

---

# Fish and livelihoods: Fisheries on the eastern floodplains, Caprivi

John Purvis

---



Directorate of Environmental Affairs, Ministry of Environment and Tourism,  
Private Bag 13306, Windhoek, Namibia  
Tel: + 264 (0)61 249 015 Fax: + 264 (0)61 240 339 email: [contact@dea.met.gov.na](mailto:contact@dea.met.gov.na)  
<http://www.dea.met.gov.na>

*This series of Research Discussion Papers is intended to present preliminary, new or topical information and ideas for discussion and debate. The contents are not necessarily the final views or firm positions of the Ministry of Environment and Tourism. Comments and feedback will be welcomed.*

**Contact details:**

**John Purvis**, Ministry of Fisheries and Marine Resources, Private Bag 13355, Windhoek, Namibia  
email: [jpurvis@iafrica.com.na](mailto:jpurvis@iafrica.com.na)

**Edited by Directorate of Environmental Affairs**

**Cover illustration by Helga Hoveka**

Thanks to the staff in the Ministry of Agriculture, Water and Rural Development (MAWRD) office in Katima Mulilo and in Rundu for all their assistance during the fieldwork contributing to this paper. Thanks also to all the farmers, fisherfolk, traders and community representatives who found time to work with me and colleagues from the MAWRD. 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.

This report has been prepared in an attempt to document the existing systems, and to inform and assist various stakeholders in the development of plans and proposals for interventions in the rural environment of Caprivi region. Views, conclusions and recommendations expressed herein do not necessarily reflect those of the MAWRD, MFMR or of DFID.

## Table of Contents

|   |           |
|---|-----------|
| <b>1. INTRODUCTION</b>  | <b>5</b>  |
| 1.1 <i>Fisheries in Caprivi</i>   | 6         |
| <b>2. THE EASTERN FLOODPLAIN ENVIRONMENT</b>  | <b>6</b>  |
| 2.1 <i>River systems</i>  | 6         |
| 2.2 <i>Aquatic environments on the floodplain</i>   | 7         |
| 2.3 <i>Dryland environments on the floodplain</i>   | 8         |
| 2.4 <i>Land tenure</i>  | 8         |
| 2.5 <i>Flood variability</i>  | 9         |
| <b>3. LIVELIHOODS ANALYSIS</b>  | <b>10</b> |
| <b>4. FLOODPLAIN FISHERIES</b>  | <b>12</b> |
| 4.1 <i>Fish species</i>   | 12        |
| 4.2 <i>Seasonality in the fishery</i>   | 12        |
| 4.3 <i>Fishing inputs</i>   | 13        |
| 4.4 <i>Access to fishing locations</i>  | 16        |
| 4.5 <i>Trends in the floodplain fishing system</i>  | 17        |
| <b>5. OTHER FLOODPLAIN LIVELIHOOD ACTIVITIES</b>  | <b>17</b> |
| 5.1 <i>Crop production and horticulture</i>   | 20        |
| 5.2 <i>Livestock</i>  | 21        |
| 5.3 <i>Fishing, fish processing and trading</i>   | 22        |
| 5.4 <i>Home-based industries</i>  | 22        |
| 5.5 <i>Off farm activities</i>  | 23        |
| 5.6 <i>Wildlife and tourism</i>   | 23        |
| <b>6. OTHER FACTORS INFLUENCING LIVELIHOODS</b>   | <b>24</b> |
| 6.1 <i>Transboundary issues and migration</i>   | 24        |
| 6.2 <i>HIV/AIDS</i>   | 25        |
| <b>7. FISHERIES MANAGEMENT, INSTITUTIONS AND POLICY</b>   | <b>25</b> |
| 7.1 <i>Current status of fishery management on the floodplains</i>                              | 25        |
| 7.2 <i>Central government management of inland fisheries</i>                                    | 26        |
| 7.3 <i>Traditional/local fisheries management</i>   | 27        |
| 7.4 <i>Inadvertent management practices or traditions</i>                                       | 30        |
| 7.5 <i>Other features limiting (managing) fisheries on the plains</i>                           | 30        |
| 7.6 <i>Future fisheries management</i>  | 31        |
| 7.7 <i>Co-management as the future for fisheries management</i>                                 | 31        |
| <b>8. CONCLUSIONS</b>   | <b>32</b> |
| <b>9. RECOMMENDATIONS</b>   | <b>34</b> |
| 9.1 <i>Proposed legislation</i>   | 34        |
| 9.2 <i>Assessment of suitable co-management framework</i>                                       | 34        |
| 9.3 <i>Creation of a Regional Fisheries Authority</i>   | 34        |
| 9.4 <i>Piloting of management activities</i>  | 34        |
| 9.5 <i>Improved cooperation with adjacent states</i>  | 35        |
| 9.6 <i>Increased staffing and capacity building of Inland Fisheries Office in Katima Mulilo</i> | 35        |
| 9.7 <i>Learn lessons from other natural resource management initiatives</i>                     | 35        |
| 9.8 <i>Increase alternative livelihood activities for fishing communities</i>                   | 35        |
| 9.9 <i>Assess the potential for fish farm development</i>                                       | 35        |
| 9.10 <i>Improve postharvest efficiency</i>  | 36        |
| 9.11 <i>Development of long-term monitoring systems</i>   | 36        |
| <b>10. REFERENCES</b>   | <b>37</b> |

