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Postharvest fisheries on the eastern floodplains, Caprivi

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Questionnaire survey work was undertaken in the Katima Mulilo market in January 2001 by Mulonga Samson Nzehengwa (Department of Natural Resources and Conservation, University of Namibia) and Sikwana Leonard Munyaza both of Caprivi Region. In addition, a variety of participatory methods were used in a variety of places across the floodplain in order to explore many of the issues raised.
This report was prepared as part of the assignment of an Associate Professional Officer (Fisheries and Aquatic Resources/Livelihoods) to the Department For International Development (DFID) assisted Kavango Farming Systems Research and Extension Project in the MAWRD – North East Division.
Views, conclusions and recommendations expressed herein do not necessarily reflect those of the MAWRD, DFID, MFMR.

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Abstract

With concerns regarding over-fishing facing fisherfolk in the Caprivi Region, the search for improvements in the fishery sector may lie in closer examination of the post-harvest sector. Particularly when fish are in short supply, efforts must be made to ensure that waste and losses are minimised, whilst value-added (at the regional scale) is maximised.

This paper describes the post-harvest marketing and distribution systems of fish on the eastern floodplains of the Caprivi region. Frequently reported losses and problems in the chain are identified and described and the results from a survey of over one hundred fish vendors in Katima Mulilo are reported. A number of possible intervention points in the post-harvest chain are suggested, described and potential strengths and weaknesses of these interventions identified.

1. INTRODUCTION

The post-harvest fisheries sector refers to fishery activities undertaken between the time the fish is caught and it is sold to the final consumer. The sector is often neglected in rural development and in the planning of interventions, but should be seen as an important component of the livelihood system and can be the principal way that a resource is transformed into a direct family income.

As the fisheries resource itself is increasingly believed to be over-fished (or at least near to full exploitation levels) there is limited scope to improve fishing income by increasing production. Fisherfolk[1] regularly complain of decreasing overall catches and the diminishing size of individual fish caught. Instead, opportunities need to be sought that emphasise maximising the benefits obtained from fish already caught. Improving the efficiency of post-harvest handling, processing and marketing can significantly improve the livelihoods of producers and traders. The dominance of women (especially female-headed households) in the post-harvest sector ensures that any successful intervention in this sector should benefit one of the poorest sectors of society. Appropriate improvements in the post-harvest sector may also benefit the many families across the region who depend on fish as a major protein source.

A major concern is that any intervention to improve the effectiveness or efficiency of the marketing chain will result in an intensification of the fishery, either through an increased number of fishermen and/or improved or more units of gear. With the intensification of the fishery, income gains to the original group of fisherfolk may be dissipated among the new entrants. Post-harvest activities should thus be considered as part of the broader fishery and wider floodplain management.

A good understanding of the present system and the problems identified by the participants at different stages in the chain is crucial before any interventions can be seriously considered, and any improvement must be technically correct and in line with the desires and aspirations of the participants in the chain. Thus, post-harvest interventions should also consider issues relating to fisheries management such as whether access to the fishery should be limited, how to ensure that only non-destructive methods are used in fish harvesting, etc. Only if post-harvest interventions are accompanied by broader fisheries management considerations can we be sure that an apparently beneficial short-term intervention will not be damaging to the resource in the longer term.

Improvements in the post-harvest sector should be accompanied by efforts elsewhere in the livelihoods system to regulate fisheries: a system of managed development should be adopted.

2. LOSSES, PRESERVATION AND PROCESSING

2.1 Fish spoilage

Spoilage and post-harvest losses of fish[2] as identified in the region can be can be classified into physical, quality and market losses. Physical losses are those resulting from the fish (whole or part) that is damaged by insects or animals, thrown away, stolen or is discarded by the fisher when he empties his nets. Physical losses are usually transformed into financial losses. Quality losses are also financial losses (i.e. the difference between the potential value of the fish and the actual value

[1] Fisherfolk is a term used to denote men and women, young and old who are involved in the fishery sector ranging from the person catching the fish, through the trader, to the person selling fish to the consumer.

[2] The main species caught are *mbufu* (redbreast tilapia), *siyeo* (banded tilapia), *muu* (greenhead tilapia), *njinji* (three-spot tilapia), *ndombe* (catfish), and *ngweshe* (tigerfish). The most prized fish being *mbufu* and *njinji*.

realised) (Ward and Jeffries, 2000). Market losses in Caprivi usually occur when the market is saturated with the same type and quality of fish.

Poor handling of fish along the distribution chain often gives rise to physical and quality losses – the result of cramped conditions on *mokoros*, the lack of infrastructure at landing sites and their scattered nature, the difficulty of transport to market and the relatively high ambient temperatures. Physical losses are usually the result of poor handling practices (e.g. fish being killed by being hit with wood/stone, being stepped on, fish being thrown out of the boat at the landing site, being damaged by sharp pieces of ice). Quality losses are often due to poor processing practices (e.g. laying fish directly on the ground before/after cleaning, using storage/carrying containers that are difficult to clean, spreading contaminants by re-using ice). Table 1 below shows the different losses in the post-harvest chain in the Caprivi. Future interventions should be designed to reduce such losses and add value to the fish catch.

Table 1 Sources of post-harvest losses in Caprivi

Activity	Cause of loss
Fishing	Fish taken from the nets by crocodiles, otters and turtles or fisherfolk are unable to empty nets because of animals (e.g. crocodiles, hippos). Some fish may be identified as 'trash' fish and discarded on capture (e.g. squeakers or undersized fish) but this is often a personal choice. Poor handling (e.g. thrown around, stepped on) causing bruising and speeding up the spoilage of fish. No cooling facility/storage in the boat so fish left exposed to high ambient temperatures.
Landing	Poor handling at the landing site (e.g. thrown around, left adjacent to waste). Women take over the work after landing and they are often busy with other tasks so the fish are left unattended for a time. Fish can be left unattended on the riverbank and attacked by rodents. Fish are not cleaned and gutted immediately (if at all) before sale, because demand is largely for whole fish.
Transport (landing site to Katima market)	Delays in getting fish from the landing site to the pick-up point and from the pick-up point to the Katima market – this may be because the women responsible for the task have many other activities. Roads are poor resulting in delays or breakdowns, exacerbating the problem of few and unreliable vehicles. The poor roads can also break dried fish during transport (especially if it is over-dried) over long distances.
Processing	Poor processing techniques (e.g. with racks on the ground, drying the fish too slowly, or too quickly) leads to increased opportunity for attacks by insects or decline in quality. Fish are often processed late in the day after waiting for transport so spoilage is already setting in. Weather conditions (especially during the wet season) make the efficient drying of fish very difficult – fish that retain a high level of moisture after drying can develop moulds which must be removed before sale.
Storage	In many villages, there are very poor facilities in the absence of electricity – this causes particular problems during summer. The absence of efficient and reliable storage facilities makes even the overnight storage of fish difficult at Katima Market and reduces the shelf life of fish stored.
Selling	Generally poor facilities and conditions at Katima market reduces the shelf life of fish Repeated handling of dried fish by customers causes breakage. If fish are not sold then vendor accepts losses and reduces the price.

