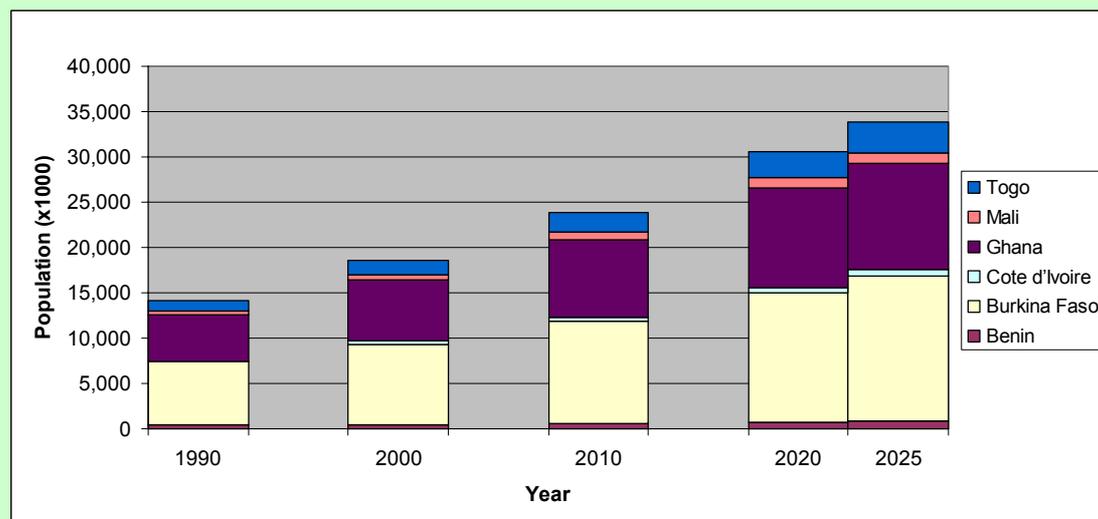
Future Trends

While the preceding analysis has dealt primarily with historical and current data trends, the following section provides an overview of how predicted climate, social, and population trends may impact fisherfolk livelihoods in the future.

Impacts of population pressure and economic trends on water resources

Several studies have assessed the current demand on Lake Volta basin water resources, and though their projections of water supply and demand for water based purely on past rainfall and population trends (excluding the variables introduced by predictions of climate change models, discussed below), many of their overall observations remain valid (GEF 2002). Across the Volta basin, population densities range widely (between 8 and 104 persons/km²) and population growth rate estimates range between 2.27% in Benin, to 2.8% in Togo (**Table 4**). By 2025 these growth rates will translate into an estimated overall 81.7% growth in basin populations over year 2000 levels (**Fig.8**), with significant implications for these nations' respective demands on water resources. Needless to say, based purely on an extrapolative calculation, any basin population growth on the order of 346% by 2050 will impose large-scale changes to the demand and use of water resources that may force these countries to significantly revise their water planning altogether.

Fig.8. Projected growth in Volta River basin populations by country (1990-2025)



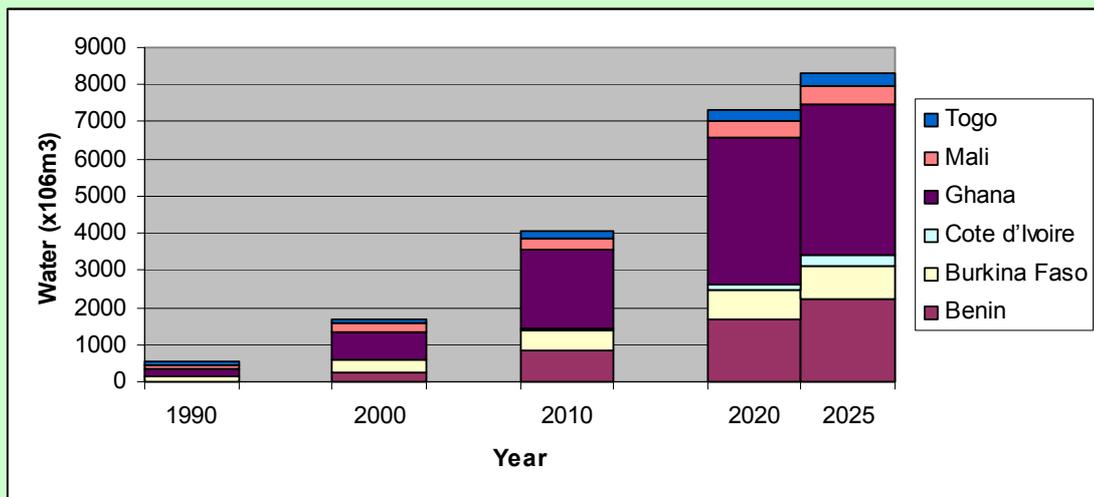
Source: WARM (1998), GEF (2002)

Table 4. Volta River basin statistics on area coverage, and projections of growth in population and water demand, 2000-2025

Country	Area Coverage		Population					National Water Demand (x 10 ⁶ m ³)			Water Demand (m ³)/person		
	% Basin area	% Nation area	2000 (x1000)	2025 (x1000)	2050 (x1000)	% Ann. Growth	% Growth 2000-2025	2000	2025	% Growth 2000-2025	2000	2025	% Growth 2000-2025
Benin	4.1	15.2	477	820	1,437	2.27	72.0	249	2,223	792.8	522.3	2711.0	419.1
Burkina Faso	42.65	63	8,874	15,997	28,802	2.38	80.3	335	876	161.5	37.8	54.8	45.1
Cote d'Ivoire	2.99	3.9	398	718	1,341	2.53	80.4	24	293	1120.8	60.3	408.3	576.8
Ghana	40.18	70	6,674	11,696	21,684	2.5	75.2	729	4,084	460.2	109.2	349.2	219.7
Mali	3.65	1.2	625	1,260	2,501	2.78	101.6	223	471	111.2	356.8	373.8	4.8
Togo	6.4	47.3	1,594	3,385	6,751	2.8	112.3	137	351	156.2	85.9	103.7	20.7
Total			18,643	33,876	64,566		81.71	1,697	8,298	389.0	1,172	4,001	241.3

Sources: Spatial and water demand data from GEF (2002) and WARM (1998); Population data for 1990-2025 from WARM (1998), population projection for 2050 are based purely on an extrapolation of respective 2000-2025 projected annual growth rates.

