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Food security, nutrition and HIV/AIDS in African fisheries: emerging evidence and research directions

A Literature review

Dolf te Lintelo

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University of East Anglia

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Food security, nutrition and HIV/AIDS in African fisheries: emerging evidence and research directions

Dolf te Lintelo

A literature review undertaken for the WorldFish Centre/FAO regional project 'Fisheries and HIV/AIDS: Investing in sustainable solutions'

2008

**Overseas Development Group & School of Development Studies,
University of East Anglia, Norwich, NR4 7TJ, United Kingdom**

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Preface

The WorldFish Centre and FAO are implementing a regional project entitled “Fisheries and HIV/AIDS; investing in sustainable solutions”, funded by the Swedish International Development Cooperation Agency (SIDA) and the Norwegian Ministry of Foreign Affairs. As part of this project, the Overseas Development Group/School of Development Studies was asked to produce a literature review on ‘Fisheries and HIV/AIDS in Africa: evidence from social science, medical and policy research’. The task was to collate available data from socio-economic and medical research to identify trends in fishing communities in Sub-Saharan Africa.

This paper is the third of three parts of the literature review, which covers:

- Review of research on health service delivery and other HIV/AIDS related interventions in the fisheries sector in Sub-Saharan Africa;
- Review of social science research on risk and vulnerability to HIV/AIDS in the fisheries sector in Sub-Saharan Africa;
- Review of research on the relationship between food and nutrition security and HIV/AIDS, and how this applies to the fisheries sector in Sub-Saharan Africa.

In each area, the Review describes the main research directions and summarizes key findings, identifying key knowledge gaps as well as areas of potential linkages with promising research in related sectors.

Methodology

This report reviews the literature on food security, nutrition and HIV/AIDS in relation to the fisheries sector, predominantly in sub-Saharan Africa. Considering the limited literature on fisheries, dominant processes and factors emerging in the agrarian literature are reviewed, and assessed for their actual and potential applicability to the fisheries sector.

Aspects of food security: availability, access, utilization

Whilst acknowledging diversity between countries, regions, villages, households, and household members, it is clear that food insecurity is an important element of pervasive poverty in urban and rural communities in developing countries. Although Africa is the only continent in which overall per capita food supply has fallen over the past 30 years, often food security problems do not merely concern overall food shortages, but insecure and poorly distributed food supplies (Barnett and Grellier 2003). People enjoy food security when they have access to sufficient, nutritious food for an active and healthy life (Drimie and Mullins 2006). Food security thus entails several components, which if unbalanced, render households vulnerable to food insecurity (Barnett and Grellier 2003):¹

- food should actually be available
- people should have access to sufficient food
- supplies should be stable, and
- food should be of good and dependable quality.

Moreover, cultural norms, traditions and taboos construct what are 'appropriate' food choices, and intra-household allocations determine utilisation of the foodstuffs.

Production for personal use is a key source of food for most rural African households. For these groups, food security is partially the outcome of: food production using mainly family labour, land and other resources; food purchase using household income (often gained through sales of other farm produce); and availability of assets and social claims – e.g. being able to borrow an implement or a worker at short notice (Barnett and Grellier 2003). However, households' (and some of their members') food security may also

¹ The World Bank and international organisations such as IFPRI now distinguish between food security and nutrition security. Food security concerns the physical and economic access to food of sufficient quality and quantity in a socially and culturally acceptable manner. Nutrition security is conceptualised in a broader fashion, combining secure access to food with a sanitary environment, adequate health services, and knowledgeable care to ensure a healthy life for all household members (Gillespie, 2006; Greenblott 2007). This distinction highlights that food security may not lead to nutrition security, for instance due to poor health or improper care, ignorance, stigma, gender, personal/cultural preferences, or that food may not be used in a nutritionally sound manner. Whilst 'nutrition security' helps place food security in a wider context, it reduces analytical focus and is hence not used in this review.

be subject to food payments in kind, and the seasonality of production may imply that people need to tide over a 'hungry season'. Besides individual and household constraints (e.g. purchasing power), food security should be further understood within the context of state policy and institutions, market institutions and fluctuations and natural environments (Regional Centre for Quality of Health Care 2003).²

HIV/AIDS and malnutrition

HIV/AIDS, food insecurity, and malnutrition relate to overlapping and interacting sets of problems (Gillespie, 2006). Insecure livelihoods exacerbate the risk and vulnerability environment for HIV/AIDS, whereas similarly, HIV/AIDS can also be a cause of fragile livelihoods and food insecurity (Drimie 2002).

Poverty, which is widespread in rural areas, is often closely associated with poor nutrition and poor health. "On a global scale, probably the leading cause of increased host susceptibility to infection is malnutrition" (Morris and Potter 1997; cited in Stillwaggon 2002: 4). Hence, impoverished persons who have nutritional deficiencies, parasitic diseases, and poor health, and who have little access to health services, have greater susceptibility to infectious diseases whatever the mode of infection (Stillwaggon 2002). Moreover, nutrient deficiencies result in infections lasting longer than in well-nourished individuals (Grellier and Omuru 2008).

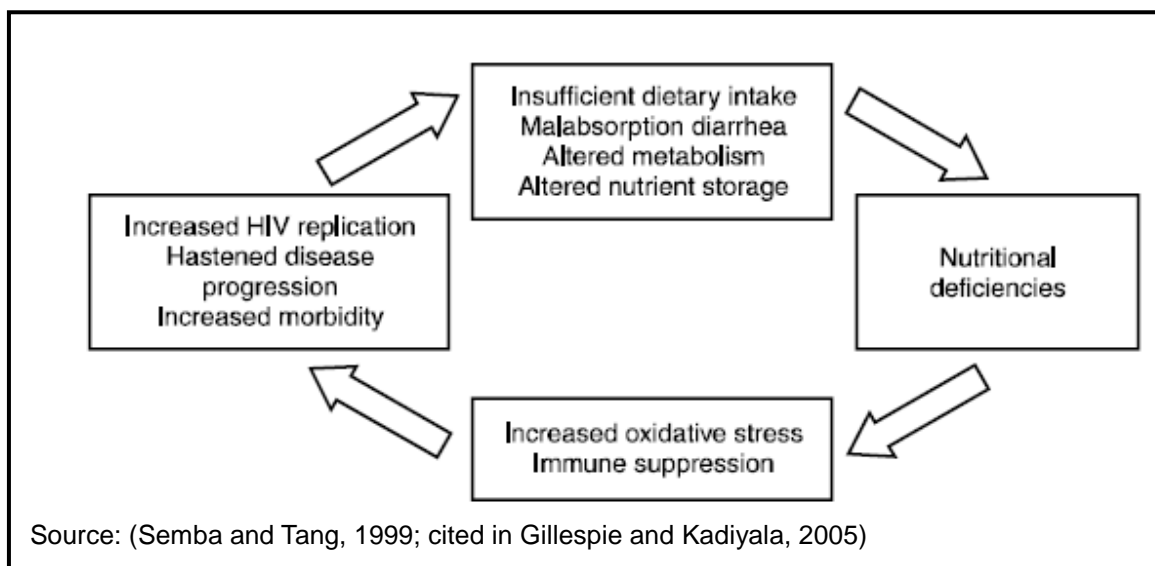
Accordingly, households and individuals that are food insecure, underfed and in poor health are more vulnerable to HIV infection and to the subsequent development of AIDS. Poor health and malnutrition weaken the immune system, which may shorten the incubation period of the virus, causing symptoms to appear sooner, particularly if no access can be obtained to health care - a situation all too common for the rural poor (Drimie 2002; Drimie and Mullins 2006).

Certain environmental health conditions prevalent in Africa are also implicated in the poor nutritional status of food insecure individuals, and are important co-factors for increased HIV *transmission* (Stillwaggon 2002). Malnutrition makes one more susceptible to endemic parasitic diseases such as malaria, schistosomiasis, sleeping sickness and intestinal parasites. These, in turn, exhaust the body's immune system and further aggravate the weak nutritional and epidemiological status. People become increasingly susceptible to opportunist infections after HIV infection. Furthermore, malnutrition may also be implicated in increasing the particular virulence of the HIV/AIDS virus in Africa (Stillwaggon 2002).

² Barnett and Grellier for instance refer to structural adjustment policies, environmental and climate change, the absence of a 'green revolution' in Africa and the crisis of state legitimacy in many rural African areas (Barnett and Grellier 2003).

Three critical processes can lead to rapidly accelerated weight loss, malnutrition and wasting for People Living With HIV/AIDS (PLWHA), due to: reduced consumption of food; impaired nutrient absorption; and changes in metabolism (Regional Centre for Quality of Health Care 2003; Greenblott 2007). During the early asymptomatic stages of the infection, HIV often affects people's nutritional status before people know they have the disease, by reducing the body's ability to absorb nutrients and complex metabolic changes. Moreover, the disease affects people's appetite, due to nausea, mouth sores, diarrhea, or the side-effects of medication and other illnesses. At the same time, metabolic requirements for energy, protein and micronutrients increase in order to fight infection and compensate for reduced absorption of nutrients (Grellier and Omuru 2008). Malnutrition resulting from food insecurity, and HIV/AIDS progression, thus sustain a vicious cycle, depicted in Figure 1.

Figure 1: The vicious cycle of malnutrition and HIV



As PLWHA may take several medications, it is worth noting that drugs may interact with each other further to reduce food intake or affect nutrient absorption and metabolism (Regional Centre for Quality of Health Care 2003). However, the impact of medications still needs to be better understood (FANTA 2007), particularly with respect for long term recipients of Anti Retroviral Treatment (Grellier and Omuru 2008).³

When considering food security, it is useful to distinguish macronutrient (protein-energy) malnutrition from micronutrient (vitamins and minerals) malnutrition. Both are common in developing countries, but whereas the former is visible, for instance by wasting symptoms, the latter is often 'hidden'. Onset of HIV/AIDS however has quite different implications for the micro- and

³ Grellier and Omuru (2008) further note that a recent literature review (i.e., Gillespie and Kadiyala 2005) failed to find evidence of whether pre-existing malnutrition reduces the efficacy of Anti-Retroviral Therapy (ART) or increases the side-effects of long term medication.

macro-nutrient requirements of affected individuals; in particular, energy rich starch and sugars are important to PLWHA (Table 1).