Adapted from: Ward and Jeffries, 2000.

The vendors themselves have adopted a number of coping strategies to deal with these losses and issues but the degree of success is varied and many of the techniques are not widely applied. Many of the interventions identified and described in Section 6 are designed to address such losses. In order for fish to maintain (or increase) their value, there are two main methods or techniques to slow the rate of fish spoilage – preservation and processing .

2.2 Preservation

Preservation tends to keep the fish 'fresh', as far as appearance is concerned – the aim of preservation is to maintain the fundamental condition of the fish in terms of taste, texture, appearance and smell. Preservation usually involves lowering the temperature of the fish using ice or freezing to slow the rate of spoilage. Just over 40 per cent of fresh fish vendors in Katima use ice when they are transporting fish from the floodplain, and a further 18 per cent use ice once the fish has arrived in Katima. However, about 40 per cent do not use ice at all because of the cost or the belief that it melts too quickly without a cool box or that it spoils the fish.

Ice is available only in Katima at a small number of retail outlets, adding to the difficulty of preserving fish. The price varies depending on the type and quantity of ice (block or cubes), vendors claim to pay about $N10 per block.

Freezing fish is confined to private households and is at present not used on a large scale in the Caprivi. Many areas of the floodplains have no electricity for refrigeration.

2.3 Processing

Processing usually results in a change in the taste, texture and appearance of the fish, so that the rate of spoilage is reduced. In changing the characteristics of the fish, it is hoped that the value of the product is enhanced (or at the very least, not reduced). By far the most common method of processing fish in the region is sun drying. Sun drying can be done in conjunction with smoking, but is rarely done in conjunction with salting in the Caprivi. It must be assumed that the choice of sun drying as the main technique for processing is as a result of the geographical location, socio-economic factors, habits of the local population, purchasing power and local infrastructure.

2.3.1 Sun drying

Fish are washed (in river water), scaled, gutted and split dorsally (if larger species) immediately after harvest or purchase. The fish are then dried either on a raised multi-purpose shelter (*ngalani*) (by 77 per cent of those women interviewed), on the roof of the house or laid out to dry on mats on the ground (*ziande*). Although less common, fish can also be dried by hanging them vertically on lines or sticks. Depending on weather conditions, fish may be dried for two to six days. Over 67 per cent of the 45 vendors interviewed say they dry their fish for only two or three days. Once dried the fish can be sold immediately, or packed and taken to market in bulk.

Perhaps the biggest influence on the quality of dried fish is the quality of the raw material. In the market in Katima, sun drying is often used (but by no means always) as a processing method after the fish has remained unsold for a day or more, though a fish which has already started to spoil cannot be 'saved' by sun drying. Fresh fish (even if a little spoiled) will sell for up to 100 per cent more than dried fish, so vendors keep their fish until the last moment before splitting it for drying. Of course there are times of the year or places when fish that is landed is immediately destined for drying, because of problems of access to the market preventing the sale of fresh fish.

The treatment of the fish prior to drying, and the practice of drying and re-drying is the source of a lot of suspicion regarding dried fish, resulting in low consumer confidence and thus low prices for dried fish.

Over 74 per cent of the vendors interviewed in the market reported that salt is rarely used in the drying process ('why add salt when they [the buyer] can add it themselves', 'salt is expensive', 'why will I carry salt onto the floodplain for the fish?'). With very little salt being used the attacks by blowflies can be more severe, especially in the wet season when conditions are humid and drying is slow. That the dried finished product is often brittle, and susceptible to damage in transit is a problem referred to by a number of the vendors interviewed. No insecticides were reported to be used either on the fish or in the area where fish was being dried.

2.3.2 Smoking

Basic or quick smoking (sometimes known as 'servicing') is carried out mostly during the wet months and is done to reduce insect infestation, inhibit mould growth and improve the appearance of the fish. The fish is smoked over a fire for 10–15 minutes. Once the dried fish are in the market, the vendors may smoke the fish occasionally to impart a more desirable colour to the dried fish – sometimes four or five times – and combine this with repeated drying to prolong the shelf life of the fish. It is largely as a result of such practices that consumer attitudes to smoked, processed fish are generally negative, as it is seen as a way that fishers and/or vendors hide a poor quality fish. However such suspicion is not true everywhere – in other parts of Namibia smoked fish is a popular product.

3. POST-HARVEST INFRASTRUCTURE

3.1 Landing sites

Fishermen usually land fish in their village of origin where their wife or a vendor will take over, unless an arrangement has been made to land for a buyer elsewhere. Consequently, landing sites are many and dotted across the floodplain, some dealing with only a very small amount of fish.

Landing sites are difficult to monitor because they shift with the rise and fall of the water – depending on the water level, fishermen may travel two or three hours to the fishing site, clear their nets and then return to the landing site. The water may be adjacent to a main dirt road and therefore fish can be landed and sent to market relatively quickly.

3.2 Storage

There are no commercial-scale storage sites or facilities on the floodplain. Most fish is either taken directly to market for sale or is dried in the villages. Once the fish are dried they can be stored until large enough quantities are amassed at which time the dried product is taken to market.

3.3 Roads

Fisherfolk cite the poor quality of roads as one of the main problems facing their business. The poor roads take a heavy toll on vehicles and mean that transport is often difficult to obtain. The road network across the floodplains is very poor, as one would expect given that large areas are flooded each year. Most roads are unsurfaced, and are impassable from March to July as a result of the flood, as well as during the rains between December and February. There are proposals to improve and extend the road from Iseze to Malindi and Schuckmannsburg which should improve access to sections of the floodplain. This project is in the five year plan for the Ministry of Works.

3.4 Katima market

The open market in Katima Mulilo is the destination for most of the fish caught on the Zambezi/Chobe floodplains. Despite being the largest fresh fish market in Namibia it is in poor condition with very few services supplied to the vendors. Although there is water and a limited amount of electricity available, the outlets are limited and far from the area used by the fish vendors. (See Section 5 for the views of vendors regarding the market.) Areas are set aside for fish, vegetables, dry goods, food stalls, etc., and a Market Committee made up of representatives of vendors of different goods (e.g. fruit and vegetables, fish, dry goods) manages the market. In 2001 the fish vendors were moved to the part of the market previously reserved for dry goods. The fish vendors now have concrete tables from which to sell their fish.