Note: Population growth projections differ and should be used with caution. To illustrate, BPF Volta report (2007) projections of basin population growth predict 2025 populations (rounded to the nearest thousand) at: Benin (1,047,000), Burkina Faso (21,860,000), Cote d'Ivoire (771,000), Ghana (10,621,000), Mali (1,086,000) and Togo (1,788,000), and a total projected 2025 basin population of 37,173,000. The most significant differences between projected national contributions to basin populations in 2025 are for Togo (52%) and Burkina Faso (27%), and BPF Volta report (2007) total projected populations are roughly 10% higher than projections cited above. As a larger number of growth increments are provided in the GEF (2002) projections, and in order to achieve consistency between water demand and population growth projections, this report's discussions are based primarily on the GEF (2002) and WARM (1998) data projections for 1990-2025.

Fig.9. Projected growth in national demand for water in the Volta River basin (1990-2025)

Source: WARM (1998), GEF (2002)

As discussed in the first report, while Burkina Faso and Ghana have jurisdiction over the largest part of the Volta Basin surface area (42%, and 40%, respectively), recall that almost half of neighbouring Togo and 15% of Benin fall within the watershed as well. As might be predicted, Ghana and Burkina Faso (which are also the most populous nations) consume the largest amounts of water in the basin at $729 \times 10^6 \text{m}^3$, and $335 \times 10^6 \text{m}^3$, respectively (**Table 4**). However, when water consumption is analyzed on the basis of per capita consumption, Burkina Faso's year 2000 consumption of water is the lowest in the basin (37.8m^3), while the top per capital consumers are Benin (522.3m^3) and Mali (356.8m^3) (**Table 4**). Due to inadequacy of national water supply and treatment infrastructures, demands on water supplies (primarily for domestic/industrial, irrigation, and livestock use) are not fulfilled at present in most countries and demand for water is projected to grow by 389% by 2025 for the basin over 2000 demand levels according to Barry et al. (2005), and GEF (2002) (**Fig.9**).

Ghana, which in 2000 consumed roughly 42% of the total water resources of the basin, is projected to remain the single largest consumer of water (especially for irrigation and industrial/domestic consumption) with per capita growth in demand of 576% over 25 years (**Table 4**). However, the greatest relative increases in demand for water by 2025 are projected to occur in Cote d'Ivoire (an increase of 1120% over year 2000 per capita consumption) and Benin (an increase of 792% over year 2000 per capita consumption). While Cote d'Ivoire's overall consumption will nevertheless remain of negligible importance in absolute value terms, the forecasted growth in Benin (primarily for increased irrigation and domestic/industrial use) will result in it surpassing Burkina Faso as second-largest consumer of Volta River water resources (at 26.7% of the total water consumption) (**Table 4, Fig.9**). None of the countries predict any absolute or per capital declines in water consumption, however the arid Sahelian nations of Mali and Burkina Faso, and the coastal nation of Togo claim the most modest increases of 4.8%, 45.1%, and 20.7% increase over population growth.

In all Volta River basin nations, the single largest planned source of growth in water consumption is for irrigation (GEF 2002). Secondly, the coastal nations of Ghana, Benin and Togo anticipate modest growth in industrial/domestic uses, and Mali and Benin anticipate the modest amounts of growth in livestock production (GEF 2002). Obviously, any growth in consumptive uses of water among these countries may represent significant threats to the fish stock productivity that depend on these rivers, lakes and wetlands, and to the sustainability of the water resource-dependent livelihoods (such as fishing and farming).

In addition to consumptive uses of water, “non-consumptive” uses of water for generation of hydropower is pivotal for the economic development of many of these nations. While not strictly “consumptive” (as in removing water that cannot then be used for other productive purposes), any proposed construction of new dam in one country will have significant effects on both consumptive and non-consumptive uses of water in areas and countries that lie downstream (Rodgers et al. 2007, Barry et al. 2005, GEF 2002, Andah et al., no date). Even within countries, governments are struggling to balance the needs between different consumptive uses (industry/domestic use vs. irrigation) and that of hydropower generation which is essential for electricity production and are presently unable to fulfill any of these demands sufficiently or sustainably (Rodgers et al. 2007, Barry et al. 2005, GEF 2002, Andah et al. no date, Phillips 2007, Lemoalle 2007).

Numerous studies have documented widespread changes in landscape use in the Volta basin as native vegetation and forests are cleared for farming (GEF 2002, Gyau-Boakye 2000, Barry et al. 2005, Asante 2006). These changes may result in a number of significant ecological changes that can have profound impacts:

- land-degradation (erosion of the productive topsoil, increased evapo-transpiration of soil moisture, decreased infiltration of rain water); resulting in
- threats to some fish stocks (through siltation of river spawning beds, increased water temperatures), and
- threats to nearby communities (flash-floods in the rainy season and drying of riverbeds in the dry season, and drying up of the groundwater aquifers).

Although the same cannot be said for all countries in the Volta basin, there are some indications of positive overall economic growth in Ghana, and predictions are that poverty levels will continue to decline in the decades to come (Claydord 2005). However even within Ghana, economic growth is highly uneven and extreme poverty remains the rule among the rural, agricultural and Northern populations who live primarily from the production of a single agricultural growing season (Andah et al. no date, Claydord 2005). Similarly, the last decade of overall economic growth in Burkina Faso, due primarily to expansion of cotton exports, has benefited a small proportion of the nation’s population while by-passing a majority of the rural and urban poor (Grimm and Gunther 2004). Overall, food production is expected to become increasingly critical as rural food production struggles to supply sufficient staples to compensate for the difference in rural to urban population growth (170% vs. 390%, respectively, between 2000-2025) (Lemoalle 2007).

Predominant Climate trends in the Volta Basin

Much of sub-Saharan West Africa is located in what is known as the Inter Tropical Convergence Zone (ITCZ, also known as the Inter Tropical Discontinuity, or ITD), an area where humid monsoon air masses from the Gulf of Guinea meet with the hot, dry Harmattan winds originating in the Sahara desert. The north/southward movement of the ITCZ is determined by the position of the sun, and modulated by the African Easterly Jet (AEJ) and the Tropical Easterly Jet (TEJ), and results in characteristic seasonal rainfall patterns across West Africa (Jung 2006). As the ITCZ moves north from the Equator, the first rains start to fall along the coastline of Ghana in March, and reach the Sahel region of Burkina Faso by April-May, with rains reaching a peak in June-July and August, respectively. From a maximum latitude of around 23N, the ITCZ then once again moves southwards, and creates a second peak of rainfall across many parts of Ghana (but more so in the South) in August-September (Rodgers et al. 2007, Andah et al no date, Jung 2006). At the northern (Burkina Faso's Sahel) and southern (the Ghanaian coastline) extremes of the Volta Basin, average estimated rainfall are 500 mm/yr and 1500 mm/yr, respectively (Barry et al. 2005, Oguntunde et al. 2006).