Table 1: Change needed in nutritional intake due to HIV infection

Nutrient	% increase above RDA needed due to HIV	Main food sources
<i>Macronutrients</i>		
Carbohydrates – starches and sugars	10% - 30%	<ul style="list-style-type: none"> • Cereals • Starchy roots and fruits • Fats, oils and sugars
Carbohydrates – dietary fibre	No change	<ul style="list-style-type: none"> • Vegetables and fruits
Fats	No change	<ul style="list-style-type: none"> • Milk and eggs • Meat, offal, poultry and fish • Fats, oils and sugars
Proteins	No change	<ul style="list-style-type: none"> • Low fat legumes • High fat legumes and oilseeds • Milk and eggs • Meat, offal, poultry and fish
<i>Micronutrients</i>		
Iron	Unclear	<ul style="list-style-type: none"> • Meat, offal, poultry and fish
Iodine	Not known	<ul style="list-style-type: none"> • Iodized salt
Zinc	Not known	<ul style="list-style-type: none"> • Meat, offal, poultry and fish
Vitamin A*	Not known	<ul style="list-style-type: none"> • Meat, offal, poultry and fish • Fats, oils and sugars • Orange vegetables and fruit
B-group Vitamins	Not known	<ul style="list-style-type: none"> • Meat, offal, poultry and fish
Folate	Not known	<ul style="list-style-type: none"> • Dark green vegetables
Vitamin C	Not known	<ul style="list-style-type: none"> • Vegetables and fruits
Calcium	Not known	<ul style="list-style-type: none"> • Milk and eggs

RDA: Recommended Daily Allowance. (Adapted from FANTA, 2007; cited in Grellier and Omuru 2008: 26)

However, there is still “a great deal of uncertainty, existing evidence suggests that protein and micronutrient requirements for adults, adolescents, children, pregnant and lactating women living with HIV/AIDS are the same as for healthy individuals of the same age, gender, and physical activity level living without HIV” (Grellier and Omuru 2008: 18). Keeping this in mind and recognising that sufficient micro-nutrient intake remains important,⁴ for PLWHA the key nutrient increase required to reduce the immediate effects of the disease concerns energy, particularly in the form of starch and sugars (Grellier and Omuru 2008). More specifically, energy requirements differ between children and adults and during a) the asymptomatic phase, and b) the symptomatic phase (Table 2).

⁴ For instance, poor maternal micronutrient status increases the likelihood of transmission of HIV from mother to baby (vertical transmission), whereas vitamin A deficiency is associated with increased occurrence of sexually transmitted infections (STI) which, in turn, increase the likelihood of transmission of HIV during unprotected sexual intercourse (Grellier and Omuru, 2008).

Table 2: Increased nutritional requirements due to HIV

Stage of HIV	Causes of reduced nutritional intake	Increased energy requirements	
		Adults & adolescents (to maintain body weight)	Children (to maintain growth)
Asymptomatic	<ul style="list-style-type: none"> • Reduced absorption of energy/nutrients 	10%	10%
Symptomatic (opportunistic infections/AIDS)	<ul style="list-style-type: none"> • Reduced appetite • Reduced absorption of energy/nutrients 	20%-30%	20%-30% (if there is no weight loss) 50%-100% (if there is weight loss)

(Adapted from FANTA 2007; cited in Grellier and Omuru 2008: 26)

Food security and nutrition in fishing communities

Unlike studies of agrarian populations, a very limited literature exists on the nutritional and food security status of African fishing communities and relatively little material addresses the presence, impacts and responses to HIV/AIDS in such communities. Most of the studies on fishing communities also focus on quite a limited area in East Africa: Lake Victoria, George, Kyoga and Edward. There is a dearth of material on food security in fishing communities in Francophone and Lusophone Africa Accordingly, where appropriate, references are made to studies of fishing communities in developing countries outside the continent, although this was not a major focus of the review. Keeping in mind these limitations, this section initially reviews findings concerning the nutritional status of fishing communities, before investigating three key aspects of food security: availability, access and utilisation.

Nutritional status of fishing communities

Evidence of malnutrition and food insecurity in fishing communities is relatively sparse. One study conducted at Tanzanian, Ugandan and Kenyan landing sites of Lake Victoria provides some insightful but also somewhat inconclusive material (Geheb et al. 2008). This study surveyed large numbers of women and children and measured body mass indexes for the former and weight, height and age for the latter.

For mothers, body mass indices showed that on the lakeshores, an average of 5.7% were chronically malnourished. This was lower than national averages in Kenya (6.3%) and Tanzania (7.9%), but higher than in Uganda (3.0%).

Table 3 presents the data for nutritional status of children, presenting proportions that are stunted (assessed by height for age, indicating chronic malnutrition); wasted (assessed by weight for height, indicating acute malnutrition) and underweight, set against the national averages of the lake's riparian states. The data present a somewhat ambivalent picture, and no indication is given whether the differences found are statistically significant. Chronic (stunting) and acute malnutrition (wasting) in the surveyed population

was both higher than national averages in Uganda and Tanzania, but lower in Kenya. However, the survey also reports that in all lakeside children, fewer children were underweight compared to national averages of the three states.

Table 3: Nutritional status of children at Lake Victoria (2002) compared to national averages for 1996–2005

Country	Stunted		Wasted		Underweight	
	Survey	National average	Survey	National average	Survey	National average
Uganda	43.3% (194)	39%	4.7% (181)	4%	17.0% (194)	23%
Kenya	26.7% (120)	38%	3.4% (119)	6%	14.9% (121)	20%
Tanzania	44.5% (236)	38%	3.4% (235)	3%	19.5% (236)	22%
Totals	40.2% (550)		3.9% (545)		17.6% (551)	

Figures in brackets refer to total sample size. Source: (Source Geheb et al. 2008)

Of additional interest, was further survey work in the hinterlands of the lake, approximately 25-35 km out, to find that in the agricultural hinterland of Lake Victoria, stunting and wasting of children was worse. Here, stunting occurred in 45.3%, compared to 40.2% at the landing sites (n=550) and wasting in 7.3% versus 3.9% (Geheb et al. 2008). However, the authors do not present the sample size for this second survey, nor do they disaggregate these additional findings by country. Hence, it is difficult to say whether disaggregation for Kenyan, Ugandan and Tanzanian lakeside communities would show quite a different picture: e.g. does Kenya provide a more optimistic picture?

Food availability in fishing communities

For fishing households, immediate availability of food depends on fish catches, and on cash earned through fish sales enabling food purchase in local markets. Supplementary livelihood activities also provide cash and in-kind outputs which help with meeting food needs. Foremost amongst these supplementary activities is agricultural production, with a smaller role attributed to livestock production.

These diverse sources all depend on access to and the abundance of natural resources (lake, land, etc.). Whilst fishermen often implicitly consider that fish will be available the next day (Geheb and Binns 1997), unsustainable fishing practices can endanger the physical availability of fish stocks, with severe implications for the food security of fishing communities (e.g. Allison 2003; Geheb and Binns 1997; Geheb and Crean 2003; Nunan 2006). The WorldFish Centre argues that African fish supplies are in crisis, with sub-Saharan Africa being the only part of the world where consumption is declining, from what is already the lowest per capita consumption of all regions. The main reason for this decline is reducing capture fish production and growing populations.

WorldFish thus advocates aquaculture to mitigate this crisis (WorldFish Centre 2005).

The availability of particular species for local markets may be affected by exports, as is the case for Nile perch. However, such exports are not necessarily responsible for food insecurity in fishing communities. In Lake Victoria, increased cash gained from exports enables fishermen to buy other (food) commodities and services. However, when Lake Victoria fish products were temporarily banned by the EU, local markets were flooded with extra fish, depressing prices, which benefited local consumers, but also reduced income for fishing families (Geheb et al. 2008).

Commercial fisheries are also linked to increased fish processing, and this may have important food security implications. About 40 percent of all processed fish is processed into fishmeal and fish oil, with the remaining 60 percent destined for human consumption. *Dagaa* (*Rastrineobola argentea*), a small fish consumed particularly by the poor, is increasingly used for fishmeal production, with estimations ranging from 50-60% of its harvest being processed this way. Previously only low quality *dagaa* was used for fishmeal production, but increasingly processing companies are demanding a higher quality product. The growing presence of industrial fish processing “is a major competitor for artisanal processors of Nile perch by-products and *dagaa*, threatening employment and protein supply among the poorer parts of the local population” (FAO 2008: 58).

Industrial fish processing also competes with local artisanal processing. For instance, the rise of industrial processing at Lake Victoria was accompanied by reduced access for local women to buy Nile perch and tilapia for their own processing. Accordingly, they either left the processing sector, or turned to processing of Nile perch by-products, such as Nile perch frames bought from fish processing factories (FAO 2008).

Availability of food in fishing communities is also significantly affected by supplementary livelihood activities that generate cash and food outputs. Although fishing takes place year-round, its importance varies seasonally. For instance, at Lake Kyoga (Uganda), strong winds constrain fishing in April/May and November, while most fish are scarce in June/July and *mukene/dagaa* is scarce in November. During such lean periods, other livelihood activities like farming are of particular importance (Allison 2003).

Indeed, mixed fishing and farming livelihoods are a common phenomenon in Africa (Torell et al. 2007; Gordon 2005). The majority of artisanal fisherfolk operate from production systems typified by both commercial and subsistence fishing, subsistence agriculture on the lake margins, and cattle grazing on seasonally flooded land (Allison 2003). For example, Luo communities dominant at the Kenyan shores of Lake Victoria diversify their livelihood portfolios over fishing, farming and livestock herding. The importance of any component varies seasonally and between years, but also in accordance with sub-clan traditions, individual preferences, and changing environmental and market conditions. For instance, although livestock is seen as an important

form of investment and wealth accumulation, rapid population growth around lakes has reduced available grazing, inhibiting livestock keeping (Geheb and Binns 1997). Increased agricultural activity is driven by declining fishing yields and income, increased theft and insecurity, fishing gear price rises, or enhanced market prices for agricultural products (Geheb and Binns 1997). Conversely, poor agricultural harvests may be compensated by a larger retaining of fishery outputs: in mixed fishing/farming systems in the Dominican Republic, drought periods made fishermen keep 20 to 25 percent of their catch for subsistence (Stoffle 2001). Hence, for a range of reasons, flexibility to shift between livelihood sources supports the availability of food to households.

It is difficult to make clear-cut distinctions between fishermen, fish traders (both men and women) and farmers. On the Kenyan shores of Lake Victoria, in 1994-95, for example, 94% of 144 surveyed fishermen also farmed. Another survey of 166 fishermen discovered that for 40% of respondents farming did not affect the amount of time they spent on the lake.⁵ The remaining 60% spent over a hundred days a year farming, and ceased fishing during this time, while 22% of fishermen spent at least half a year away from the lake (Geheb and Binns 1997). Fishermen also diversify their sources of livelihood during the course of life, as illustrated by Box 1.