Bukalo also has a small market, but most of the fish sold there is dried or originated at the Katima market. The situation is similar at the township markets in Katima.

4. PARTICIPANTS[3]

Figure 1 shows the main locations mentioned in the text. Figures 2 and 3 show the varied distribution chains from the capture of the fish to the consumer as seen in two case studies. The 'neat' groups shown in these figures hides some of the huge variety of players, methods, practices and procedures that are found in various parts of the floodplain. The following descriptions relate more to activities than individuals – an individual may at different times operate as a fisher, a vendor, and if circumstances are right may also act as a wholesaler.

Figure 1 Eastern floodplains of the Zambezi, Caprivi

4.1 Fishermen

Fishing is rarely conducted as the only income for a household, even where the fisher is widely recognized to be a 'professional' or 'commercial' fisherman. Fishing is only one component of a complex, variable and flexible household and livelihood system. The nature and intensity of fishing activity varies throughout the year but the most commonly used gear in the rivers and on the plains are gill and drag nets, largely operated by men. During the months when the floodplain is inundated with water, a variety of traditional gears are used (funnels, baskets and fences), particularly by

[3] For more detail about fishing and its role in rural livelihoods, see Purvis, 2002.

women and children. Inputs in the fishery are generally limited to a canoe or *mokoro* and paddle (for the use of nets, although traditional techniques can be used without a *mokoro*) and the fishing gear itself.

4.2 Female family members

Where the fisherman is part of a traditional household, the most common entry point for fresh and dried fish into the marketing chain is through the wife or a female relative of the fisherman. As the fish is landed, the female family member (usually) takes over to sort the catch for different uses. Decisions relating to how much to keep for household consumption, how much should be sold fresh or processed and how and where the fish should be sold are usually made at this point by the wife in consultation with the fisher.

4.3 Vendors

The vast majority of vendors are women (who may also own fishing nets) and it is often the case that the female family member mentioned above fulfils this role. Males are rarely found selling fish in the market. Of the 120 vendors interviewed, only one vendor was male – and he was only there because his wife was ill.

Figure 2 Marketing and distribution channels for fresh and dried fish from the Libula area

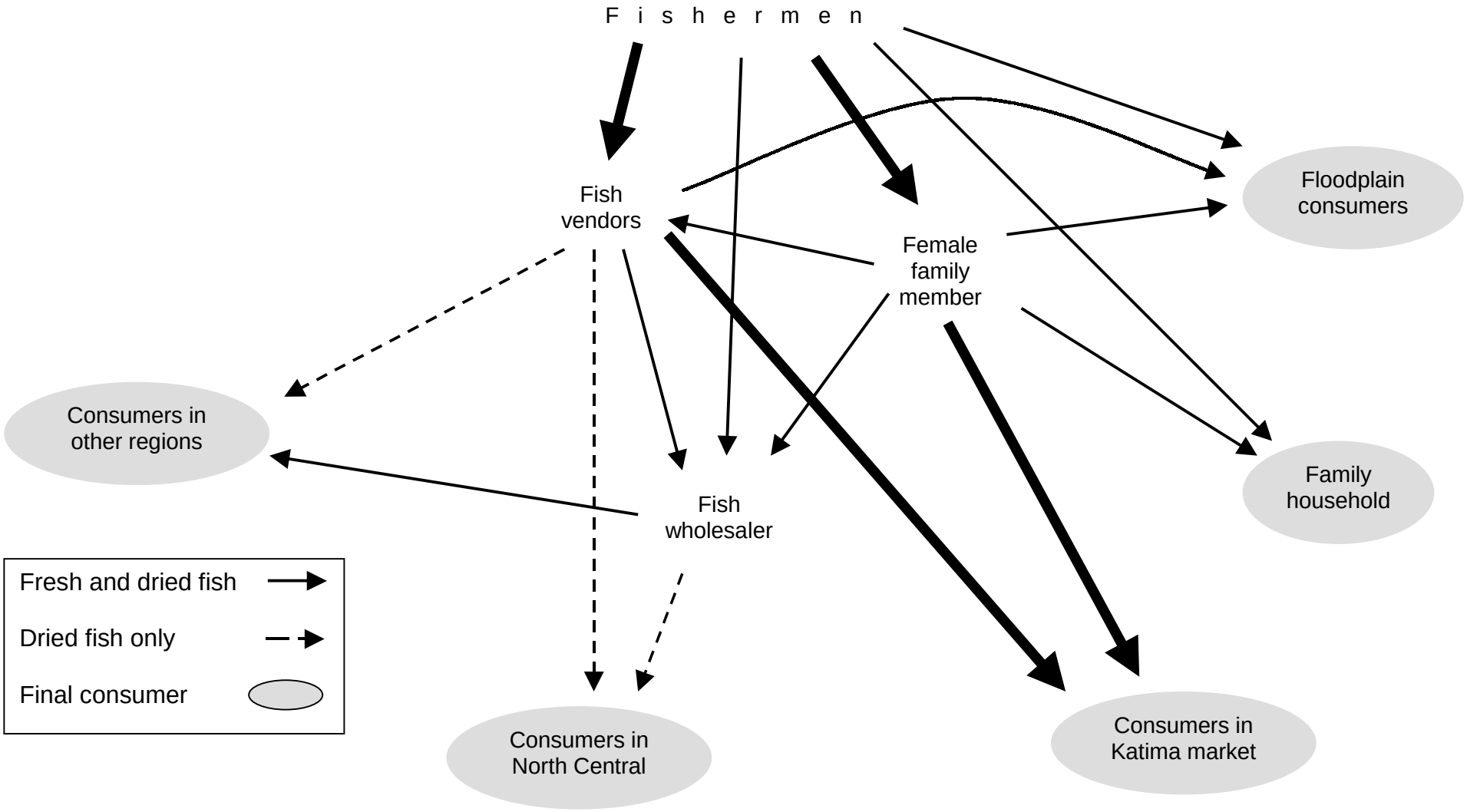
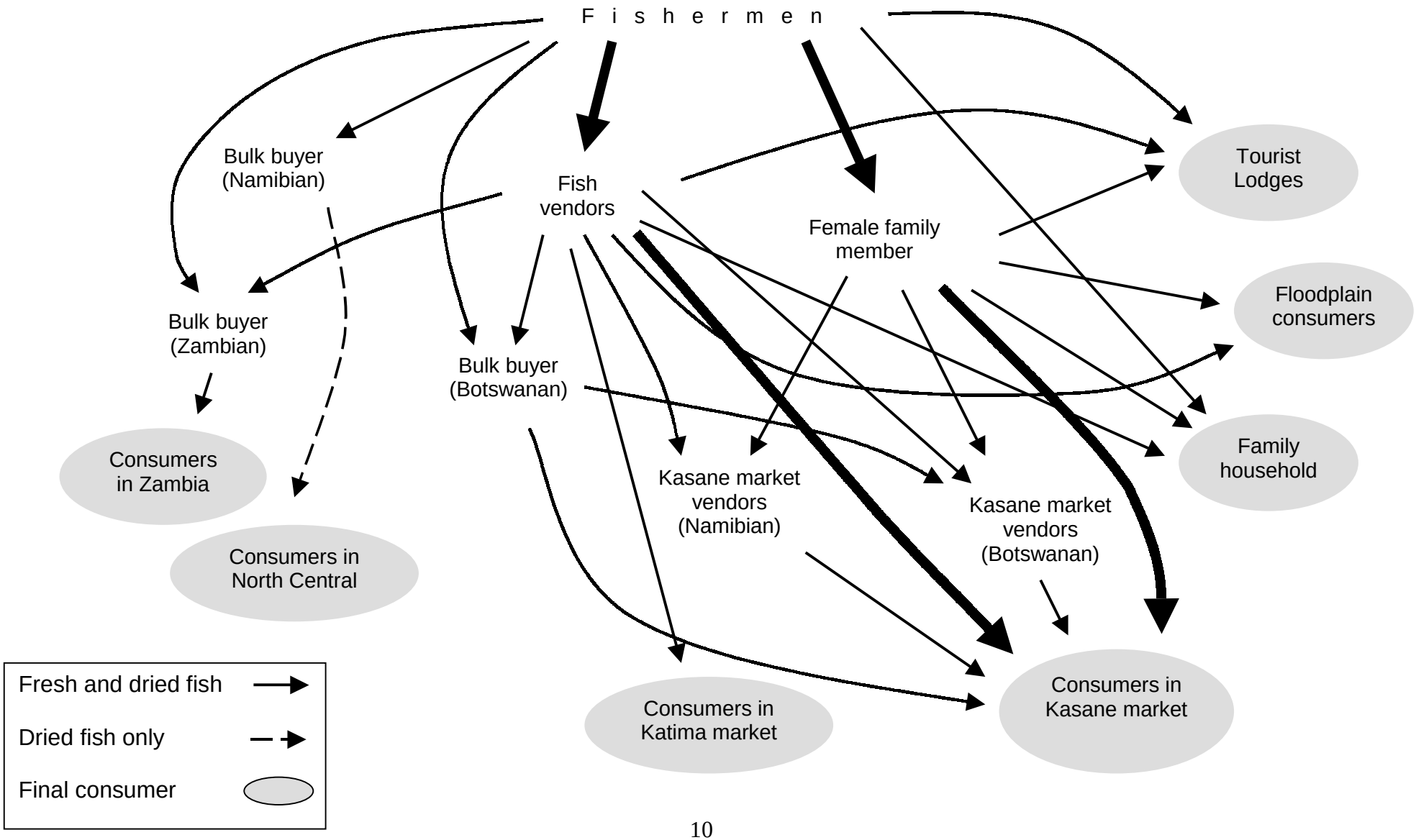