In addition to being prone to inter-annual and inter-seasonal variability, historical rainfall records in sub-Saharan West African showed strong inter-decadal variability during the last century (Jung 2006, Nicholson et al. 2000), and analyses of historical phenomena associated with climate variability (such as droughts, floods, harvests, and hydrological indicators) indicate that such variability has been present across Africa for at least 2 centuries (Nicholson 2001). Analysis of the last century's pattern of rainfall indicates that differences in rainfall between "dry" and "wet" years may reach as much as 50% (Jung 2006). Within this variability, Nicholson et al. (2000) identified three distinguishable climatic periods between 1896 and 1990 (since when reliable meteorological records were first kept in West Africa):

- 1896-1949 – an apparently random succession of dry periods, "normal" periods and wet periods;
- 1950-1969 – a series of wet years, except for 1968;
- 1970-1990 – a series of overall dry or very dry years, except for three years.
- Since 1990, dry but less than 1970-90

The current regional drought that has lasted over three decades has been analyzed by a variety of scientists (Lebarbe et al. 2002, Servant et al. 1998, Amani 2001, Nicholson 1993, 2001, Hulme et al. 2001, see also refs in Lemoalle 2007), and the 1980s were identified as the driest decade of the past century (Nicholson 1993). Though pointed to as a sign of local land-use change impacts on climates ever since the 1970's (Charney et al. 1977, Lamprey 1975, Opuku-Ankomah and Amisigo 1998), Nicholson (2000) and Brooks (2004), argue that this drought is not necessarily a sign of anthropogenic activities causing climate change (see also Lebel et al. 2000), noting that similar periods of drought are known to have taken place in the 18th and 19th centuries. Indeed, sea surface temperature is well-accepted as the primary determinant of the monsoon rains in West Africa (Nicholson 2000, Brooks 2004, Lamb 1978a, b, Druyan 1991, Vizy and Cook 2001, 2002), and a review of recent research by Brooks (2004) suggests that rather than land-use changing rainfall patterns, changes in land-use are primarily *determined* by shifts in the ITCZ. At lower scales, however, there is

extensive evidence that local changes in land-use (by their impacts on vegetation cover, soil moisture, and albedo) may play significant roles in determining the *persistence* of rainfall regimes (Brooks 2004, Wang and Eltahir 2000, Walker and Rowntree 1977, Zheng and Eltahir 1997, Jung 2001, Nicholson 2000, Oguntunde et al. 2006). The removal of natural vegetative cover through intensified traditional agricultural practices such as slash-and-burn are also known to decrease the capacity of water to infiltrate the soil, promoting runoff, erosion, river siltation, and flash floods (GEF 2002, Gyau-Boakye 2000, Barry et al. 2005, Asante 2006).

The complex interactions between different climatic influences means that predictions of climate change are necessarily to be taken with caution, and most climate change models are poor predictors of unpredictable non-linear climatic shifts (Brooks 2004). However, two studies (Jung 2006, Andah et al. no date) used simulations of global climate change trends to forecast their impacts on weather in the Volta basin over the course of the next half century (using disaggregated global climate change models). Primarily due to a 0.5-1C predicted rise in sea surface temperature, a small increase in rainfall is anticipated for four out of five simulations modelled (collectively, between the two studies), conclusions that are also supported by Maynard et al. (2002). Both studies also forecasted an increased inter-annual variability in rainfall. Jung's (2006) predictions also include:

- an increase in average temperature between 1°C (along the coast) and 1.5 °C (in the Sahel), particularly in Apr-May and Nov-Dec. although Hulme et al. (2001) predict that overall temperature change in Africa may be as high as 2-6 °C)
- a delay in onset and ending of rainy seasons between 3.5, and 9.6 days along the coast and in the Sahel, respectively
- a shift in the peak of the rainy season from July-Aug to Aug-Sept, producing a peak runoff shift from August to Aug-Sept
- an overall southward shift in the rainfall dipole pattern, making more of the Volta Basin dependent on a single rainy season (see also Thornton et al. 2002).

Impacts of climate trends on Volta Basin fish stocks

Overall, the above studies indicate the probability of some increase in rainfall in the Volta basin, though the associated increased air temperatures will cause a significant proportion of increased rainfall to be lost to surface evaporation and plant transpiration. Based on analyses of historical river discharge and precipitation data, Andreini et al. (2000), Obeng-Aseidu (2004), and Andah et al. (no date) have shown a non-linear relationship between precipitation and river discharges in the Volta basin. This non-linear relationship suggests that even small increases in runoff should translate into disproportionately large positive changes on river discharges. Such models would predict a reversal of the declining runoff trends seen during the last half century (presented in the first report, also see Abe et al. 2004)..

Of course, all predictions based on climate change and population growth models must be taken with extreme caution, and erring on the conservative side is recommended. Additionally, these predictions represent average outcomes across the Volta River basin and may therefore inform large-scale regional interventions, but should be used with extreme caution for any planning of interventions at local levels.

As discussed in the first part of the report, the influence of water levels on biological productivity in lakes and reservoirs remains a subject of ongoing debate. Most authors, however, support the growing evidence in African reservoirs and lakes for the applicability of the “flood-pulse” concept where seasonal flooding is regarded as being a major driver of biotic productivity (Junk et al. 1989). Combined with predicted overall increased rainfall levels, an increase in the variability of rainfall in the early rainy season in less human-altered landscapes might therefore have a positive effect on the maintenance of highly heterogeneous landscapes and rich biodiversity (Allan 2005a). However, given the wide range of landscape types and uses in the Volta River basin, impacts are likely to differ based on local patterns of land-use, and where ecosystem and ecological community resilience is diminished by intensified land-use, increased variability in flow dynamics may instead be harmful to biodiversity.

Such impacts are also likely to affect different fish species in different ways due to trophic interactions and habitat-requirements. For instance, the pressure on top piscivore predators from over fishing makes them particularly vulnerable to extinction due to habitat degradation and/or increased environmental fluctuations. At the same time, their demise may be a boon to (generally) smaller piscivorous fish or herbivores that consequently face less predation, and the overall catches of fishers may actually appear to increase in both species diversity and in biomass. Additionally, while some potamodromous species (fish that migrate to the headwaters of rivers to spawn) are likely to be some of the early losers in the face of large scale land-use change due to reproductive habitat constraints, some catfish that migrate horizontally (from the river course into nearby flooded forests and swamps) might benefit from conditions of increased water flow fluctuation. Regardless, any decrease in the complexity of aquatic food webs should be regarded as a loss to ecosystem resilience. As such an ecosystem becomes less able to adapt to new climatic or human-induced changes or to recover from sudden shocks (Welcomme et al. 2006, Allen 2005b).