Box 1: Occupational diversification life history

Difa (32), fisherman interviewed in Iyingo, Kamuli District, Uganda, February 2001
Difa started fishing in 1986, following the death of his father. His relatives gave him some start-up capital, with which he bought a 4.5" gillnet. He hired a boat and went onto the lake himself. In 1988, after accumulating some money he began processing (smoking) fish which he later sold in Busia. He continued with this trade until 1996, when he stopped because he was not able to also monitor his crew back in Iyingo. To supplement his fishery income, he has diversified into carpentry, while his wife now dries and markets *mukene* fish.
Source: (Allison 2003: 30)

The survey of Kenyan lakeshore communities further revealed that 31% of farmers grew for subsistence use only. Few of the areas surveyed yielded more than one main harvest a year. Staple crops like maize and millet were grown by most, chiefly retained for household consumption, and usually only sold when surplus to requirements (Geheb and Binns 1997).

Several authors also remark on the integrated nature of local farming and fishing markets. Seasonal differences allow one

to finance inputs to the other and reductions in fishing income may thus indirectly affect farming incomes (Gordon 2005). Another study noted that when fishermen or farmers have good harvests, market prices of auxiliary goods increase (due to opportunistic retailers), but if the harvest/catch is meagre, demand for other produce drops. Accordingly, the temporary EU ban on Nile perch from Lake Victoria reduced fishing incomes and led to a demand slump for local agricultural crops (Geheb et al. 2008).

⁵ In general, this group either could delegate some or all farming tasks to other household members, or lived so close to the lake that they could arrange fishing and farming tasks around each other.

Inequalities in wealth prevalent in fishing, for example around ownership of fishing gear and boats, are also linked to divergent farming activity. Boat owners earned higher incomes than fishermen without boats, and were therefore better able to hire casual farm labour, permitting further concentration on fishing. On the other hand, casual fishermen, with lower incomes, tended to rely much more heavily on family labour on their farms (Geheb and Binns 1997).

Accordingly, if food security is to be achieved, understanding the impact of HIV/AIDS in fishing communities must consider the diversity of livelihood strategies, and the sustainability of both land and water based food production systems (cf. Geheb and Binns 1997).

Food access: entitlements to fishery and land resources

The previous section showed that agriculture plays a substantial role in supporting food security in fishing communities. However, the relative importance of farming depends on households' and household members' access to arable land, and research indicates significant diversity between villages. In Kenyan lakeshore villages populated by Luo ethnic groups, inheritance traditions divide land amongst sons, with the most fertile plots and land close to a water source divided separately. Consequently, fragmentation affects agricultural productivity. Here, farming outputs were at risk of uncertain rainfall patterns (in the absence of irrigation systems), damage from hippopotamus grazing the land during the night, flooding and erosion of farmland (Geheb and Binns 1997).

A study of three villages on the lakeshore of Lake Kyoga (Kamuli District, Uganda) surveyed 108 fishing and non-fishing households and compared these with another 207 households in inland rural districts Mubende and Mbale. Diversity in non-fishing livelihoods in the three lakeshore villages principally resulted due to differing quality, availability and access rights to land for cultivation and livestock grazing. Mean landholdings were much lower than in the two inland districts, although no differences were found for fishing and non-fishing households. Fisherfolk were thus considered relatively land-poor and found to own few productive assets not connected with fishing (Allison 2003).

Village histories and the ethnic composition of their population also played a role in determining access to land for agricultural production. For instance, inhabitants of one village founded by immigrants lacked land ownership and depended on rented land. In other villages, land access rights reflected the divergent ethno-linguistic background of inhabitants. Hence, in one village, men own land and women have access only through their husbands or can rent land, with sons inheriting their father's land, whereas in another village, both sons and daughters inherit land (Allison 2003).

Access to fishery resources has been the subject of several studies. Official narratives (Allison 2003) often emphasise the open-access nature of fisheries. For instance, in Nigerian coastal villages, “fishermen from many tribes and linguistic groups, were free to go fishing whenever they wished and wherever their canoes would carry them, and did not lend themselves to traditional management patterns” (Ben-Yami 2001). Many others however have pointed out that common property resources, such as fishery grounds, are rarely completely ‘open access’ (e.g. Allison 2003; Geheb and Crean 2003; Nunan 2006; Stoffle 2001), and are subject to a mix of formal government and informal arrangements informed by socio-cultural norms.

Government regulations of fisheries typically control access and effort. At Lake Victoria, regulations include a licensing duty (for which an annual fee is payable and for which there are no limits on the number that can be issued) and adherence to a number of regulations on appropriate fishing gear (Geheb and Crean 2003). However, whilst government authority over fishing is recognised, it is also widely ignored, misunderstood or deliberately flouted, whilst implementation is often arbitrary (Allison 2003).⁶

Limited state control is often accompanied by informal, socio-cultural norms which serve to minimise conflict between users and determine access entitlements, e.g. inheritance of rights of access, membership of a user group, gender, relationships, allegiances, or ethnicity (Geheb and Crean 2003). Thus, in the Dominican Republic, access entitlements to coastal fishery resources are defined by customary use, limiting access of newcomers (Stoffle 2001).

One key finding, confirmed by many studies, is that in many fishing cultures worldwide there is a taboo on women fishing, and few women are found on the water, although some fish in shallow waters from the shore for subsistence (Allison 2003). African case studies regularly report that women lack direct access to, and decision making over, fisheries. This limits their ability to use this resource to tackle intra-household poverty and contribute to food security (Allison 2003; Nunan 2006; Tindall and Holvoet 2008). Indeed, “a fishery that excludes half the potential participants, women, can hardly be termed open access!” (Allison 2003: 19).

Research studies have difficulty coming to clear conclusions about access entitlements for male newcomers (migrants). Hence, at Lake Victoria, “access to the fishery, and how ownership is perceived, is not clear-cut by any means” (Geheb and Crean 2003: 105). Such entitlements may be location-specific, and temporally defined. Hence, a 1997 study noted that entry requirements to the Lake Victoria fishery were much less than in the past, particularly for boat crew, where lack of experience was not regarded as a barrier to employment (Geheb and Binns 1997). However, a study of Lake Kyoga fishing villages reported that lack of experience is not a barrier to entry for skilled migrant fishermen, but effectively is for others (Allison 2003). Fishing requires skills

⁶ This has prompted a shift in fisheries governance towards more participatory and co-management styles (Allison, 2003).

and experience, and this is also illustrated by Dominican Republic fishermen, who distinguish a hierarchy of apprentice, journeymen, craftsmen, and beached fishermen (Stoffle 2001). Fishing skills are typically taught to adolescent boys in fishing villages by fathers and kinsmen (Allison 2003; Stoffle 2001), and newcomers may not have (had) access to such instruction (Allison 2003).

Access of newcomers with fishing skills is further regulated by informal mechanisms. Outsiders at Lake Victoria (Uganda) are challenged for letters of introduction, access fees, etc. However, granting access claims depends on the community. Claims themselves are not strictly territorial: fishermen demand the right to be able to move freely about the lake, but were also willing to use violence to limit access to other fishermen (Geheb and Crean 2003). Whilst the shape of such communities are poorly defined, some studies suggest that ethnic identity may not in itself pose a significant barrier to engage in fishing (Allison 2003; Ben-Yami 2001).

Traditional authorities also play an important mediating role when conflicts arise about access entitlements. At Lake Kyoga (Uganda), the head of the fishing community, the *gabunga*, settles disputes, advises on fishing places and methods, regulates new entrants to fishing, and liaises with other communities. The *gabunga* also enforces ritual prohibitions on fishing that appease lake spirits to ensure good catches and the safety of fishermen, and his example is important for fishing practices in a village (Allison 2003).

The position of *gabunga* was hereditary, but is increasingly elected, albeit from amongst male boat owners. The Ugandan Government incorporated such traditional authority in new fishery management structures, as *gabungas* head landing site committees or task forces, which exercise similar functions regarding security, disputes and regulation of new entrants (Allison 2003). However, the Government of Uganda has also issued a new policy for broadening access of marginalised groups, such as women and boat crew members, to the fisheries and to local decision-making bodies, enabling an improvement in their food security status.⁷ Lake Management Organisations and Beach Management Units empower such stakeholders, for instance by allocating a number of committee places to them (Nunan 2006). Moreover, 30% of licenses are now required to be allocated to women, and an evaluation at Lake George, showed that this had already helped to increase the representation of women to roughly 19% of licensees. However, entrance remained limited to owners of fishing boats and gear complying with fishing regulations. Other barriers to entry by women still persisted, including: the gender-insensitive implementation of guidelines; a lack of representation on committees; and lower awareness of opportunities and procedures due to inadequate sensitisation and limited participation in community meetings (Gooding 2003). Despite such limitations, these initiatives suggest that

⁷ Such institutions could play a broader socio-economic developmental role (Nunan 2006), possibly including HIV/AIDS control measures, although the suitability of these institutions for such a role has been questioned (Westaway et al. 2007).

institutionalised norms governing access entitlements to the fisheries are dynamic and allow for change (Nunan 2006).⁸

While it is important to recognise the diverse populations and sets of access rules found within a community,⁹ other factors also influence access to fishery resources, affecting food security. For instance, fisheries are affected by how fishing communities perceive their rights to the resource, its ease of access, and its abundance, in relation to the technologies used, and local socio-political struggles (Geheb and Crean 2003).