Figure 3 Marketing and distribution channels for fish from Impalila island and adjacent floodplain



The fish vendors working from Katima market tend either to sell fresh or dried fish, though there is some overlap (some women sell dried or fresh fish at different times of the year). Of the 45 dried fish vendors interviewed, less than 30 per cent were also involved in the fresh fish sector.

Table 2 Source of fish sold in Katima market during the survey period

Village	Where do you buy your fish?		Transport cost to Katima market (N$)
	Dried fish vendors	Fresh fish vendors	
Masanga		##########	7
Lisikili		##############	7
Libula		########	7
Nfoma		########	7
Kalimbeza		#	12
Sifuha	#		12
Kalundu	#	###	12
Iseze	#		12
Ngoma		######	15
Nanombe	#######	##	20
Ihaha	#	#######	20
Isuswa		##	20
Nakabolelwa	####	#####	25
Lusese	####		25
Schuckmannsburg	##	#	25
Nsundwa	#		30
Mbalasinte	######	#####	30
Kabulabula	#		35
Kasika		#	35
Kasikili		#	35
Ikaba	##########		35
Ivilivinzi	####		40
Total	**43**	**74**	

Table 2 shows that fish available at Katima market is sourced from all sections of the floodplain area (see Figure 1). The majority of fresh fish sold in the market at the time of the survey was from areas closer to Katima, whereas the dried fish was sourced from the areas further from Katima.[4]

4.3.1 Dried fish vendors

About 40 per cent of dried fish vendors identified themselves as the household head. (Either they were unmarried, usually with children, or widowed). Only 46 per cent claimed to be the partner of the household head. Many dried fish vendors live in Katima or the surrounding townships (unlike the fresh fish vendors), with the majority stating that the income from selling dried fish was the

[4] The price of transport from different areas on the plains to Katima is used as a measure of distance.

main source income for the household. The female-headed households are commonly seen to be the poorest groups in the region.

The dried fish vendors usually travel to a village on the floodplain and remain there for a week to buy fresh fish and dry it themselves. Having bought and processed sufficient fish, they then return to Katima, and stay until they have sold all their stock – which can take up to three weeks. More than half of the vendors return home each night with their stock, with the remainder storing it in one of the rooms at the market where it is vulnerable to cats and thieves. Almost 70 per cent of dried fish vendors stated that they bought fresh fish from fishermen, rather than receiving it from relatives. Only six per cent processed fresh fish caught by their husband.

Reported revenues vary enormously, but one of the most frequently occurring reports was that for $N200 of dried fish bought, a vendor will receive $N350 over approximately two weeks of selling in the market (reported 15 times). The time spent at the market for dried fish sellers varied according to the amount of fish being sold but on average the most common unit of fish bought for re-sale as dried fish was $N150 and this could be expected to take up to two weeks to be sold. Those individuals who bought about $N50 worth of fish expected to spend less than one week in the market. The majority of vendors said that they would not keep their dried fish on the market for much longer than two weeks. However, in discussions with some vendors they complained they were only selling two or three fish per day, and having difficulty paying the market fee of $N2.50/day.

4.3.2 Fresh fish vendors

Of the fresh fish vendors interviewed, almost 40 per cent identified themselves as the household head, with 56 per cent claiming to be the partner of the household head. About 70 per cent of the vendors bought their fish from a fisherman, though over 20 per cent of vendors regularly receive fish from their husband. Only four per cent or so receive the fish from a relative other than a husband.