A similar line of reasoning is likely to be applicable in relation to the impact of the projected shift in peak rainy season on fish stocks; i.e., where aquatic ecosystems remain resilient, individual species should be able to adapt to a delayed rainy season. However, where a particular species faces pre-existing pressures (for example by water diversions for agriculture) and where repopulation by nearby populations is limited by the presence of dams, the potential for negative synergies between increased variability in the early season rains and a delay in the rainy season start may result in local extinctions of species.

In terms of biological productivity, however, the likely increases in river flows combined with increasing intensification of land-use (for agriculture) is likely to result in increased nutrient-loading of streams, lakes and reservoirs. When combined with even small increases in water temperature (due to increased air temperature), a growth in primary production becomes highly likely. It remains highly unpredictable how existing fish species assemblages will react to such changes. This predictive limitation is reinforced due to an overall lack of scientific consensus regarding whether Volta Lake is meso-eutrophic or oligotrophic in terms of its nutrient richness (discussed in the first part of this report).

Finally, the benefits from increased rainfall would also extend to inland communities through the creation of more wetlands throughout the landscape. Although they fall well-below the analytic gaze of national economic production statistics, fish catches from these smaller wetlands are frequently of particular nutritional importance for poorer agricultural households that are less able to purchase fish or other sources of protein (Sarpong et al. 2005, Savy et al. 2006, Gordon 1987). The increased variability of rainfall, however, is also likely to simultaneously increase interest in land-conversion of existing wetlands into farmland (see below).

Impacts of climate change on integrated rural fishing livelihoods

While future predictions of rainfall may possibly result in increased future fish harvests (at least in the short term), the success of fisherfolk to emerge from extreme poverty (as discussed above) depends greatly on their abilities to invest their profits in diversified livelihood activities and the affordability of dietary staples that many of the poorest fisherfolk are required to purchase. Jung (2006) expresses particular concern over the likely impacts on farming activities of the predicted delay in the onset of the rains combined with an increased inter-annual variability of rain during the early rainy season.

For the small proportion of fisher-farmers who can afford to irrigate their (primarily cash) crops in times of water shortage, the decreased reliability of early rains may (further) improve their comparative livelihood advantage over those farmers who may be forced to delay planting. In addition to impacts on cash crops, however, similar risk-averse farming strategies are likely to decrease the production (and raise the prices) of staples during the time of the year when the more vulnerable fishing households will already have exhausted their food/cash reserves (Sarpong et al. 2005, Grimm and Gunther 2004, Gyau-Boakye 2000). The poorest fishers tend to have less staple reserves and experience their greatest shortages between February-May, after which the early rains bring some respite through the reproduction of fish stocks (Pittaluga et al. 2003a). Regardless, the cost of staples remains elevated until the first harvests in July-August, and any negative synergies between delayed rainfall and increased variability in rainfall may have catastrophic results for this segment of the population that lacks both access to farmland and ownership of fishing gears. It is during these months that increasing numbers of fisherfolk may be forced to make difficult choices between expenditures on food, health care, education, etc.

Overall, one may expect increased uncertainty in rainfall during the early rainy season and the predicted southward shift of the rainfall bipole to result in overall negative long-term impacts on the productivity of the land through the effective shortening of the growing season. Due to the increased variability of rainfall, as they have done in past times of climate variability, fisher-farmer livelihoods are likely to become less diversified as they increasingly turn to activities such as fishing, both to cover year-to-year short-falls in order to purchase staples or pay for medical/educational expenses, and in order to earn capital for the increasingly necessary fertilizer and/or irrigation of agricultural plots (see above and GEF 2002, Gyau-Boakye, 2000).

Finally, competition over access to land, which is typically defined by overlapping and competing claims whose legitimacy are mediated by traditional institutions

(discussed above), has increasingly become a source of intra- and inter-sectoral conflict. While such conflicts between farmers and livestock owners have always been an issue, fisherfolk have also increasingly come into conflict with farmers seeking to cultivate seasonally-flooded portions of lakeshore and wetlands (Barry et al, 2005). Though poorly documented, conflicts between fishers and farmers over wetland use, as well as conflicts between fisher groups over the desirability of particular fishing methods and (to a lesser degree) access to fishing grounds, have close associations with allochthonous-autochthonous identities (SFLP 2001, Ofori-Danson 2005). Given any increased polarization of livelihood strategies amidst an overall increased livelihood vulnerability, it is likely that these various sources of conflicts will continue to grow. Though of lesser concern at present, the growing interest among the local population in the nascent cage-culture fish farming methods should be planned and monitored carefully in order to avoid the creation of additional conflicts following the introduction of restrictions to access of fishing grounds, and friction due to these new ‘entrepreneurs’ necessary protections of the product of their cages from being poached.

Overall impacts of climate change and population growth on fisherfolk

Overall, climate trends, and their associated ecological and social impacts can be expected to have mostly negative impacts on the livelihoods of the poorest of the fisherfolk. While increased rainfall is likely to have a positive impact on the overall biological productivity of fish stocks (though not necessarily of the most “desirable”), and while human population growth will increase demand for fish, the increased rural vulnerability to climatic shocks and rising prices for staples may result in an overall higher threat for fisherfolk livelihoods. At the same time, population growth combined with increased climatic uncertainty is likely to lead to continued increasing pressure on arable land, and may hamper fisherfolk attempts to diversify livelihood strategies. Conflicts over access to fishery resources and the use of specific fishing methods can be expected to increase as well (particularly where allochthonous and autochthonous methods differ significantly). Overall, unless external agencies proactively target the socio-economic development of the lakeshore through the extension of services (particularly in extension, health, education, transportation and credit services) to these (largely neglected and isolated) populations, the limited data available appears to indicate that the resilience of the poorest fisherfolk sub-populations’ (who also form the majority of fisherfolk) livelihoods to recover from normal climatic and economic variability and shocks will continue to be eroded.

Conclusion

The original objective of this report was to address the following two questions:

- Are there any households amongst the poor and poorest living in the Volta Basin that are engaged in the fishery sector, and if so what is/are the reason(s) for their ‘poverty’?
- Which solutions in relation to the water management and watery resources can be proposed to improve the livelihoods and living conditions of these poor fishing households in a durable way (horizon 2050)?

The information available through the literature on the Volta basin allows a certain number of conclusions regarding the first of these two questions. Those conclusions will be discussed below. Based on those, a series of recommendations will be proposed in an attempt to identify ways in which the livelihood of the fishing communities of the Volta Basin can be improved. Following will be a last section where the implications that these different findings and recommendations induce in terms of research priorities, will be discussed briefly.

Poverty in small-scale fisheries

Main findings

The first and probably more important conclusion is that there is no systematic, nor clear relationship between fishery and poverty in the Volta Basin. The data shows that ‘fishing households’, regardless of whether the term includes simply full-time fisher families, or more broadly, households with one or several members partially or totally involved in some fish-related activities (fishing, fish processing or fish trading), are not necessarily the “poorest of the poor” in the basin. What the data also shows, however, is that fishing does not seem to be the way out of poverty either, at least for the largest part of the basin fishers. With perhaps the exception of one or two households who do have some fish-related activities –amongst a larger portfolio of diversified activities- and do remarkably well, fishers in general, are not within the top fraction of the well-off population.