Moreover, the relationships between boat owners and boat crew define the division of the fish catch, the fishing methods and gears used, and are therefore another important institution that affects the access to and control over fishery resources (Nunan 2006). At Lake Victoria, many boat-owners are tied into highly unequal commercial relationships with processing factory owners, who provide outboard engines and fuel which are slowly repaid, in exchange for exclusive access to the catch (Geheb et al. 2008). In remote areas of Tanzania, fishermen rely on factory owners and agents to provide them with fishing equipment in exchange for supplying fish at lower prices. Here, women were found to particularly lack access to credit (FAO 2008), whilst in Ghana, women were reported to be important credit providers (Ben-Yami 2001). At Lake Kyoga, entry as anything other than a wage labourer (boat crew member) requires significant capital outlay (whose opportunity costs are include alternative investment opportunities) (Allison 2003). Similarly, coastal Nigerian fishermen depend on the availability and cost of informal credit to purchase fuel, equipment, or a boat to enable fishing in more distant fishing grounds, which indirectly affects the size and value of catches. However, in many cases fishermen are obliged to sell their catches to their creditors at predetermined prices (below market prices) and loans are given in the form of supplies or equipment at prices higher than prevailing market prices. Hence, traditional credit is expensive and tends to keep borrowers in a constant dependence on the creditor (Ben-Yami 2001). Consequently, during periods of lack of cash, landings decrease by high percentages, and improved availability of capital may thus enhance local and regional fish supplies and food security (*ibid.*). A review of coastal fisheries in Viet Nam also noted that divergent access to capital affects the ability to purchase diverse fishing gear that could enable targeting different species, or motorised boats that could reach more distant fishing grounds or improve the ability to work year round (Lovendal 2004). Accordingly, some consider limited access to capital as the “most significant constraint on expansion of fishing effort” (Allison 2003: 20).

⁸ This suggests that development interventions may not only directly target their revision, but also facilitate indirect routes of change, for instance through the empowerment of marginalised groups. However, while the types of institutions affecting access to fisheries resources can be identified, the structures and operations of individual institutions vary considerably, and effective interventions need to engage with their particular conditions (Nunan 2006).

⁹ The literature on community based natural resource management highlights difficulties concerning the understanding of community as a homogenous entity (cf. Nunan 2006).

Government policies promoting access to produce and financial (i.e. formal credit) markets can thus have a major effect on the income generated by fisheries. At the Kenyan shores of Lake Victoria, the absence of proper roads meant that truck owners had a *de facto* monopoly on price setting (Geheb and Binns 1997). Indeed, African artisanal fisheries face major constraints due to limited access roads, inappropriate landing facilities, and poor availability of adequate gear or other inputs. Improvements to market infrastructure, coupled with investments in connecting rural roads, would reduce transaction costs, with likely beneficial effects on both producer incomes (higher producer prices) and increased accessibility for the general population to fish and fish products, at lower prices (NEPAD 2003). Moreover, Allison suggests that in the absence of access to land, produce and service markets, mobility may remain an important strategy for sustaining livelihoods of artisanal fisherfolk (Allison 2003).

Labour divisions in fishing communities

With access to the fishery traditionally largely barred to women, fishing communities display distinct divisions of labour, with implications for household food security. Women are involved in a range of economic activities directly related to fishing, as well as managing resources like water, cooking fuel, and food for household consumption, in addition to child rearing and caring duties for the sick (Torell et al. 2007). Whilst men conduct the most dangerous (Allison 2003), and possibly the most physically challenging jobs, women often conduct the most labour-intensive, poorest paid and least recognised jobs in the fish supply chains in developing countries (Choo et al. 2008). Their activities are however significant, considering that presently about 75 percent of all traded fish go through some form of processing before being consumed (FAO 2008).

Hence, whilst marine fishing is mostly¹⁰ out of bounds, West African women engage in subsistence fishing in rivers, estuaries, lagoons, or creeks. Their fishing operations, however, are separate from those of men, by specializing mostly in hand-lining, pots, baskets, small trap fishing, and small-scale drag-netting. Women also process and trade fish, and maintain and make traditional fishing equipment: for example, fish traps and fish baskets. They also act as shore gangs at fish beaches and wharfs, remove fish from fishing nets, clean and re-stack them (Ben-Yami 2001). Similarly, in Thailand, India and Malaysia, women's participation in marine capture fisheries is mainly confined to shore-based activities such as fish marketing, fish handling, net making/mending and processing, i.e. sorting, grading, weighing, gutting and filleting of fish (FAO 2008). In Senegal, 97 percent of artisanal fish processing and marketing is carried out by women. In Tanzania, women handle from 70 to 87 percent of all fish trade in the artisanal sector. Such roles are similarly important in Mozambique (*ibid.*). Also at inland fisheries in Uganda, women are involved in a range of fishing-related activities, while some own fishing boats (Allison 2003; Westaway et al. 2007). Some women are engaged in

¹⁰ Isolated cases of women fishing at sea as crew on trawlers are reported for Mozambique and South Africa (FAO 2008).

providing services to fishermen such as brewing beer or sex work (Geheb et al. 2008). Other reports posit that in mixed fishing/farming communities, women are particularly engaged in farming (Gordon 2005), and in some polygynous communities, fishermen reportedly married more than one wife to ensure that farm labour requirements are fulfilled (Geheb and Binns 1997). Such divisions of labour additionally suggest that women and men possess different knowledge regarding fishing and farming techniques, sources and ways to collect natural resources, and sources and uses of medicinal plants and minerals (Torell et al. 2007: 6).

Also at the Kenyan shores of Lake Victoria, the fishing trade is almost exclusively handled by women, with ratios of fishermen to traders as high as one to three (Geheb and Binns 1997). A recent trend is that men who cannot gain access to fishing increasingly engage in trade and processing activity (Geheb et al. 2008), thus further increasing the already strong competition. Some authors also suggest that men who no longer have the strength necessary for fishing (for instance due to HIV/AIDS) may switch to fish processing (Gordon 2005). Such competitive pressure could be a reason for women to offer sexual favours to access fish supplies (Geheb and Binns 1997). However, other authors argue that “at Lake Victoria, female fishmongers and processors are often related to boat owners and boat crew from whom they buy their fish. The relationships are therefore not purely market-oriented, but are influenced by domestic power-relations” (Nunan 2006: 1322). Similarly, FAO notes that in Tanzania, with regard to *dagaa*, fishing and fish processing activities usually involve couples (FAO 2008). This hence suggests that, in contrast to high-profile discourses on ‘fish for sex’, women employ a range of different means of obtaining preferential access to fish supplies.

Similarly, women need not always be cast in the role of economically powerless and subject to the whims of fishermen. Studies of West Africa tell quite a different story from much of the work focusing on East Africa. For instance in Ghana, women, locally called ‘fish mammies’, are estimated to handle the distribution and sales of 90 percent of the artisanal fish production, as well as part of the catch of the commercial fishing companies. Most fish mammies operate as selling agents, paying fishermen on the basis of the revenues they receive from their sales. Besides involvement in processing tasks, these women provide informal credit to fishermen (FAO 2008), and in these cases it is the women (rather than male boat owners or fishermen) who determine the terms under which fish is supplied. Similarly, in Nigerian coastal villages, “as a rule the fisher-women are financially independent”. They can become debtors to fishermen, when they lack cash to pay for the fish, but “more often they lend fishermen sums for working capital or even for investments in equipment, exacting in return the fishermen’s obligations to deliver them their catches. This system leads to prolonged and increasing indebtedness of men to their wives and [to] other women, that sometimes ends with fishermen taking their canoes and crews and migrating to other communities, distant fishing camps, or provisional settlements, sometimes for good, to avoid their commitments” (Ben-Yami 2001).

Food utilisation: fish, cash, processing

The utilisation of food is an important factor determining food security and nutrition outcomes. Three components deserve attention: fish processing, cash generation, and the actual use of fish in diets.

Artisanal fish processing

In countries like India and Thailand, fresh fish sales dominate domestic markets (FAO 2008). However, in sub-Saharan Africa, because of weak market infrastructure and facilities in rural areas, the majority of the fish — especially in inland fisheries — is marketed as dried and/or smoked products (WorldFish Centre 2005). For instance in coastal Nigeria, consumer preferences and prohibitive costs of installing, powering, and maintaining refrigeration make smoking the only feasible way to keep fish edible (Ben-Yami 2001).

From a nutritional perspective, the widespread processing of fish using artisanal methods such as sun-drying, salting, and smoking deserves attention. Compared to fresh fish, processed fish often has lower nutritional values. For instance, dried and salted second grade Nile perch, known locally as *kayabo*, has a low nutritional value compared with fresh fish, as vitamins, proteins (amino acids) and lipids degrade during the course of processing and storage. The longer the product is stored (indicated by browning), the poorer it becomes nutritionally. Sun-drying is also used for preserving small Nile perch, caught illegally or as bycatch of *dagaa/mukene* fishing, and for Nile perch filleting by-products (which constitute up to 60 percent of the fish after removing the fillets). However, during the rainy season, drying becomes difficult and a good fraction gets insect-infested and spoiled (FAO 2008). In many parts of Africa post-harvest losses exceed 30% of the catch (WorldFish Centre 2005).

Smoked products from Nile perch are also mostly of poor quality because they are made from spoiled fish rejected by fish processing plants. Moreover, whilst the heating effect of smoking and frying potentially reduces microbial contamination, subsequent handling is often unhygienic, leading to poor quality fish, and often not more hygienic than dried and salted fish (FAO 2008).

Regardless of such disadvantages, the ability to preserve large quantities of fish, even at lower nutritional value, remains important. For instance, small dried fish provide an important source of available and affordable protein in the traditional diet of poor and middle-income groups throughout East and Southern Africa and are a valuable food for children, particularly so during the dry months of July and August (FAO 2008). Dried fish can also be a rich source of vitamin A. Dried *dagaa/mukene* has a high protein content and is used in Kenya, for example, to prepare a protein-rich baby food based on beans, soy and maize to protect against *kwashiorkor* disease. Access to only 10 grams of dried *dagaa/mukene* adequately addresses iron, zinc and vitamin A deficiencies common among children (*ibid.*).

Income from fisheries

While fish in kind helps to support food security for fishing households, the generation of incomes derived from sales, trading or wages in the fisheries sector is often even more important as an indirect contribution to food security, as it allows for other food purchases (WorldFish Centre 2005). Fishing is hence often more than just a subsistence activity and access to fishing income is associated with greater wealth. A survey of income of 53 fishing households and 52 non-fishing households at Lake Kyoga (Uganda) shows that a higher proportion of fishing households appear in the upper income quartiles, while a higher proportion of non-fishing households appear in the lower quartiles. Moreover, fisherfolk earnings are often higher than those of other rural people. However, fishing is risky from both financial and safety perspectives (Allison 2003).

Declining incomes from fisheries, due to price fluctuation or reduced catches, thus could have a serious impact on households. These impacts may be felt more keenly by some members than others. Recent studies have shown that control over fishing income is highly contested by husbands and wives.

Men sell the daily catch in return for cash, and “claimed to give sporadic support to the household, but did not actively engage in daily household maintenance” (Geheb et al. 2008: 92). Rather, men were found to spend income on beer (ironically brewed by women), women and the fishery (*ibid.*). Similarly, another study found that “while women perform a long list of tasks, from farming to child care, men basically spend their time fishing, drinking and sleeping” (Allison 2003: 20).