More than half of the fresh fish vendors who could identify a price bracket, reported that they usually buy between $N50 and $N100 worth of fish at the river side and come to the market everyday to sell their catch. If the catch is not sold the same day then it can be stored in cool boxes (e.g. broken refrigerators containing ice blocks) or cartons. The fish is vulnerable to theft if left overnight in the market. Some of the women also buy ice to take to the riverside for the fish the following day or for fish they are storing in the market overnight.

4.4 Wholesalers

Wholesalers provide a very important service, though there appear to be few wholesalers in Caprivi – of the 142 vendors interviewed, only two had bought fish from a middleman. Particularly between May and July when the floodplain is inundated, wholesalers buy catfish (fresh or dried) on the floodplain and transport it to the North Central region of Namibia, where it is a highly marketable product. Wholesalers from Zambia and/or Botswana often work in the more isolated areas of the floodplains, often trading goods or services from their home country in return for fish.

Wholesalers may provide a very important market service and incur considerable costs (e.g. vehicle damage, fuel, time, etc.) and take relatively high risks of being unable to sell all their fish.

4.5 Consumers

The majority of consumers in the region are households or tourist lodges who buy fish for both consumption and as bait fish for angling customers. There appears to be no premium for quality fish (or fish handled well), although evidence suggests that it is sold more quickly, freeing up time for the vendor to attend to other tasks associated with the household. Primary demand is for whole, fresh fish particularly large bream (mostly tilapia), although the poorer section of the market prefer catfish largely because they are cheaper. As described above, dried or smoked fish is widely seen as inferior; iced fish is similarly viewed with suspicion, as if the ice conceals bad fish. Members of the Seventh Day Adventist Church do not consume catfish for reasons associated with their beliefs.

5. STAKEHOLDER CONSULTATIONS

A survey of fish vendors (both fresh and dry) in Katima Mulilo market was undertaken over 10 days in January, 2001. During that period over 120 vendors were interviewed on a range of different topics.

5.1 Issues relating to the market

Comments from both the dried fish vendors and the fresh fish vendors regarding the market and facilities are shown in Table 3 (in no particular order). Over 80 per cent classed the facility as either poor or very poor (Figure 4).

Figure 4 Opinions of Katima market conditions and facilities

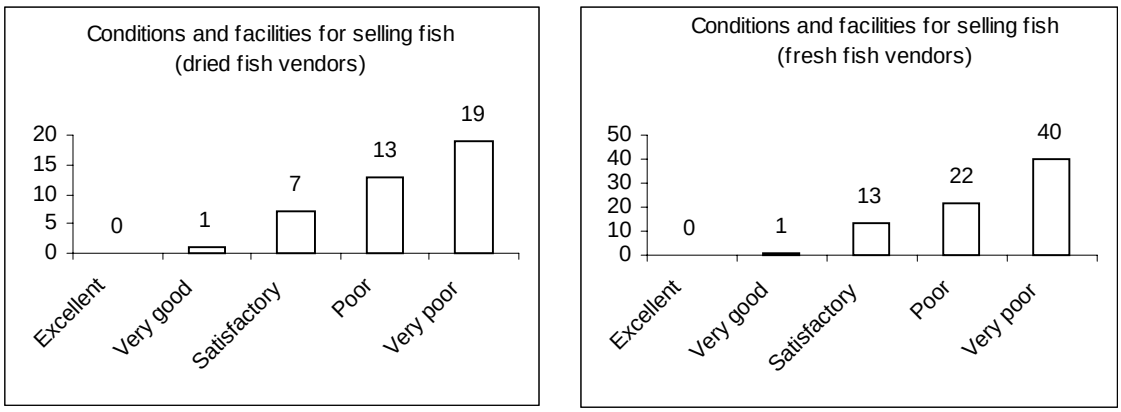


Table 3 Problems identified by market vendors regarding Katima market

Complaint	Notes/details	Suggested solutions
Infrastructure issues		
Insufficient stands*	People fight for stands. People lay fish on the floor in the dirt and dust in the dry season and water in the wet season, which spoils the fish.	Build more stands, even if they are not 'owned' by an individual.
Overcrowding	The fish vendors, cloth sellers, fruit and vegetable vendors are all grouped in one market with too many people.	The market should be extended and fish should be separated from other items being sold.
Flooring is very poor*	The dirt floor means dust and water contaminates the fish.	Concrete or other suitable flooring is required.
No roofing*	No protection from sun, rain or wind for vendors or their goods, which speeds the decomposition of fish.	Roofing is required.
No storage facilities	So that people can store fish until there is sufficient quantity to make it feasible to arrange transport to take the fish to other parts of Namibia Dried fish are attacked by worms and beetles or stolen by cats because of the lack of secure storage facilities.	Build fish store, co-operate with others to move fish to other places for sale (e.g. North Central Namibia)
No cold store	Lack of cold storage speeds spoilage. Problems of storage overnight, problems of theft for those who do store goods overnight.	Proper and secure cold storage should be built.
Poor sanitation and no toilet	Poor water supply and the water is often dirty, no electricity for freezers, no ice available on site.	Improve the services available to vendors at the market.
Management issues		
Market is dirty	Cleaners do not do their work, vendors do not clean their area, vendors have no discipline, vendors are ignorant, no sweeping equipment is available, no fines for dirty behaviour.	'Employ cleaners who are interested to do their job.'
No 'personal' stands	Vendors have to fight to get a stand, and as there is no ownership, people are less likely to clean the area.	People should be given individual stands.
Market fee	Current market fee is $N2.50 per day, regardless of whether the vendor is selling the same fish on more than one day, also the fee must be paid despite the lack of facilities.	Should only pay $N2.50 once for each batch of fish
No action from the Market Committee	The Market Committee do not take up issues with the Town Council and the Town Council does not help the Market Committee.	Improve co-operation between the Market Committee, Town Council and the vendors
Theft	Complaints about theft if goods stored at the market overnight.	Proper and secure storage facilities in the market area.
Illegal sellers	Illegal immigrants regularly sell fish in the market, who often charge low prices because they want to return home.	Enforce laws on illegal entrants. Police should increase the number of raids on the market.

***** In late 2001, the fish vendors (both fresh and dry) were moved form selling fish 'in the dirt' to an area of the market previously reserved for the sale of dry goods. The new area allows the vendors to use concrete tables for the laying out of their produce.