The second major conclusion that should be highlighted is that fish-dependent communities extend far beyond the boundaries of the small fishing camps from which a few dozen of full-time professional fishers operate. The general perception (unfortunately widespread amongst policy-makers and researchers in agricultural and/or water management sciences) that fishers are simply those ‘over there’ spending their entire life on a boat denotes a very poor understanding of the economy of households and communities living close to these water-bodies (lakes, reservoirs, rivers, seasonal ponds). Indeed, as was clearly illustrated by the case of Bagré reservoir where only a minority of households (mainly migrants) are engaged in full-time fishing, more than 70% of the entire local population around the reservoir and its vicinity are involved in fishing to some degree. Usually for those households, fishing-like dry season cultivation, small-scale irrigation of vegetables, or seasonal migration- is an extra opportunity that allows people to generate some marginal additional cash, making them less ‘worth-off’ than households only engaged in rain-fed agriculture.

What the analysis failed to show, though –due to the lack of quantitative data in the literature-, is that the contribution of this fishing as a complement to the main farming activity is worth much more than the market value of the few fish that these farmers-fishers catch. Where household quantitative data are available, analysis shows the many different contributions that small-scale fisheries can play in terms of household nutritional security, maternal and young baby health, women’s economic empowerment, and household income or livelihood security (see e.g. Béné 2004 and Heck et al. 2006 for reviews). In particular, by generating cash at critical periods of

the farming calendar, the few fish sold on the local market allow farmers to reduce the seasonal effect of the '*soudure*'²⁴ or even to purchase the input (fertilizer, labour, tools) that will be crucial for the success of next year entire crop.

Full-time migrant or local seasonal fishers?

Another important element highlighted by the Volta Basin poverty analysis is the recognition of the mobility that characterize the life style of a large number of fisherfolk, and the co-existence in many of these fishing communities of local and migrant (or autochthonous versus allochthonous) 'fishers'. While this distinction autochthonous-allochthonous largely overlaps the full-time versus seasonal nature of the activity, this overlap is not complete, as some local fishers may also be full-time engaged in the sector. The distinction however is important as it plays a critical role in highlighting the exclusion or marginalization that often characterises the day-to-day life of a large number of migrant/allochthonous communities, thus potentially greatly impacting their overall well-being. Indeed, what the Volta Basin data confirmed is that a large part of the 'poverty' that affects fishing communities is not related to their level of income but rather to their social and/or political marginalization. This is true around the Volta Lake where it was observed that very few of the fishing villages have decent access to sanitation facilities, tap-water, school or formal credit facilities. This was also observed around Bagré reservoir, where even if access to these facilities is better (as Bagré reservoir is not as isolated as some part of the Volta Lake shoreline), the full-time migrant fishers are clearly marginalized by the rest of the local community.

In line with the point above, the question of whether professional -and often, but not always- migrant fishers are better-off than fisher-farmers is another possible entry point to tackle the question of poverty in small-scale fishery communities. While some element in the Volta basin analysis suggests that full-time fishers can be 'richer' than fisher-farmers –as seems to be the case for the successful winch-net boat owners- thus confirming the widely accepted view that full-time 'professional' fishers are more efficient and thus likely to be better-off than seasonal farmers-fishers (see e.g. Morand et al. 2005), it seems that in many other occasions full-time fishers are just barely able to maintain themselves above the poverty line. Hence, on the same water body where some very successful full-time fishers operate, other subgroups of full-time fishers appear to belong to the poorest of the poor in the communities, just earning enough to feed their family with great difficulty. Trying to classify, or to explain, success (or failure) of fishers based on their 'full-time' or 'seasonal' status does not, therefore, provide a satisfactory framework to improve our understanding of the cause or origin of poverty in small-scale fisheries. It does however highlight a factor that seems to be at the center of the process of poverty prevention²⁵ in rural communities. This factor is diversification.

²⁴ La '*soudure*' (literally the 'seam' in West African French) refers to the critical period between the end of the dry season and the beginning of the rainy season (May - June) when the main rain-fed crops (millet, rice or maize) of the previous season have been exhausted or sold out and the new harvest is yet to be completed.

²⁵ 'Poverty prevention' refers to the role of safety-net played by certain institutional processes and/or economic activities in helping households to maintain a minimum standard of living and preventing them from falling any deeper into destitution in a general context of *vulnerability* (Béné 2004, p.11)

Diversification and alternative livelihoods

A growing literature in fishery sciences highlights the importance of 'alternative livelihoods' and diversification as key elements in the general equation on poverty in small-scale fishing communities. Both theoretical and empirical foundations for livelihood diversification as a major strategy for risk management and poverty prevention have also been largely documented in agriculture and farming system literature (Reardon et al. 1992, Ellis 1998, 2000, FAO 2002). Data from the Volta basin confirms this. The ability to diversify their sources of income and types of economic activity seems to be a key factor in determining local communities' poverty status. On the shore of Volta Lake for instance, those who depend solely on fishing are to be found predominantly in the very poor group. Similarly, as mentioned earlier, the full-time fishers of the Bagré reservoir seem also to be amongst the poor of their community. This 'destitution', however, is not specific to fishers, as 'full-time' share-cropping farmers are also amongst the most destitute households of the Volta Lake communities. In other words, these fishers are not poor because they are fishers, but because (like those share-croppers) they lack the opportunity to diversify their activity –thus making them highly vulnerable to any shock that may affect their unique activity: bad weather, loss or destruction of fishing gear, fluctuation of the stock, etc. This finding highlights the importance of the other dimension of poverty pointed out by the PEV framework, that is, vulnerability₂ and raises the interesting question of whether small-scale full-time fishers are mainly chronically poor due their low productivity or mainly vulnerable to poverty due to their dependence on one single economic activity. Much more research will have to be conducted before a clearer understanding of this issue is achieved.

Economic water productivity

Identifying the potential factors that contribute to the economic success of small-scale fishers also raises the question of the role of productivity in small-scale fisheries and the potential links that exist between fisheries productivity and poverty. While there is no doubt that in the long run, households who are able to acquire more efficient fishing gear are more likely to increase their catch, it would be misleading to assume a direct, causal, relationship between the use of efficient fishing gear or techniques (e.g. winch-net and boats, or *acadja*) and the success of specific groups or individual households. Indeed, ownership of those more efficient fishing gear is probably more the consequence, or the symptom of success, than it is its cause. Explaining economic success of fishers merely by their acquisition of more efficient fishing gear misses the original step that had made these fishers able to purchase these more efficient fishing gears in the first place. This critical first step is essentially related to the levels of financial capital of the family/household to which the fishers belongs, that in turn results from a combination of different but correlated factors such as social network, overall family endowment, savings, and education. All of these factors, however, are closely linked to a certain level of trans-generational wealth -if your family is wealthy you are more likely to be able to become a 'rich' fisher- highlighting the relevance of the definition of chronic poverty as recently proposed by some scholars (Green and Hulme 2005).