A male monopoly on access to the fishery resource, and traditional roles for women imply that women have much fewer but highly competitive income generating options (Geheb et al. 2008). Consequently, livelihood diversification was far more common amongst women than men. For men, fishing provided at least 90% of income and they did not diversify even when the fishery was closed. “For women, incomes earned from a single sector alone were rarely sufficient to cover household, childcare and personal needs. Hence they spread their capital and activities over several businesses, one of which might, at any time, be profitable” (*ibid.*: 93). Often such businesses are conducted in close proximity to the home, enabling domestic duties. Moreover, women saved profits to contribute to household expenses, and these could hence not be reinvested in the business.

Control over income from fishing is strongly contested. Women attempt to access a part of the income from fishing, while men attempt to protect their spending privileges. Accordingly, both men and women withhold economic information and attempt to hide incomes (Geheb et al. 2008). Whilst women in Geheb et al.’s study at least had some control over some of the household expenses, elsewhere in coastal Tanzania, male household heads were found to make most decisions concerning income expenditure, labour allocation, mobility of family members, health care provision, food production and food purchase (Torell et al. 2007).

Male control over much of the household income and expenditure has important implications for nutritional inequities within the household, as suggested by two authors (quoted in: Geheb et al. 2008: 94):

...during the hunger season, "Poorer households buy what maize they can but otherwise eat bananas and root crops, while the men spend money on beer. Men say that beer is like food. It fills you up and stops hunger from hurting. From the perspective of the individual drinker this is, indeed, the case. Thick beer has a high calorific value and is quite nutritious. . ." (Green, 1999: 414). Howard (1994: 248) reports on earnings generated by Chagga women in Tanzania from beer sales: ". . .women's ability to raise income from commercial beer brewing offsets their insecure access to their husband's income from cash cropping and livestock sale, and their husband's over consumption of beer and meat at the expense of his dependents".

Fish in diets

The literature on artisanal fisheries often highlights its importance in terms of its contribution to exports, revenue generation and nutrition. It is posited that fish makes an important part of household diets (e.g. Grellier et al. 2004), and is a cheap source of protein and other nutrients compared to other sources (e.g, Gordon 2005; NEPAD 2003) especially important for infants, young children and pregnant women (WorldFish Centre 2005). Smaller fish species are especially important for poor consumers as they can be purchased in small quantities (RMAG Ltd, n.d.).¹¹ At a macro-level, poor nations are more dependent on fish for obtaining animal protein in their diets than rich nations (Kent 1997).

Protein deficiencies are likely to occur in African populations that are highly dependent on roots, tubers, and bananas/plantain (Williams and Ayemon 1998). Such diets could be complemented by fish, providing important protein and essential nutrients that are not, or insufficiently present in these staples, for example: iron, iodine, zinc, calcium, vitamin A, vitamin B and fatty acids (WorldFish Centre 2005).

Whilst there is little doubt that fish is nutritious, this review could detect little published data discussing at a sufficiently detailed level fish's actual role in fishing households' diets. It is thus unclear to what extent fishing households retain fish for home consumption, or sell these for cash. Some reports posit that "small-scale fishers usually satisfy their subsistence needs first, before selling the rest of their catch. The amount that is retained is fairly constant, independent of the size or value of the catch. This demonstrates that subsistence needs are their first priority, but that increasing catches enables

¹¹ Some argue that consumers often cannot afford to buy other animal protein sources which have to be bought in larger quantities, such as chicken (RMAG Ltd, n.d.), but for instance informal meat markets in Burkina Faso are known to offer portions in different sizes [Hoffman 2007 #194.]

them to gain benefits beyond this” (RMAG Ltd, n.d.: 1). However, our discussion in the previous section regarding households’ struggles over cash, rather than fish, suggests that a significant, if not a majority of the catch could be sold, rather than consumed in the household. For instance, Nile perch and Nile tilapia fishing is dominated by artisanal fishermen, but high prices incentivise sales of their catch.

Taking into account differentials in control over fish sales, and the possibility that fishing households actually receive little fish in kind, one may consider the importance of elasticities of demand. Although fish may be cheap, it also tends to have strong price and income elasticities of demand. For consumers, fish often is a non-staple food, and subject to a high income elasticity of demand. Hence, unlike a fairly constant demand for staples like maize, demand for fish rapidly increases when incomes grow and decrease when incomes fall (Ahmed and Lorica 2002).¹² Price fluctuations may also have distinct effects for the access of the poor to fish products. Whilst generally, high value fish products such as crustaceans have a higher price elasticity of demand than low-value products, these also differ for consumers from rural and urban areas and from different income groups (*ibid.*). For the same product, however, price-elasticity of demand is likely to be higher for the poor than for richer groups. Accordingly, “when fish supplies deteriorate, fish tends to disappear first from the plates of the poor” (Kent 1997: 403).

While micro-level data on fish consumption in fishing communities is sparse, FAO publishes national production level data for countries around the world.¹³ These present total fish supply per capita, and indicate the share of fish in total animal protein intake (Table 4). Such figures probably underreport supply for inland and coastal fishing communities (RMAG Ltd, n.d.), present averages (aggregating rich and poor groups) and are unable to account for intra-household allocation differences, if any. While some reports note that fish, unlike other high protein foods, is distributed more equally among household members in many parts of the world (WorldFish Centre 2005), it is unclear to what extent this is the case in African fishing communities.¹⁴

¹² This however does not necessarily lead to improved nutritional intake.

¹³ These data normally have already deducted wastage and fish used for non-human food (e.g. fishmeal). Figures represent fresh weights, are highly aggregated, and are drawn from national statistics which may contain gaps; therefore the contributions of artisanal fisheries may be under-estimated..

¹⁴ However, a study of Vietnamese coastal fishing villages reported that children and seafaring men have priority access to food, followed by the elderly and women [Lovendal, 2004 #198].

Table 4: Fish supplies and share of fish protein in animal protein consumption

Country	Per capita fish supply (kg)	Fish protein/animal protein (%)
Angola	6.6	27.1
Burundi	3.2	29.6
Congo Dem. Rep.	5.7	31.0
Equatorial Guinea	22.6	61.9
Ghana	22.5	63.2
Malawi	5.7	37.7
Senegal	36.3	47.4
Tanzania	10.3	33.6
Uganda	9.8	30.0

(Adapted from WorldFish Centre 2005: 3)

Presenting fish as a part of animal protein intake perhaps also inflates its importance. Fish can certainly contribute to protein intake, but should be recognised as just one of several options, particularly in mixed fishing/farming production systems.

National production data for fish and other food products in Africa¹⁵ for 47 African countries for 1987 and 1990, show that grains are the most important source of protein by volume, providing nearly one-half of total protein intake. Maize was found the most important contributor by volume, followed by sorghum, millet, and rice (Williams and Ayemon 1998). In sub-Saharan Africa, maize is the staple food, and lower socio-economic groups obtain up to 66 percent of daily energy intake from maize products, mainly in the form of flour (Elvevoll and James 2000). Maize is also the most widely grown crop in mixed fishing/farming communities at Lake Kyoga (Allison 2003) and Lake Victoria (Geheb and Binns 1997). In such communities, changing cropping patterns, as for instance reported in agrarian households affected by HIV/AIDS, can influence access to protein. For instance, macro level trends replacing rice and maize containing 6.4% and 9.1% protein respectively, for millet and sorghum with protein contents of 10.3% could reduce the total protein available (Williams and Ayemon 1998).¹⁶

Besides grains, roots and tubers (including cassava, yams, etc) and bananas/plantain provide approximately 15% and animal products, fish, pulses, oilseeds, and nuts combined provide approximately 35 percent of protein by volume (Williams and Ayemon 1998).¹⁷ However, crop based protein are more difficult to digest efficiently (80 to 90 percent) than animal and fish proteins (*ibid.*).

Considering deficiencies in protein availability in Africa, Williams and Ayemon consider increased fish production through aquaculture¹⁸ as one of a number

¹⁵ These are subject to similar weaknesses reported as those for fish production discussed above.

¹⁶ However, such an argument appears to (unrealistically) assume equal yields per unit of land and equal monetary input/output ratios.

¹⁷ NB actual volumes depend on local cropping patterns and yields, and the percentages presented therefore indicate only broad general trends.

¹⁸ Whilst aquaculture is considered to have strong potential for increasing fish production in Africa, currently, after more than four decades it is still in its "infancy" (NEPAD 2003: 54). Only

of potential solutions. Soybeans are considered to provide the highest yields of protein per hectare of any common crop, and its protein is of excellent quality, particularly to supplement the protein in grain.¹⁹ Other sources of protein suggested are pulses, groundnuts, meat, poultry and milk, or higher yielding varieties of sorghum, millet, maize, rice and cassava (Williams and Ayemon 1998). However, such solutions should tally with local food preferences as cultural constructions of appropriateness and taste also determine food intakes. For instance, whereas Mozambicans are traditionally fish eaters, consumers in Namibia, South Africa and Botswana are considered to prefer red meat and chicken to fish (FAO 2008).²⁰ Understandings of the properties of fish also relate to HIV/AIDS. One report noted that fishermen realise the nutritional and health benefits of fish consumption: a male boat owner at Lake George argued: *“If you stay in the village HIV/AIDS takes a high toll on your health quicker, but when you eat fish you live longer with the virus”*. However, the diet of fish was also thought to increase men’s sexual libido which, coupled with reluctance or inability to use condoms, in turn increased susceptibility to infection: *“The fish we eat, and especially the soup, gives people a lot of fluids (semen). When semen accumulates it disturbs you”* (Grellier et al. 2004: 56).

Moreover, another concern must be that if overall calorific intakes are deficient, which occurs to an appreciable extent in Africa, particularly for PLWHA, protein may be used not to best advantage. In these situations, protein may be used for energy rather than for building and repair of body tissues (Williams and Ayemon 1998).

HIV/AIDS and food insecurity in agrarian household economies

The literature on the impacts of HIV and AIDS has grown very rapidly in recent years (for a review, see: S.R. Gillespie and Kadiyala 2005). The epidemic has a long-wave effect and affects the most productive population through multiple, interrelated, gendered and often highly contextual pathways (Gillespie 2006; Jayne et al. 2006). Also, where HIV/AIDS is most prevalent in Sub-Saharan Africa, it is often one among many concurrent stresses for people’s livelihoods (Gillespie 2006).