5.2 Other comments

In the wider fish business environment, the main problems identified by the vendors were:

- the high cost of transport for themselves and fish from villages to the market in Katima;
- the poor quality of roads and irregular transport system;
- small profit margins associated with fish vending;
- 'unfair' competition with the illegal sellers (immigrants);
- fierce competition between the vendors who buy the fish at the river for sale in the market and the women who are given the fish to sell by a relative. (The latter group are often more willing to accept a lower price per fish so that they can sell all of their produce quickly and return to other tasks. The group who have paid for their fish are forced to bargain and make sure that they at least cover their costs.);
- the lack of alternative marketing options;
- lower returns for processed fish which requires more labour input; and
- the lack of access to loans or credit to develop or expand their businesses.

6. POSSIBLE INTERVENTIONS AND OPPORTUNITIES

6.1 Local buying stations and cold stores across the floodplain

Vendors complained that they spend too much of their time travelling to and from the riverside or their village to the market in Katima Mulilo. Many of the conditions for post-harvest losses are the result of damage caused during the journey, or the time taken for produce to reach the market.

The dispersed nature of the landing sites means that it is often a long period of time before fish enters a chain where quality is incorporated. The concept of the local buying stations tries to bring the services (ice, transport, and cold storage) closer to the landing sites. The local buying stations could provide an intermediate point of selling, collection and storage of fish.

Buying stations could be in villages and should provide cold storage and make ice available on the floodplain. Such facilities would give more opportunities for controlled marketing to the fishers. A range of institutional set ups could be considered – private ownership, community ownership or formal cooperatives, for example. The need for electricity at these buying stations would be determined by the local need for deep freezing or short term chilling.

Table 4 Local buying stations across the floodplain

Potential strengths	Potential weaknesses
Reduce fish spoilage in more remote areas during transport to market. Reduce the need for regular travel between the floodplains and market, freeing up time for people to become involved in other activities. Improve or maintain the quality of fish (and price), by ensuring that the vendor has access to ice and cold storage at the earliest possible time. Improve vendors control over marketing and, reduce losses resulting from over-supply at certain times of the year. Provide the opportunity for trading fish in bulk to institutions or more distant markets. Maximise returns to fisherfolk by ensuring that most of the fish is sold fresh rather than dried.	Reduce the regular/daily supply of fresh fish to the market in Katima (e.g. as wholesale dealers take an increasing proportion of the fish landed) resulting in a price rise. Purchasing power for fish concentrated in the hands of individuals/groups controlling access to storage. Increase in pressure on the fishery because people can sell or store all the fish they catch without any concern for market saturation or the difficulties of transporting the fish to Katima. Have a negative influence on the well-established (social) practice of daily travel to market.

6.2 Small markets across the floodplains

Particularly in the north and eastern areas of the floodplain, where fish is sold in Zambia and Botswana, new market facilities could bring the people to the fish rather than the current situation of vendors working hard to take fish to the people. The residents on Impalila Island identified new markets as one of the most pressing concerns for the future of their fishing businesses. Namibian vendors selling fish in Botswana are coming under increasing pressure from the Botswana authorities to sell their fish at the immigration post to be re-sold in Kasane by Botswanan vendors. These vendors complain that prices are lower from the Botswanans but, because they are sometimes refused entry to Botswana in order to sell their fish at the market, they are forced to accept these prices.

It is not only the fish from Impalila which is sold in Kasane but much of the fish from Kasika area and that side of the floodplain also ends up in the market in Kasane. The community on Impalila is keen to see a market established somewhere on Namibian soil. This request has also been voiced by other communities on the floodplain.

Table 5 Establishing small markets across the floodplains

Potential strengths	Potential weaknesses
Reduce the amount of time that fisherfolk spend taking fish to market, especially women. Reduce the need for vendors to use their passports or travel documents on an almost daily basis. Reduce the costs of transport for the sale of the fish. Namibians take control of activities in the market. No apparently arbitrary controls on the movement and price of fish. Bring Botswanans to Namibia to buy fish where they may also purchase other items.	Insufficient fish for sale year round. Entrepreneurs or individuals continue to sell to Kasane vendors undermining the newly established market in Namibia. People from Kasane do not come to the Namibian market, but obtain fish from another source (e.g. Zambia). Vendors from Namibia no longer earn Botswanan Pula (directly) from the fish sales in Botswana, which is required to purchase a number of essential household items (e.g. oil, sugar) from shops in Botswana.

6.3 Improving storage and transport containers

The current methods for carrying fish to market are generally basic and include plastic bowls, tin dishes, sacks, old cardboard boxes and plastic bags. Some of these containers actively encourage attacks on the fish by beetles, flies, mites and mould by being difficult to clean thoroughly between batches (especially of dried fish). Any effort to improve the quality of the containers used to transport fish must result in containers that are low cost, light, easily available locally and appropriate to local conditions and practices.

A project to improve the containers for transporting fish should promote the use of improved ice boxes. A suitable container would need to be identified or designed which would ideally meet the needs of both vendors and fishers – it should provide insulation, protection from attack by rodents and insects and could be used to transport ice back to the floodplain.

Table 6 Improved storage containers

Potential strengths	Potential weaknesses
Improved hygiene and quality of fresh fish, and potentially higher prices received or selling prices maintained for a longer period. Fish sells more quickly due to improved quality, freeing up time for vendors to undertake other activities. Reduced post-harvest losses through the infestation of fish with insect pests. Better security from theft at landing sites, in transport and at Katima market. Extend the cold chain and associated quality improvements to include the period when the fish is in transit. Ensure that small-scale fisherfolk can participate in any benefits in quality brought about by the improvement in the market in Katima and the exploitation of new markets.	Quality improvements may not be reflected in price increases, so the investment in the fish box would be recouped only slowly. Design of the container does not take into account the practical features sufficiently (e.g. lightness, cost) and uptake is slow. Fish transport may not be considered (by men) as an essential, productive component of the fishing activity (like nets or a canoe) so people may be reluctant to use scarce resources to buy such a unit. If inadequate training is given in the use and maintenance of improved boxes then the life of the box may be drastically reduced.

6.4 Improved fish market in Katima

The market in Katima currently provides very few facilities for the vendors – though this survey and paper focus only on fish vendors. As can be seen in Figures 2 and 3, fish from across the floodplain passes through Katima market, making it a critical component in the distribution chain. The market itself has the potential to be one of the strongest driving forces in the improvement in fish handling. If the improvements in quality are not maintained as the produce comes to the market, then new practices on the floodplain will be particularly hard to implement.

A wholesale improvement in the conditions in the market is required to realise the full potential of the important trading activities undertaken there. The construction of a new market is a large undertaking and can only happen with the collaboration of all stakeholders. To be suitable for a fish market, any new construction must consider whether the site is easy to clean (sloping floors, adequate drainage, adequate water supplies); storage is sufficient for both dried fish (secure from insect or rodent attack, from human interference, easily cleaned) and fresh fish (incorporating cold storage and/or a freezing facility); that the management and ownership of the market area is efficient; and the new facility incorporates offices and at least one meeting area.