On the other hand, within the time-scale of a generation, access to financial credit is probably one of the most limiting factors that determine whether or not poor people will be able to lift themselves out of poverty. If one can access credit, one is more likely to be able to seize the opportunity to invest, for instance in the case of fisher, in adequate fishing equipment. Unfortunately, as illustrated by the Volta basin data, a large number of rural fishing communities along the shores of the Volta Lake or in many other rural areas have still very poor or no access to formal credit facilities, exposing these fishers to potentially exploitive ‘deals’ with informal local creditors, or simply making them unable to reach the minimal investment level that would pull them out of the low productivity level in which they stagnate. To some extent the poverty trap as understood and described in conventional agricultural economics (e.g. Devereux 2001, Sachs 2003) is therefore applicable to small-scale fisheries. But the *root* cause is not the low productivity of these fishers, the *root* cause is an acute economic and institutional marginalization of the fishing communities that does not allow them to access economic institutions (credit markets) or makes this access too costly transactionally or economically for the poorest, thus excluding them from the productive part of the fishery. Here again the examples of Bagré and Volta Lake where only a minority (the better-off) are able to engage with formal credit institutions (rural banks) is a good illustration of a situation which, in fact, affects the majority of small-scale fishers in the Volta Basin and certainly in a large number of countries across the developing world.

The last few lines of the above paragraph suggests that enabling fishers to increase their productivity is indeed an important factor for poverty reduction, as it is in agriculture in general. And the example –once again- of the winch-net boat owners of Volta Lake does confirm this point. But the fact that those winch-boats owners represent only 1.2% of the total estimated fishing population reminds us that fisheries share with other common pool resources some characteristics that differentiate them fundamentally from agriculture: they are based on finite resource-bases (Bailey and Jentoft 1990). As such, they sit very uncomfortably in the new ‘water-productivity’ discourse that drives a large part of the current agricultural research. One cannot simply advocate for a new ‘blue revolution’ in small-scale fisheries similar to the ‘green revolution’ that lifted millions of Asian small-scale farmers out of poverty²⁶. In fact as pointed out earlier in this discussion, poverty reduction in small-scale fishing community is only very loosely related to direct increase in fisheries (or water) productivity *per se*²⁷. In reality, most of the potential for major progress in poverty reduction in fishing communities is related to other factors, outside the conventional productivist domain. In particular, it was extremely illustrative to observe that in both Volta Lake and Bagré reservoir’s fishing communities, the first source of crisis that was identified by the respondents was not the lack of fish (as conventional fishery managers would have predicted) but... health issues.

²⁶ As a matter of fact, the term ‘blue revolution’ is usually restricted to aquaculture where indeed dissemination and transfer of technological innovation seem to be the main avenues to increase water productivity, as they had been in agriculture during the green revolution. In that case, the use of the analogy ‘blue – green revolution’ is indeed appropriate.

²⁷ Unless of course one includes in this ‘water productivity’ aspects of marketing and post-harvest activities. See recommendation section below.

To pre-empt the recommendation section below, this last result suggests some fundamental shift in the way fisheries managers, donors and researchers conceive poverty interventions in small-scale fisheries. For fisheries managers and donors it means that there is a need to recognize that interventions aimed at improving access to health facilities, and more generally, access to public services and institutions (transport, education, water, electricity, financial credit) may have deeper impacts on the livelihoods of fishing communities than interventions aiming at improving fishery productivity. For fisheries researchers, it means that there is an urgent need to document and analyze the current policy processes with the ambition to improve our understanding of how policy and governance mechanisms could support and trigger these institutional changes. This research would, however, have also to integrate the new, increasingly challenging, context in which fisheries operate -an environment where central governments are disengaging from their role of provider of public goods; extension and national research agencies are facing drastic reduction in their budgets, thus becoming more and more limited in their capacities to assume effectively their share in monitoring and managing the fisheries; and targeted communities (the fisherfolk) are largely marginalized in the water and agricultural/rural planning processes.

Impacts of future trends

Finally, our last concluding comment concerns the main outcomes of the trend analysis and the ways these outcomes are expected to impact fishing communities in the next three to four decades. Currently, fishing communities are facing some increasing challenges. Water availability (through rainfall) has been globally decreasing over the whole Volta basin, reflecting the drought that has affected West Africa and the Sahelian Belt in general since the 1970s. At the same time population is growing, leading to increasing pressure on, and growing demand for, natural resources. In particular, common pool resources are being eroded in most parts of the basin, with direct and indirect implications for fisheries. Direct implications, as the local and urban demand for fish is likely to increase further and the number of unskilled young men who turn to the fishery as a source of income will continue to increase, due to the difficulty for this labour force to find employment in other sectors; and indirect implications, as the continuous erosion of other CPRs (forest, rangeland) will lead a greater number of poor households to turn to on the fisheries to compensate for the loss of these other CPRs.

Paradoxically, the analysis of the climate change scenarios suggests that some of these trends may reverse in the future. In particular, rainfall may possibly increase in the region, which could overturn the negative trend that has been affecting water availability in the recent decades. This increase in overall rainfall is however predicted to be accompanied by an increase in the variability / unreliability of the rainfall pattern. The overall effects of these changes for fisheries are difficult to predict especially at the local level. While water-bodies across the basin may see their natural productivity increase due to greater amplitude in intra and inter-annual water level fluctuations, the higher unpredictability in the rainfall pattern will certainly also increase the vulnerability of the poorest portion of the farmer communities, in particular those who do not have access to irrigation, leading them to turn to fisheries as a safety net.

Recommendations

Based on the above conclusions, a series of suggestions can be made on what to do (or not to do to do) to improve the livelihoods and living conditions of the poor fisherfolk of the Volta Basin.

What not to do...

The data has shown that the general level of poverty of the population within the Volta basin is very high and the geographical and economic isolation acute (in particular for some part of the Volta Lake). For most of the households, both farming and fishing activities are characterised by extremely low productivity levels. In addition, institutional and financial constraints (e.g. lack of access to credit, high transaction costs due to frictional distance²⁸ to markets) have eroded further the potential margin of profit of the producers, hindering investment and adoption of more efficient techniques. This creates a vicious cycle of low productivity \Rightarrow low profit \Rightarrow low investment \Rightarrow lower productivity, eventually forcing the less successful households to fall into a classic poverty trap. At present, these extremely low-income groups have very little, if any, flexibility, to reduce their fishing effort. In this context, trying to impose fishing regulations in an attempt to address the reported over-exploitation of the resources would in reality affect only negatively the already very fragile economic activity of these households and potentially run against the initial poverty reduction objective of the intervention²⁹.