HIV/AIDS affects households’ and communities’ human, financial, social and physical capital, having direct or indirect bearing on access, availability and utilisation of food. Illness and death affect human capital, through psycho-

a few percent of total fish production in the continent derive from aquaculture. The growing literature on aquaculture is hence not included in this review.

¹⁹ For example, replacing 10 percent of maize meal with soybean flour increases its content of protein, methionine/cystine, and threonine by about forty percent and nearly doubles its content of lysine and tryptophan (Williams and Ayemon 1998).

²⁰ For Laos, Meusch reports that nutritious foods that lactating women need to regain their health and improve the quality of their breast milk are prohibited, such as meat (Meusch et al. 2003).

social stresses, reduced labour productivity and destruction of education and intergenerational knowledge transfer, for instance regarding productive farming methods. Moreover, illness constrains options for productive activities, reduces participation in community activities, and increases time needed for caring activities. The burden of disease also depletes control over and access to financial and physical capital, whether in the form of food reserves, savings, investment, land and livestock assets, and the ability to earn income. Furthermore, social support systems are stretched, sometimes beyond recovery.

Households respond to food insecurity in a variety of ways, using consumption, expenditure, income, and migration strategies (Senefeld and Polsky 2006). Consumption strategies include buying food on credit, relying on less-preferred staple substitutes, forgoing or reducing the daily number of meals eaten, reducing nutritional diversity, eating unusual wild foods, restricting consumption by adults so children can eat normally, and feeding working members at the expense of nonworking members. However, nutrition foregone by virtue of a shift in dietary patterns and longer working days can affect health (Baylies 2002). Expenditure strategies include avoiding health care or education costs in order to buy food. Income strategies include taking loans, depleting savings and investments, selling household and livelihood assets such as livestock, and diversification of income sources. These strategies can also include begging and transactional sex (i.e. selling sex in exchange for food or other resources). Where labour has been lost due to morbidity, labour tasks are reallocated within the household, extra hours are put in, labour might be hired or family members come to assist, whereas the cultivated area may also be reduced. Migration strategies include sending children to relatives' or friends' homes, or migrating to find work (UNAIDS 1999; cited in Drimie 2002; Senefeld and Polsky 2006).

Critically, many short-term coping responses discount longer term productivity, health and exposure risk to HIV/AIDS. Moreover, many strategies addressing food insecurity are applied and exacerbated in households afflicted by HIV/AIDS, accelerated by the vicious impoverishment-malnutrition-HIV/AIDS cycle.²¹ Some studies have suggested stages through which households go, from initial use of welfare mechanisms, to the sale of assets and ultimately the dissolution of the household, but such approaches risk overlooking the complexity and depth of impacts of the epidemic (Baylies 2002). Indeed, "responsive strategies are often but not always and not necessarily 'one way streets' which may lead not to extended 'coping' and recovery but to destitution" (Barnett and Grellier 2003: 20). Hence, there is a need to learn more about how increasing numbers of HIV/AIDS affected households and communities are struggling to respond to multiple overlapping vulnerabilities and interacting processes of change (Gillespie 2006). What is clear however is that at least three processes affect food security, malnutrition

²¹ In the context of HIV/AIDS affected households, the concept of coping strategies has received criticism for inappropriately focusing on success events, ignoring long term costs and neglecting to depict the actual bleakness of peoples' possibilities to deal with the disease (cf. Drimie 2002; Baylies 2002).

and impoverishment at the household as well as the community level: labour adjustment, diversification out of agriculture, and decapitalisation.

Labour adjustment

Household responses to HIV/AIDS involve farm and non-farm livelihood strategies. Morbidity has important implications for the food security status of poor households, as illness of productive adults reduces the labour supply. For farming livelihoods, this may be particularly problematic considering the seasonality of agricultural work. Hence, in case morbidity incapacitates a household member long enough to disrupt the farming cycle, it may affect food security (Barnett and Grellier 2003). Indeed, in homes afflicted by HIV/AIDS, food consumption has been found to drop by 40 percent (Drimie 2002).

It is often posited that with respect to farming activity, a farming household's first response is often to adopt "downshifting" measures – changing cropping patterns with respect to the number and range of crops grown, for instance, progressively sacrificing high value cash crops for food crops and leafy crops and fruits for starchy root crops (Barnett and Grellier 2003). Loss of cash income may disable buying agricultural inputs like seeds, fertiliser and pesticides required for high value produce. As labour intensive crops are replaced with labour extensive produce (Drimie 2002; Dorward and Mwale 2006), reduced labour inputs may also affect the care of livestock. Both crops and livestock may thus suffer from weaker disease and pest control, thus reducing agricultural yields (Barnett and Grellier 2003).

Micro level empirical data indicates that HIV/AIDS impacts household agricultural production (and thus availability of food) adversely (Jayne et al. 2006). However, these authors question the 'conventional wisdom': that AIDS drives a shift to less labour-intensive and less nutritious crops; reduces cultivated areas and weeding labour leading to lower yields; or reduces agricultural inputs such as fertiliser, resulting in declines in crop production, losses of off-farm income, and increased poverty. Criticising the often qualitative nature of methodologies observing such findings, they note that most quantitative household-level studies (while subject to some methodological weaknesses themselves) "provide a less catastrophic assessment of the impact of rising AIDS-related mortality on the agricultural sector" (*ibid.*: 155).

Instead, the effects of death on the agricultural production of a household appears to be highly sensitive to the age, sex, and position of the deceased. This is particularly the case when the household head or spouse dies. Impacts also depend on the initial level of wealth of the household, its ability to attract new members, and the agricultural system in which it operates (Jayne et al. 2006).

It is argued that AIDS impacts are mitigated by the ability to attract new household members (or bringing back members residing away from home) to

compensate for the lost labour and knowledge of the deceased. Zambia's census statistics thus for instance show a huge population (thus labour) shift from urban to rural areas (Jayne et al. 2006).

Moreover, analyses must be sensitive to the particularities of the agricultural system in which HIV/AIDS impacts occur. Agricultural systems in eastern and southern Africa exhibit considerable heterogeneity in terms of land, labour, and capital input ratios. Moreover, such heterogeneity is large between farmers, and even so within groups of smallholder farmers. Hence, for those farmers with the smallest landholdings, land rather than labour inputs appear to be the limiting factor in economic growth, whereas larger farms may attract non-resident family labour or hire farm labour through a process of reverse migration (Jayne et al. 2006). In such cases, one additional implication is that it is difficult to assess whether the major constraints being faced by agriculture-dependent households in the contexts of AIDS relate to labour, cash, or a combination of other resource deficits (Gillespie 2006).

Furthermore, households incurring a shock to their own labour supply (for example, because of an AIDS-related death) can and will often vary the proportions of land, labour, and cash or adjust their cropping patterns based on the particular mix of resources that they possess after the death (Jayne et al. 2006).

Finally, attribution is not without problems. No evidence exists that neatly separates the effect of AIDS on farmers' choices from other contributing factors affecting cropping pattern changes, such as policy changes affecting market access, input prices, and crop prices (*ibid.*).

Decapitalisation

HIV/AIDS also leads to decapitalisation: the phenomenon of capital diverting out of agriculture, as the epidemic compromises the accumulation and maintenance of many asset types (e.g., Baylies 2002; Drimie 2002). The loss of savings, cattle assets, draft equipment, etc., may pose a significant hindrance to rural productivity and secure livelihoods for the poorest communities (Gillespie 2006).

Illustrative of this is the care and husbandry of livestock. Livestock is disposed of to generate cash for care and treatment of the sick, slaughtered for consumption during funerals, de-stocked because of shortage of labour, or may die because of poor management. Loss of livestock implies loss of manure for the farm and loss of products such as milk meat and eggs for the family, thus implies liquidation of important savings for many households (Barnett and Grellier 2003). Lawson also provides some evidence using quantitative analysis that Ugandan households with a sick head are more likely to sell off enterprise livestock and other assets than households with a healthy head (Lawson 2004).

It is also important to recognise that smallholder agriculture forms part of diversified livelihood portfolios, and is subjected to multiple environmental, economic and social pressures that drive diversification. For instance, younger generations are often unwilling to continue farming activity (Oxfam and New Economics Foundation 2006). HIV/AIDS is hence an additional factor that can accelerate the de-agrarianisation through the disposal of productive assets; labour losses; disruption of traditional social security mechanisms; and draining of skills (Drimie 2002).

Livelihood diversification

The poor also move to seek additional employment or self-employment to address the impacts of HIV/AIDS, and sometimes engage in activities that increase individual and household exposure risk (Barnett and Grellier, 2003). For instance, Bryceson and Fonseca (2006) report how, under conditions of food insecurity and disposal of assets, the common livelihood diversification strategy of *ganyu* in Malawi drives impoverishment and de-agrarianisation, heightens women's exposure to HIV/AIDS and entails a threat to the integrity of the household. *Ganyu* is a traditional practice, where households lacking adequate labour can access additional labour on a seasonal basis, typically through the sale of labour by people from poorer households in exchange for cash or goods. However, during peak agricultural seasons, *ganyu* often disadvantages casual wage labourers, who are driven by hunger and the need for immediate access to cash to buy food to divert work from their own fields. These peasants thus prioritise off-farm casual labour to address immediate food needs over longer-term staple food planting and harvesting cycles on their own landholdings, causing underutilisation of household land and labour. Consequently, a vicious cycle of impoverishment is in progress, undermining smallholders as viable agricultural producers. For households, *ganyu* entails a significant shift: "(1) from self-sufficient unpaid labour performed within the household (especially by women and children) toward cash-earning labour outside; (2) from agriculture toward nonagriculture, with income earning turning increasingly to trade and services, including sexual services; and (3) from household toward individualised work, whereby every able-bodied person works" (*ibid.*: 104).²²

Hence, some labour substituting/livelihood diversification measures addressing food insecurity, like *ganyu*, involve increasing the likelihood of exposure to HIV, through sexual exploitation and transactional sex (Greenblott 2007). While studies like Bryceson and Fonseca's give qualitative evidence of the association between food insufficiency and HIV transmission behaviours, Weiser et al. (2007) provide quantitative evidence to substantiate these associations. Their study found that food insufficiency is associated with multiple (often interdependent) risky sexual practices among women in

²² The importance of context for coping strategies is highlighted by the authors. They compare *ganyu* with the strategies of Sudanese peasants, who facing similar circumstances, resort to starving to tide over lean periods rather than engage in distress strategies that endanger their long term survival (Bryceson and Fonseca 2006). Such contextual factors include culture, but also (among others) the economic, agroecological, and political situations.