In 2002, the Katima Town Council and Luxembourg Development began working together on the design of a new ‘open market’ for Katima Mulilo.

Table 7 Potential strengths and weaknesses of an improved fish market in Katima

Potential strengths	Potential weaknesses
Improved hygiene and quality should encourage people to buy more fish in the market. Reduce wastage by reducing pest attacks. Provide a focal and meeting point for small vendors, traders and consumers in the region. Provide a basis for various group activities in the different sectors. Provide a central eating area for vendors and visitors.	Market is constructed without proper consultation resulting in low levels of 'ownership' and use of the facility. The market constructed is inadequate or inappropriate for the majority of the users. The market fee is unacceptable to users. Management of the facility is inadequate so services offered are not viable and fall into disrepair. Private businesses are not adequately involved in the design, construction and operation of the facility, resulting in a 'government' market not owned by the people or managed by a business. Poorly estimated running costs reflected in higher vendor charges, then passed onto the consumer as higher prices for fish.

6.5 Promoting the use and sale of ice

Chilling fish using ice is the most common method of preserving fish in Caprivi. At present the vendors can buy ice only in Katima. There are various methods of producing ice and a variety of business structures which could be used in the establishment of an ice-making facility. It is suggested that a facility owned and managed by a private operator is incorporated into the design of a new market building. Ice making could be integrated into a larger cold storage operation serving needs wider than that of just the fishing sector.

Table 8 Promoting the use and sale of ice

Potential strengths	Potential weaknesses
Improve the quality and appearance of the fish being sold at the market. Increasing the shelf life of fish may open up opportunities to send fish to more distant and lucrative markets. Reduce spoilage and opportunity for attack by insects. Provide the basis for a cold chain operating from the landing site to the consumer (when combined with the interventions identified above). Raise awareness of the importance of product quality and hygiene.	Ice is available but cultural preferences may mean it is unused, or has such a high price that fish prices increase also. Management of the ice plant is inefficient and not sustainable. Inappropriate machinery for ice making is used – maintenance and spare parts become a problem. Icing of fish will become required by consumers and so vendors who are unable to access ice will be penalised with lower prices obtained. Ice is not used properly, increasing damage to the fish and increasing opportunities for pest attacks.

6.6 Improved processing methods

The prevalence of drying (accompanied by periodic smoking) of fish is due to a variety of local factors. Any intervention tampering with this system of processing must consider the requirements of the consumer, the suitability of fish species for different types of processing, the local climate, whether the facilities and raw materials needed for processing are available locally, and the cost of the final product.

6.6.1 Improving drying methods

Despite the apparent simplicity of the sun drying method for processing fish there are a number of techniques or modifications which can be used to improve the quality of the final product. For the best quality sun-dried product the following should be remembered in the drying process where possible, usually adapted to the local conditions:

- Fish should be dried on raised racks (*ngalani*) to reduce pest attack and to improve the drying rate (air circulates around the fish on all sides).
- Fish racks or shelters must be clean and free from insects; fish waste should be disposed of away from the racks to reduce pest attacks (insecticides should only be used when absolutely necessary).
- Racks and shelters should slope slightly to allow moisture to drain away.
- If initial drying is too quick then 'case-hardening' will result (the outer surface forms an impenetrable layer slowing the flow of moisture out of the fish) and the moist internal section spoils rapidly. Rehydration to a consumable, palatable product is difficult in fish hardened in this way. However, drying needs to be quick enough to reduce blowfly attack (blowflies attack only when fish are still moist).

The use of solar driers has been tried in a number of places in Africa, with limited success. A solar drier concentrates the heat of the sun on the fish itself, speeding up the process by which the water is removed from the fish. These functions would be especially useful in the wet season in the Caprivi floodplains.

Table 9 Improved drying methods

Potential strengths	Potential weaknesses
Improve the quality and hygiene of the product. Maximise the price obtained for the product. Reduce pest infestation rates and physical losses. Better quality product should encourage a quick sale and will reduce the amount of time vendors spend in the market freeing up their time for other activities. Reduce risks to human health (some toxins in mould are poisonous).	Physical methods of protecting fish from attack by insects can be expensive. Prices do not rise with the increase in quality. Construction of solar driers can be expensive. Some methods may not be robust enough for the environment. Some methods may have a relatively low capacity for drying fish in batches, and consequently the process may be lengthy.

6.6.2 Salting and smoking methods

The preparation of salted–dried fish is very similar to the method of drying fish, and is done to preserve fish, whereas salted–smoked fish is prepared to give the fish a distinctive flavour. The use of a salt solution speeds the drying process. Salted–dried fish are soaked for three to five hours in a brine solution (the salt concentration will depend on the species and the consumer preference) and dried in the usual way. Smoking preserves fish by both drying them (in the heat of the fire) and as a result of deposition in the flesh of the chemicals from the wood smoke, which inhibit bacteria growth.

In tropical environments, using hot-smoking methods cooks fish in the process so it does not need subsequent cooking – however this method does not allow preservation for long periods. Fish are cleaned and gutted (depending on the size) and then soaked in a brine solution (as above) and then cooked in boiling water for five or more minutes before cooling down. A smoking drum is then used to impart a smoky flavour to the fish. There are a variety of types of smoking drums available – further research is required to ensure palatable and safe smoked fish are produced. Care should be

taken in the selection of smoking materials because, through the smoking process, some woods can transfer dangerous toxins to the fish.

Table 10 Other preservation methods

Potential strengths	Potential weaknesses
Additional smoking and/or salting of fish reduces the chance of pest infestation. Differentiated products may attract new customers. Different products broaden the basis for competition among vendors. Different products should provide additional income for fisherfolk.	Lack of customers (particularly locally) for smoked or salted–dried fish. Smoked fish may command a lower price. Difficult to get a uniform product every time and even within each batch. Processing can be labour intensive, so must be rewarded with higher prices. Inputs may be expensive, so profit margins are reduced.

6.7 Formation of Fish Vendors Association in Katima market

At present, vendors at Katima market have not formed groups or been able to act as a cohesive body. However, there is a desire among a number of the women to cooperate. Experience has shown that group formation is stronger and likely to be longer lasting if the group can be established with a particular focus or target. For the fish vendors this might be any number of issues as identified during the consultations in the market survey. The group could be either a loose association or a co-operative.