Increase in water productivity

Is ‘increase in water productivity’ a viable option to improve the livelihoods of the poorest amongst fishing communities in the Volta Basin? The answer is Yes but only if “water productivity” is not interpreted in its agricultural, conventional (productivist) dimension and does not in particular promote technological and/or capital intensification of the fisheries. Instead, the ways to increase water (or fisheries) productivity in a pro-poor manner in the Volta Basin lies essentially with four types of interventions:

- community-based stock enhancement in small and medium reservoirs
- improved post-harvest management and marketing
- improved access to financial credit for the poorest
- non-farm livelihood diversification

Improving water productivity through stock enhancement

Experts agree that the largest potential for increasing inland capture fisheries in Africa lies in the enhancement and culture-based techniques (stocking) of reservoirs and

²⁸ Frictional distance = time \times distance

²⁹ Notwithstanding the fact that such intervention would have very little chance of success as the local population would show very low level of compliance.

natural lakes (Brummett 2006, Kolding and van Zwieten 2006, Sugunan et al. 2007). In effect, when compared to Asia, most of the reservoirs in Africa seem to be ‘underfished’ and well below their maximum productivity potential (Duncan 1999)³⁰. This suggests untapped possibilities of increased production through more effective management, stock enhancement, or even species introduction. In that respect, empirical experience shows that small and medium reservoirs are potentially the most promising water-bodies for enhancement techniques. The Volta basin, due to the presence of several hundreds of these small and medium reservoirs (essentially irrigation reservoirs in the northern part of the basin), can largely contribute to this development option. Recognizing this initial potential, a German Cooperation (GTZ) project had been implemented from 1988 until 2002 in Burkina Faso. Similar experiences have then been reiterated more recently in Burkina Faso and Niger through the Sustainable Fisheries Livelihood Programme (SFLP 2005). All these different projects generated some success and many lessons to draw upon.

A series of caveats of course applies. To fully unleash this apparent potential and make it socially beneficial, any interventions of this type would have to be rooted in community-based approaches where the socio-economic and institutional context of the communities in which these enhancement activities take place is taken into account. Experience has shown that the changes induced by the introduction of new species or the productivity increase following the adoption of enhancement techniques may not only affect the ecological dynamics of the water-bodies, but also alter the socio-institutional arrangements that link the different actors involved in the enhanced fishery activities (Ahmad *et al.* 1998, Apu and Middendrop 1998). Mechanisms such as enclosure (i.e. privatization of the common property resources), social exclusion of one part of the community –usually the poorest-, re-appropriation by the more powerful, local, elite may annul partially or even totally the potential benefits generated by an adopted enhancement program (Ali and Islam 1998 Capistrano *et al.* 1994). The socio-institutional changes induced by these improved productivity activities need therefore to be anticipated, assessed and carefully managed.

Improving water productivity through post-harvest management and marketing

The few estimates available in sub-Saharan Africa suggest that the post-harvest losses in small-scale inland fisheries is on average 30%, (probably amongst the highest rate in the world), due essentially to the general lack of infrastructure that affects the fishery sector and also, more broadly, the remote areas where those fisheries are operating. As the data in this report showed, there is no reason to believe that the situation is any better in the Volta Basin³¹. In other words, it is probably correct to claim that the overall economic value (and therefore the economic water productivity) of the Volta basin fisheries could be increased by 30% through adequate, targeted investments aiming at reducing the institutional, technical and financial constraints that affect fish processing and marketing.

³⁰ For instance stocking small water-bodies in Burkina Faso with 20kg/ha of *Oreochromis niloticus* (nile tilapia) has been shown to increase production from 23 to 269 kg/ha (de Graaf and Waltermath 2003). More globally, productive culture-based fisheries have developed in small reservoirs in Africa with yields of up to 329 kg/ha/yr. This is still about half the productivity level achieved in some highly productive water-bodies in Asia or India.

³¹ Although field observations indicate that some efforts have been devoted to avoid losses in some of the villages along the Lake’s shores (smoking, drying, salting workshops).

These could target different stages of the marketing chain (including e.g., processing, transport, storage, micro-finance for wholesale and retail trade –see next point) thus “spreading” the benefits to a wide group of stakeholders. Indeed, the market system (value chain) is a critical determinant of how value added –and thus revenues and benefits- can be created and distributed along the chain.

Of particular importance for our pro-poor consideration is the fact that a large majority of the actors involved in fish processing and fish trading in the Basin are women –often, but not systematically- wife or relative of fishers. Any intervention in the post-harvest sector would therefore have instantaneous effects on the economic empowerment of these women but also important indirect trickle-down effects on the fishing community as a whole through their roles of wives, mothers, or credit providers.

Note finally that the caloric and nutritional benefit would be even higher than the economic gain as investments in post-harvest activities would not only reduce the losses but also improve the overall nutritional quality of the existing production to the benefit of the direct producers but also the urban consumers.

Increasing water productivity through improved access to financial credit

The third leg of this “water productivity” approach lies with the critical issue of access to (micro) credit. We recall that the issue –the lack of access to formal credit facilities and loans- affects more severely the poorest fishers or fish processors/traders who usually lack the social, economic and financial ‘backing’ to satisfy the guarantee requirements (collateral) imposed by the formal institutions. Adding to these institutional and economic constraints is the geographical isolation (frictional distance) that separates a large number of fishing communities from the –mainly urban-based- financial institutions, making the actual contact between these two parties extremely difficult. Faced with no possibility to invest in a new fishing gear to replace the old ones, or to purchase larger amount of fish to reach the minimum economically viable threshold, these individuals (fishers, fish processors, fish traders) are condemned to stagnate in low productivity activities.

To reverse this situation, interventions are needed that improve the access to micro-credit and loan facilities for these categories of small-scale entrepreneurs. The most appropriate solution for each community is likely to reflect the local-specificities of the existing constraints, but it is expected that those interventions should focus primarily on the formal financial system (banks, micro-credit institutions) and also systematically explore the many various possibilities offered by the informal system (self-help organizations, women tontine, local NGO program, existing fish-trader fisher arrangements, etc.).

Improving water productivity through livelihood diversification

Farm or non-farm options?