Botswana and Swaziland. Women who reported lacking sufficient food to eat had an 80% increased likelihood of selling sex for money or resources, a 70% increased likelihood of engaging in unprotected sex and reporting lack of sexual control, and a 50% increased likelihood of intergenerational sex.

Gendered and demographic HIV/AIDS impacts

AIDS strikes prime age members of society (Gillespie 2006). However, many children and the elderly, as well as women of all ages, are amongst the most marginalised groups, and are often hardest hit by the impacts of HIV/AIDS.

As AIDS mostly afflicts people in the 15 to 50 age group, large numbers of orphans are left behind when people with die. By 1999, there were 13.2 million AIDS-orphans, 95 percent of them in sub-Saharan Africa. In 1997, in the most-affected countries, up to 11 percent of children were orphans. Orphans in the most-affected areas are exposed to severe food insecurity, compounded by the fact that many have lost their parents before learning basic agricultural skills and nutrition or health knowledge (Drimie 2002). This implies that the elderly, who often take over orphans' care, have an important role to play in ensuring food security (*ibid.*).

AIDS affects women disproportionately, especially in youth and adolescence, as the epidemic worsens existing gender-based differences in access to land and other resources (Drimie 2002; Baylies 2002). This puts both men and women at risk, but leaves women less able to protect themselves (Baylies 2002).

Biological as well as social factors play a role. Biological factors related to modes of transmission result in HIV infection rates that are three to five times higher in young women than in young men (Drimie 2002). Social factors include limited control over sexuality and migration patterns, among others. Women whose husbands migrate for work are especially vulnerable to HIV/AIDS, as their spouses may have other sexual partners (*ibid.*). Additionally, adult men are often the first to be affected in a household, and the first to die, leaving women to head the household (Baylies 2002).

Although the diversity of socio-cultural contexts make it hard to generalise, women within households in various parts of sub-Saharan Africa tend to be less food secure than men as a result of unequal intra-household food allocation. This can start from an early age, but the situation is exacerbated by their lack of control over decisions related to food production, consumption, and sale (Grellier and Omuru 2008). Men are also often served both higher quantity as well as quality of food. The resulting malnutrition makes these women more vulnerable to HIV infection.

Women are affected by discriminatory practices from both formal and informal institutions. Examples of this include women's reduced access to credit, information and agricultural extension services, among others (Grellier and Omuru, 2008; Jayne et al. 2006).

In households affected by AIDS mortality or morbidity, women often face a double burden: gaining income and caring for sick relatives (Drimie 2002). Female-headed households often have a higher dependency ratio than male-headed households (Baylies 2002). Whether male- or female-headed, a household's labour availability is restricted by HIV/AIDS. Heavier workloads may induce women to plant less labour-intensive, and sometimes nutritionally inferior, crops. These shifts may increase food insecurity and malnutrition (Baylies 2002; Regional Centre for Quality of Health Care 2003). Hence, in places where women are in charge of food production, animal tending, crop planting and harvesting, illness and death of a woman particularly threatens household food security.

A range of social factors and practices also impoverish women and weaken their food insecurity, enhancing their likelihood of resorting to transactional sex or other risky strategies to secure a livelihood. In HIV/AIDS affected households, in case the male head of household dies, stigmatisation may lead to social exclusion (Russell 2003). Where inheritance rights are weakly formulated or poorly enforced, women's land tenure and access to their late husbands' property is threatened, exposing them to rapidly deepening poverty (Baylies 2002; Jayne et al. 2006). In some cases, traditional mechanisms to ensure a widow's access to land can contribute to the further spread of HIV/AIDS, such as the custom obliging a widow to marry her late husband's brother (Drimie 2002).

Impacts on the rural economy

Thus far the discussion of food security, malnutrition and HIV/AIDS focused on the household level. Widening the analysis to the level of the community or the wider rural economy poses different questions and throws light on additional impacts.

Decapitalisation of the poorest is likely to increase inequality within the community, as better-off households buy up land, livestock, tools and machinery and poorer households lose their productive capacity. However, while capital assets lost by afflicted households are generally redistributed within the rural economy rather than lost entirely, the loss of labour and knowledge represents a loss to entire communities (Jayne et al. 2006).

A community's vulnerability arising from HIV/AIDS is intertwined with its vulnerability to environmental stress. Early research into the impacts of HIV/AIDS on rural livelihoods considered that the effects of the epidemic would be more acute and pronounced in environments constrained by poor soil or unfavourable climate (Barnett and Grelhier 2003). Conversely, the incidence of HIV/AIDS in a community may impact management of community owned natural resources (common property), as extraction rates accelerate to negatively affect sustainable use (Dwasi 2002, cited in Drimie 2002).

Rural communities also often bear the burden of HIV/AIDS-affected urban and migrant labourers, who return to their villages when they become sick (Drimie 2002), not only implying additional health care costs, but also reduced remittances (Dorward and Mwale 2006). This strains social solidarity mechanisms, which are already under pressure of HIV/AIDS induced decapitalisation, and livelihood practices such as *ganyu*, as the epidemic reaches every home and neighbours become too overburdened to help each other with food, loans or a hand in the fields (Drimie 2002). However, this issue may not directly affect migrant fishing communities in this way, where fisherfolk may return to their home communities for care when ill. This issue is discussed further in the accompanying review of health service delivery (McPherson 2008).

Similarly, Barnett and Grellier (2003) note that in many cattle-keeping communities, people share the care of their animals with friends and relatives over a wide geographical area. This reduces risk of loss in the event of disease or theft. Reduction of the range of domestic animals kept or withdrawal from such risk pooling arrangements are all symptoms of the way that AIDS impact makes a household, cluster or community more vulnerable to the next traumatic event. Such erosion of social safety nets is also correlated with and need to be understood within the broader (neoliberal) contexts, where “monetisation and privatisation serve to undermine traditional notions of reciprocity and to remove what might formerly be seen as kin-based entitlements” (Baylies 2002: 622).

Moreover, community relations may be under further tension over land inheritance disputes, and possible land concentration. As land rental markets are weakly developed, AIDS-affected households are not able to securely rent out land, thus risking underutilisation of their productive capacity. In particular, widows fear that renting out might affect their tenure rights (Jayne et al. 2006).

Regardless of decapitalisation and livelihood diversification processes, much remains unknown about the macro-effects of HIV/AIDS on the agricultural sector. While information at the household level provides a reasonable understanding of the impacts of HIV/AIDS, impacts on the structure of the agricultural sector, its cropping systems, relative costs of inputs and factors of production, technological and institutional changes, and supply and demand for agricultural products as a whole “provides a very murky picture” (Jayne et al. 2006: 140).

Hence, even though many studies highlight the significant negative impacts experienced by individuals and households as a direct result of AIDS-related labour losses, there is as yet no conclusive support for the net decreases in agricultural output that might be expected as the impacts of HIV and AIDS increase (Larson et al. 2005, discussed in Gillespie 2006). One potential explanation is that land exchanges at the community level lead to larger, more efficient and more productive farms. However, land acquisition by better-off households from widows and orphans who fail to keep access and/or ownership rights to land after the death of the husband/father, increase inequality, poverty, and malnutrition (Gillespie 2006). Relating these trends to

fishing communities, it appears likely that intra-community inequalities could lead to a similar concentration of assets. This would negatively affect poverty and malnutrition of the most vulnerable households.

HIV/AIDS has been estimated to reduce GDP growth per capita by an estimated one percent annually in Africa, affecting countries ability to import food, and therewith affecting food security (Drimie 2002). Others argue that such estimates severely underestimate actual economic impacts, by neglecting to include the costs of reduced future productivity, due to heavily impeded intergenerational knowledge transfers (Bell et al. 2003). This latter issue is unexplored with respect to fishing communities.

Alternatively, the sheer impact of the epidemic on countries' productive populations suggests how agricultural economies are affected. Drimie records that AIDS has killed around 7 million agricultural workers since 1985 in the 25 hardest-hit countries in Africa, and could kill 16 million more by 2020. Table 5 shows that the most-affected African countries could lose up to 26 percent of their agricultural labour force within two decades (Drimie 2002). Given the high incidence within fishing communities (Kissling et al. 2005), the loss of fishing workers may be even more stark.

Table 5: Projected loss to agricultural labour force through AIDS, 1985-2020

Namibia	Botswana	Zimbabwe	Mozambique	South-Africa	Kenya	Malawi	Uganda	Tanzania
-26%	-23%	-23%	-20%	-20%	-17%	-14%	-14%	-13%

(Drimie 2002)

Drimie thus wonders whether in 20-30 years, demographic changes will induce major changes in the division of labour in families or communities. Although this is an interesting question, some would argue it may not be a relevant one.

The analysis of death tolls, however striking, might obscure other factors affecting labour availability. The net size of working populations in the African countries hit hardest by HIV/AIDS may not actually change significantly between now and 2025, because of the momentum of population growth (Jayne et al. 2006).²³ Moreover, any dramatic upward pressure on agricultural wages would likely induce reverse urban–rural migration from the underemployed informal sector and cross-border migration (*ibid.*) . This also implies that the catastrophic death toll may not enhance agricultural wages for the surviving rural labour force. The advent of Anti-Retroviral Therapy (ART), if the roll-out of the drugs reaches those in need for treatment, will also influence patterns of demographic change.

²³ However, the quality of the labour force will suffer, as using (predicted) population figures tends to overestimate the available time for labour. These populations will be subjected to periods of sickness, care-giving for those afflicted with the disease, and mourning periods after a death (Jayne et al. 2006).

Determining the nature and magnitude of HIV/AIDS impacts on labour markets and wages more generally is a treacherous task (Dorward and Mwale 2006). Dorward and Mwale conduct a modelling exercise, which suggests that morbidity and mortality among skilled members of the community can lead to reduced demand for both on-farm labour and unskilled labour providing non-tradable goods and services within the local economy. They conclude that there is a “very real” possibility of HIV/AIDS leading to falling wages for unskilled labour (including those non-affected by HIV/AIDS)(2006: 92) . Accordingly, such a drop in unskilled and low skilled wages would drive further inequality within communities. Again, these types of dynamic factors would need to be accounted for in any comprehensive analysis of HIV/AIDS impact on labour force or wages within fishing.