Table 11 Potential strengths and weaknesses in establishing a Fish Vendors Association in Katima market

Potential strengths	Potential weaknesses
Group activity to achieve shared objectives engenders co-operative spirit required to achieve positive development outcomes. May give strength and confidence to the group in dealing with external operators. Group activities may spread to other aspects of the post-harvest sector such as transport. Co-operation in buying and selling will increase power as consumers of inputs such as ice, boxes, etc. Enable input into the design and management of new fish market. Facilitate the involvement of the vendors in future consultation exercises. Organisational and institutional training can be made available to the group.	Group structure is inappropriate for the task envisaged and group motivation declines/collapses. Poor or lack of training for group members and officials in how to handle such a group could result in dissatisfaction of members. Lack of appropriate support from the concerned line agencies. Lack of support from the Town Council and the Market Committee. The group may expect too much assistance from government.

6.8 Establishment of a savings and credit scheme for the vendors in Katima market

Savings and credit schemes across the world have a variety of structures and one would have to be developed which is appropriate for the conditions in Katima. It is strongly recommended that a revolving saving and credit system be implemented in the hope of establishing a sustainable system which will grow with the success of the system. Whichever system is implemented, it must be agreed upon in consultation with the stakeholders if it is to be sustainable over the long term.

Table 12 Potential strengths and weaknesses of a Katima market vendors' savings and credit scheme

Potential strengths	Potential weaknesses
Can be the basis for the creation of self-help groups. May be the start of the empowerment process of a hitherto unrecognised group. May form the basis for other group actions and activities. Credit records (for groups and individuals) may serve as a basis for accessing formal credit at a later stage. May lead to a more business-orientated system among the vendors. Skills learned during the process can be applied in a wider sphere	Poor repayment rate results in the collapse of the revolving fund, the loss of interest, motivation and cohesion in the group. Lack of transparency builds a feeling of mistrust among the members. Inadequate training and awareness raising among the group results in a dole-out mentality and poor rates of repayment. Inadequate preparation of the group to receive and deal with money leads to poor repayment. Administrative costs associated with a savings and credit scheme may be high.

6.9 Exploiting new markets

A number of problems associated with the fisheries sector (e.g. poor prices, fish spoilage at certain times of year) may be resolved by the identification and exploitation of new markets This activity may be one of the most important interventions – many other potential interventions are designed to improve fish quality (and/or reduce spoilage and losses) in order to obtain better prices. However higher prices will not necessarily be forthcoming in Katima, where the market is traditional and may not necessarily pay a premium for a higher quality product. Markets must act as the driving force for improvement in any of the techniques suggested above.

The exploitation of new markets must not be undertaken before sufficient information on the nature, and requirements of more distant markets is available. In addition, credit should be available to vendors to enable them to accumulate sufficient stock to make the journey to distant markets worthwhile. Training in recording, book-keeping and other small business management skills should be provided to ensure that vendors can successfully exploit new markets. Finally, information about necessary permits for the transportation of live or dead fish is necessary, as is sufficient storage for stock.

Table 13 Potential strengths and weaknesses in the exploitation of new markets

Potential strengths	Potential weaknesses
Empowers individual vendors to improve businesses. Maximises value received for fish brought to Katima. More attention to quality in the whole chain, reducing losses.	Best quality fish is sold outside of the region. Fish becomes more expensive in Caprivi as supply is effectively reduced to the local market. New fishermen will be encouraged by high profits, while existing fishermen may intensify their efforts to catch more fish increasing pressure on the fishery.

7. CONCLUSION

All of the interventions discussed above will require further work before they can be implemented – some will need trials of technologies, others will need liaison with line Ministries and players and all will require further consultation with fisherfolk and vendors.

Consultations should be carried out as an integral component of more detailed project planning. Within the above interventions there are roles for the national government (in providing the enabling environment), local and regional government (in co-ordinating the activities at the local level), the private sector (as vendors and entrepreneurs) and also the non-government sector (perhaps in capacity building for group work and in assisting small business development).

However, it must be recognised that opportunities in the post-harvest sector cannot be divorced from the capture sector. Fishing is based on a renewable resource, but not an infinite one. Any intervention in the post-harvest sector is likely to have repercussions on the capture fishery. A successful intervention (e.g. one raising vendors' incomes) is likely to increase the number of vendors operating, which may result in an intensified demand for fish, subsequently increasing the number of fishers. In the long term, the overall result of the intervention may be the depletion of the resource, or an irreversible change in the diversity of the fishery.

In addition to this, a range of factors – not solely associated with the post-harvest sector – including the following must be considered:

- Any uncertainty about the status of the fish stocks should ensure a cautious and calculated approach and an intervention in line with wider fishery management objectives.
- Given the multiple activities undertaken by most households on the floodplain, any future intervention must fully consider the likely impacts on other components of the livelihood system.
- At present, post-harvest businesses tend to be family owned and run, with few entrepreneurial businessmen involved. This is likely to change as opportunities present themselves.
- The current handling of fish in the distribution chain is poor but in many cases there are not obvious, direct or immediate incentives (e.g. higher prices) to encourage adoption of the improvements identified above. Incentives for the improvement in fish handling and quality are only likely to be realised through the exploitation of markets in Windhoek or elsewhere (i.e. the market segment expressing a desire for quality).
- Conditions for selling fish at the Katima market are poor and do nothing to enhance the business. This is a missed opportunity for the market to be a driving force in the improvement of the post-harvest chain.
- The increasing flow of marine fish onto the market in the northeast is an issue to be examined. Marine fish is available in five retail outlets in Katima at about $N5/kg, (compared to an average cost of $N9/kg for some river fish). The effect of import substitution at regional level is likely to be an issue.
- Middlemen currently operate, but play only a small role in the distribution chain. Most fish passes from fisherman to vendor, who makes the final sale to consumers. Given that there are currently few middlemen, care should be taken that any intervention considers the potential impact (particularly on the poorer sections of society) of establishing another player in the distribution chain.
- Many of the female vendors in the market are the head of households and analysis elsewhere suggests that female-headed households are some of the poorest. Any intervention in this sector should be sure to include positive impacts on these households.

- There is an international dimension to the fish marketing in the region – if foreign currency is required (e.g. Botswana pula) fish vendors can sell produce in Kasane, similarly if Zambian Kwacha is required, fish can be sold on the other side of the river in Zambia.

In conclusion, there can be no doubt that a range of people (e.g. entrepreneurs, officials, farmers) are beginning to recognise the potential for positive outcomes in the post-harvest sector. Whatever pressure these people now exert will be magnified in the coming years. The Caprivi Region is often seen as one of the most resource-rich areas of Namibia, particularly in terms of rivers and rainfall, and it is not a strong local argument that the rivers must not be part of any development strategy for the region. Demand for employment is on the increase, there is always demand for fish at affordable prices, as there is for income generating opportunities from the people that live on the floodplains and use the resource everyday.

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