Based on the analysis presented earlier it seems natural to propose livelihood diversification as an important opportunity for improving the well-being and economic situation of the fishing communities in the Volta Basin. One or two caveats however are worth noting. First, livelihood diversification has been the object of important research in agricultural economics for many years (see Ellis 1998 for a review) and it is interesting to notice that fishing is recurrently proposed as a potential

diversification option for farmers. ‘Symmetrically’, farming is often presented as a way to diversify livelihoods for fishers! Clearly the long-term solution (for both farmers and fishers who wish to diversify their livelihood-basis) is outside these two sectors, in what is conventionally called the non-farm activities.

Promoting diversification through non-farm activities is the appropriate strategy and the importance of these non-farming activities has been re-emphasized recently in the agricultural literature (Reardon *et al.* 1992, Hazell and Haggblade 1993, Davis *et al.* 2002, Ellis 2006). The question however is: how does one promote non-farm activities in remote areas where few other economic activities other than subsistence farming or fishing currently exist? Not an easy question. Developing successfully proactive strategies that favour viable livelihood diversification in remote rural areas is in fact a major challenge which very few developing countries or regions have managed to tackle. It requires in-depth changes at various ‘layers’ of the economic and institutional matrix of the whole region/country and is likely to take place over a longer-term horizon.

Cage culture

On a shorter, and perhaps more ‘accessible’ scale, aquaculture, and in particular small-scale aquaculture, has also been more and more frequently presented as a potential avenue for fishers’ (and farmers’!) livelihood diversification. Integrated Agriculture Aquaculture (IAA) for instance that relies on the potential synergies between small-scale aquaculture activities and farming systems is often presented as one promising avenue for rural development (SCS-CGIAR 2006). However, IAA, and more generally, land-based aquaculture, requires land ownership –a constraint which is likely to exclude the poorest and/or the fishers who rarely own their own plot of land- and access to water – a condition that may become

Cage-culture (water-based aquaculture) could be a potential solution to overcoming this land ownership constraint around large water bodies, and experiments of small-scale cage culture are currently (2007) being implemented on the Volta Lake as part of the CPWF programme (CP-PN 34). Preliminary results suggest however that, despite the huge fascination that cage-cultures generate in the local community where these experiments are being conducted, the initial investment necessary to start up this activity is often out of reach for the poorest households. Experience from South and South-East Asia also teach us that the development of these small-scale cages –where successful- becomes rapidly anarchic (in particular in absence of a management agency able to monitor and regulate their development) and can generate over the period of only a few years tremendous negative impacts on the environment but also on the local community’s social and economic cohesion (e.g. Pattanaik 2007).

In short, more research on these issues is needed to determine more precisely the economic and institutional conditions under which this potentially very powerful engine of rural development can become a real and sustainable solution for livelihood diversification in inland fishing communities.

Research on poverty in fisheries in relation to water productivity

The different issues addressed in this report highlight a series of knowledge gaps and research priorities in relation to poverty and water productivity in fisheries. Those are described briefly in the last four paragraphs of this document below. A more in-depth analysis (which is beyond the scope of this study) would be necessary to address them in a comprehensive manner.

Understanding the water policy process

River and reservoir fisheries of the Volta Basin (and other part of the developing world) are highly vulnerable as they are now facing growing competition for water from other sectors, especially irrigated agriculture and hydropower. As demand grows for basin's water resources, those who depend on these fisheries need a voice in decisions on water allocation and river basin management. At present, these fisheries and the communities that depend upon them are remarkably absent from the water productivity debate. In particular very little is known about how decisions dealing with changes in water allocation and management affect the socioeconomic and livelihood value of these fisheries. This situation partly arises from an absence of a clear understanding about policy mechanisms in relation to inter-sectoral water allocation. There is need here to analyze more carefully these policy processes, in particular from the perspective of the small-scale fisheries sector.

Developing valuation tools for small-scale fisheries

More fundamentally, the lack of voice that handicap small-scale fisheries vis a vis the other economic sectors in relation to water or land uses reflects the greater lack of quality information on the full value of inland fisheries and their contribution to national and local economies. In several occasions in this report, for instance, the lack of quantitative data regarding the fish-related activities (fishing, trading) on which the communities living on the shores of the lakes, reservoirs and other water-bodies of the basin depend for their livelihood has been underscored. Without such quantitative information, it becomes difficult for national or local policy-makers to support those who claim that small-scale fisheries are important for the livelihood of local populations or that their catch contribute to the food security of poor urban dwellers. There is in this domain an acute knowledge gap and an urgent need to develop valuation tools that are adapted to the specific context of artisanal, often poorly commercialised and informal activities such as small-scale fisheries.

Better understanding the relation between poverty and small-scale fisheries

The lack of appropriate valuation tools to estimate the contribution of small-scale fisheries to national and local economy is aggravated at the micro-level by a related absence of information concerning fisher household economy and how this economy relates to their level of relative poverty. Our capacity to understand "what makes a fisher 'rich' or 'poor'" is therefore still very limited, as has been vividly illustrated by the limitation of our present analysis. A lot of the current research on poverty in fishing communities still relies on untested hypotheses and assumptions –to a degree that is unseen in other similar sectors such as small-scale farmers, agro-forestry or pastoralist communities. Unless more systematic data and information are collected about fishing households, scholars will continue to struggle in their attempt to describe and better understand the cause of the relative impoverishment (or wealth accumulation) of these communities. In this domain, a particular effort will have to be made to document the interaction –at the household level- between the different

activities in which these communities are engaged. Indeed as highlighted earlier in this report, inland fishing communities are for a large part characterised by a high degree of diversification. What is poorly understood and documented is the way households use (and ‘re-invest’) the cash generated by the sell of their catch into other economic activity (e.g. purchase of agricultural tools or input, or even labour). One of the current assumptions is that fishing is used as a ‘bank into the water’ to cover some the household’s other activities and/or needs (e.g. school fees, health expenditures). This ‘bank into the water’ function has been documented in few in-depth analyses, but need to be more systematically documented.

Identifying the socio-institutional factors supporting innovation

Of critical importance to enhance the potential positive impact of increased water productivity on poverty is the understanding of the socio-institutional conditions under which technical innovations are accepted and ‘taken up’ by local communities, in particular the poor households. While this issue is not, by far, specific to small-scale fisheries, its implication for the dissemination of small-scale aquaculture and culture-based fisheries, or even for the adoption of improved fishing and/or processing techniques, is essential. For illustration, very recent research based on 82 reservoirs in the Indo Gangetic basin revealed that where the technicalities of fishery enhancement are not mastered (that is, at the beginning of the innovation process) the factors characterising the socio-institutional context of the reservoir (e.g. the period of the leasing system, or the type of property right in place) have potentially greater impacts on the overall productivity of the reservoirs than the physical or technical factors. In those conditions, it becomes essential to improve our general understanding of these processes before policy makers and planners can design supportive pro-poor policies.

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