Conclusion - HIV/AIDS, food (in)security and malnutrition in African fishing communities

This section considers existing knowledge about HIV/AIDS, malnutrition and food insecurity in African fishery contexts. While artisanal activity is an important but often neglected part of African fisheries (FAO 2008; Nunan 2006), it is also increasingly recognised as having very high incidences of HIV/AIDS (Allison and Seeley 2004; Kissling et al. 2005; Seeley and Allison 2005). In the absence of detailed research, explanations concerning the spread of the disease and its relation to food insecurity and malnutrition in fishery contexts must draw upon lessons derived from agrarian studies. For instance, Gordon (2005: 4) posits that the “generalised scenarios of the impacts of HIV/AIDS on rural households in Africa”, typified by loss of productive labour, asset depletion, reduced inputs, constrained access to credit, removal of children from education “also applies to fishing households.” . Similarly, Torell et al. (2007) conclude that HIV/AIDS poses four threats to coastal fishery resources and biodiversity :

- accelerated extraction rate for natural resources;
- decreased labour availability ;
- reduced management capacity;
- loss of traditional/indigenous knowledge and skills.

Applying lessons from agrarian to fisheries contexts is intuitively attractive, and apparently plausible. However, empirical evidence to support such claims is often conspicuously absent. Thus, understanding HIV/AIDS, nutrition and food security in fishing communities requires a more critical approach. The remainder of this review takes stock of how the processes identified for agrarian contexts fit with current knowledge of fisheries, and suggests a tentative research agenda.

The rather limited available data (mostly focusing on the Great Lakes Region) suggest that food insecurity may be prevalent for a small section of fishing communities, but possibly less prominently so than in nearby rural areas. Within fishing communities, limited access to the fishery and limited control

over cash expenditure suggests that women and dependents are more vulnerable to food insecurity and malnutrition. Right now there are neither data on the nutrition status of men, nor on the nutrition status of PLWHA in fishing communities. Moreover, little is known about seasonal food insecurity, although livelihood diversification appears to have a buffer function in this respect.

A note of caution is required generally when talking about fishing communities. Critiques of community based natural resource management point out the fallacy of assuming homogeneity in rural communities, with shared social norms (Nunan 2006). Fishing communities hence differ from each other socially, culturally, economically, and ecologically, and members can well have conflicting interests (Ben-Yami 2001) and varying influence, power and assets (Nunan 2006). Ethnically, some communities were reported as homogenous, but others as highly diverse. For instance, villages on the Kenyan shore of Lake Victoria are dominated by the Luo ethnic group (Geheb and Binns 1997), while Allison found that three villages on the Ugandan shore had distinct ethnic compositions (Allison 2003). Similarly, considerable ethnic diversity was reported for Nigerian coastal fishing communities (Ben-Yami 2001).

Whilst keeping in mind the diversity of fishing communities and its members, currently no analytical schemas appear to help identify which types of communities may be more or less vulnerable to food insecurity and HIV/AIDS impacts.

Migration is well-acknowledged, and linked to the spread of HIV/AIDS in and beyond fishing communities (Allison and Seeley 2004; Kissling et al. 2005; Seeley and Allison 2005). However, the background and modus operandi of the migrants may require further investigation: e.g. are these migrants itinerant or settling permanently? Some reports found that when catches decline in one place, casual boat crew migrate to other, hopefully more productive, fishing grounds (Geheb and Binns 1997). For Tanzanian coastal villages, seasonal migration is a major recurring factor, as men - mostly between the ages of 15 and 39 - move between villages according to fishing and farming seasons. Here, most migrants come from *neighbouring* villages, in contrast to larger fishing centres handling lucrative fish trades which attract "outsiders" migrating from nearby islands and larger towns and cities (Torell et al., 2007). Accordingly, the composition of fishing communities may well vary in relation to their economic function, and their endowment of trading facilities and road networks. Moreover, this variation in types of migration patterns may also affect: the nature of access entitlements to the fishery; social cohesion and the shape and workings of social safety nets; or pathways spreading HIV/AIDS, among other factors.

Some fishing locations themselves are temporary in nature. Ben-Yami (Ben-Yami 2001) distinguishes fishing villages, temporary settlements closer to the fishery which are effectively almost permanently populated, and fishing camps (for instance on floodplains) which are only temporarily populated. The more temporary the location, the worse the environmental health infrastructure is

likely to be, with poor provisioning of sanitation and potable water having clear implications for the food security of its inhabitants. Many Tanzanian fish marketing centres lack electricity or running water even where water pipes are installed (FAO 2008). At Lake Victoria, commercial demand for fish drove population increases, and many shanties sprung up. A survey of over fourteen hundred landing sites in 2004 found that one in five had communal lavatory facilities, 4% had electricity and 6% were served by potable water supplies (LVFO 2005, in Geheb et al. 2008)). Such conditions enhance the chances of malnutrition, and are conducive to presence of and susceptibility to parasitic and infectious diseases, which risks increased levels of transmission of HIV/AIDS. In Uganda, schistosomiasis is for instance considered the largest threat to the health of remote fishing communities (Kabatereine et al. 2004).

Generally, there is very limited material discussing the occurrence or importance of labour adjustment, diversification and decapitalisation strategies used by PLWHA in fishing communities. It is unclear whether 'downshifting' occurs in fisheries, the extent to which this occurs, or the illness stage when HIV/AIDS might affect fishermen's involvement in fishing. Some reports suggest that such HIV/AIDS affected men shift to trading instead, increasing competition in this sector, and possibly pushing women out of work and into risky sexual practices (i.e. fish for sex) to retain access to fish. However, evidence of diversification by fishermen in farming, trade, or other self-employment is very limited. Further questions remain around how women in fishing communities respond to illness. For instance, when women get ill, do their agricultural, processing or trading activities display signs of 'downshifting', with consequences for access to nutrition?

It is unclear to what extent different configurations of fishing and farming livelihood systems are able to adjust labour/capital/resource inputs in order to deal with HIV/AIDS induced deaths/illness. Capital appears one of the strongest limits to productivity, although it remains unclear whether households affected by HIV/AIDS are able to retain access to expensive informal credit, or recruit new members to retain labour productivity. The availability of labour may consider background population growth trends, reverse and regional migration. Moreover, illness induced productivity loss needs to be considered against other threats, notably, reducing natural resources, such as fish stocks.

Aquaculture has also been proposed as appropriate for PLWHA, as it has a low physical labour requirement, generates nutritional fish and cash to buy food and medication (WorldFish Centre 2005). However, its widespread expansion will require drawing lessons from previous experiences of aquaculture in Africa, a sector which has so far remained small-scale in most places (a notable exception being Egypt).

The strong divisions of labour in fishing also imply that HIV/AIDS could have differential impacts on men, women, and dependents. It is unclear who undertakes caring duties of sick people, and whether or not migrants return to their native communities. Similarly, it is not clear what happens to children

orphaned by AIDS, and to what extent this is an issue in fishing communities.²⁴

Little is yet known about household consumption, the role of fresh and processed fish in consumption baskets, and the intra-household allocation of food to individual members. For PLWHA, who particularly require additional energy, fish may contribute indirectly when its protein is metabolised as energy when existent energy intake is deficient. For those PLWHA who do consume sufficient amounts of energy, fish is one of the sources that can provide important protein and micro-nutrients. Its promotion should be considered and compared against alternative food sources in terms of its availability, affordability (e.g. number of nutritional units as % of recommended daily intake per price unit) and cultural acceptability to poor communities. Are some foods considered particularly beneficial and/or detrimental, and how do such notions square with their nutritional content and PLWHA's need for specific nutrients? As PLWHA require particularly enhanced energy intake, and considering that fishing often goes hand in hand with farming, it should be considered to what extent the latter can provide more energy.

Within fishing communities, more needs to be understood about the ways in which HIV/AIDS may induce ecologically unsustainable practices, or affect members' access entitlements to the fishery. Additionally, it is important to analyse whether such impacts arising from HIV/AIDS contribute to the further spread of HIV/AIDS by predisposing individuals to engage in risky sexual behaviour. Following on from this, social institutions and customs further warrant attention. For instance, are practices reported for some agrarian communities, such as re-marriage following deaths, or limited inheritance rights, also important in fishing communities?

In case of deaths, what effects does this have for the agricultural/fishery productivity of the household? In case of death of a spouse, what evidence do we have of stigmatisation affecting the ability of their surviving husband/wife to earn or engage in profitable economic activity that does not expose them to HIV/AIDS? Such diverse impacts need to be understood in relation to (*inter alia*): initial levels of wealth; households' ability to attract new members; identity of the deceased (i.e. head/spouse); the nature of fishing/agriculture system; and households' scope for adjusting land, labour, capital ratios (cf. Jayne et al. 2006). Considering evidence from Lake Victoria (Geheb et al. 2008), the ability of fishing communities to attract new members, and the rapid increases of boats and fishermen on the Lake does not support the argument that HIV/AIDS leads to production declines and "threatens the ability of the fisheries sector to supply fish and fish products to the low-income groups" (Gordon 2005: 4).

Considering reports of male 'irresponsibility' in behaviour and spending patterns, does HIV/AIDS induced illness and deaths of the husband or spouse affect households' food security differently? An additional consideration is that

²⁴ The work of Elizabeth Westaway (2008) provides some insights on the lives of children in fishing communities in Uganda.

men and women may have distinct knowledge of fishing and farming (Torell et al. 2007). Whilst a death results in some loss of specialised fisheries knowledge, the question remains whether systems of apprenticeships in fisheries can mitigate the loss of a father, or uncle due to HIV/AIDS.

Moreover, could the death of the wife, often the manager of the household, leave children and other remaining members more strongly exposed to economic hardship and food insecurity than the death of the husband? As women are generally barred from fishing, the death of the husband or partner may suggest being cut off from whatever direct contributions the fishing made to the household (if items from the catch were brought home).

HIV/AIDS affects households' and communities' human, financial, social and physical capital, but we have little evidence how this affects individuals' or households' access, availability and utilisation of food within fishing communities. Some evidence suggests that women adjust food consumption patterns and reduce expenditure on food during times of hardship. Women at Nyamkazi landing site cut food expenditures by half, whilst those at Bugoma reduced the number of meals by half, whereas the composition of meals also changed towards cheaper ingredients (Geheb et al. 2008). Otherwise, currently, limited evidence has been presented of how PLWHA in fishing communities employ food consumption, expenditure, income or migration strategies to address food insecurity.

These micro-level processes certainly merit further research. However, at a macro-level, it is important to remember that other forces of change concurrently affect the fishing sector, including ecology, climate, costs of inputs and production factors, prices, and so on. Studies of the wider impact of HIV/AIDS on food security and nutrition within fishing communities should set the immediate impact of the illness within the broader context.

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