|  |           |
|--|-----------|
| <b>APPENDIX 1 FISH NAMES USED IN THE CAPRIVI</b>   | <b>38</b> |
| <b>APPENDIX 2 MAIN FISHING GEARS FOUND IN USE ACROSS THE EASTERN FLOODPLAIN</b>                                      | <b>40</b> |
| <b>APPENDIX 3 POTENTIAL STRUCTURE FOR ESTABLISHMENT OF CO- MANAGEMENT SYSTEM FOR FISHERIES IN THE CAPRIVI REGION</b> | <b>44</b> |

**List of tables and figures**

|   |    |
|---|----|
| Table 1 Flood levels at Victoria Falls, Zambezi River.....                              | 9  |
| Table 2 Common fish species identified by fisherfolk.....                               | 12 |
| Table 3 The seasonal fishing cycle .....  | 13 |
| Table 4 Main fishing gear in use across the floodplains .....                           | 14 |
| Table 5 Fishing nets in the Caprivi region .....  | 15 |
| Table 6 Livelihood activities and their timing .....                                    | 19 |
| Table 7 Fishery management restrictions from traditional authorities/family groups..... | 29 |
| Table 8 Inadvertent management practices or limitations on fishing.....                 | 30 |
| Figure 1 Eastern floodplains of the Zambezi, Caprivi .....                              | 5  |
| Figure 2 Generic aquatic features of the floodplain.....                                | 8  |
| Figure 3 Contributions of livelihood components.....                                    | 11 |
| Figure 4 Monthly cycle of activities .....  | 18 |
| Figure 5 Masubia Traditional Authority on the eastern floodplains .....                 | 28 |
| Figure 6 Range of co-management options.....  | 32 |

## **Acronyms**

|          |   |
|----------|---|
| ALPs     | alternative livelihood projects                                       |
| BAMB     | Botswana Agricultural Marketing Board                                 |
| CBNRM    | community based natural resource management                           |
| FFI      | Freshwater Fisheries Institute (MFMR)                                 |
| IGPs     | income generating projects  |
| KFSRE    | Kavango Farming Systems Research and Extension                        |
| kms      | kilometres  |
| MAWRD    | Ministry of Agriculture, Water and Rural Development                  |
| MFMR     | Ministry of Fisheries and Marine Resources                            |
| MTI      | Ministry of Trade and Industry  |
| MWCT     | Ministry for Wildlife, Conservation and Tourism                       |
| NGO      | Non government organisation   |
| RDCC     | Regional Development Coordinating Committee                           |
| SADF     | South African Defence Force   |
| WWF-LIFE | World Wide Fund for Nature – Living in a Finite Environment Programme |

## **Abstract**

*The diversity of the floodplain environment and the changing patterns of the land and water interface, provide a range of different resources for exploitation by different groups, at different times of the year and in different ways. In order to maximise the opportunities presented and reduce the level of vulnerability to a failure in any one component, households adopt a complex, diverse and flexible system of production. This diversity of productive activities on the floodplain is further complicated by important linkages, dependencies and relationships between the components, which are essential for the overall success of the livelihood strategy. Changes in one component can induce significant changes in other components.*

*The fishery is only one, albeit critical, component of the multi-activity livelihood system. The fishery on the eastern floodplain is characterised by hundreds of small-scale fisherfolk using a range of largely unsophisticated gears, targeting a multi-species resource across a multitude and ever-changing set of floodplain water bodies.*

*The paper outlines the production system on the eastern floodplains paying special attention to the fishing activities. Although there are already some indications that the resource may be over-fished, this paper suggests that the situation could become much worse if the current trends continue – continued weakening of the influence of the traditional management systems; increasing availability of fishing inputs; market demand and prices for fish remain strong; and worsening problems in the agricultural sector (e.g. withdrawal of government subsidies for certain inputs, increasing incidence of wildlife/human conflicts, marketing problems).*

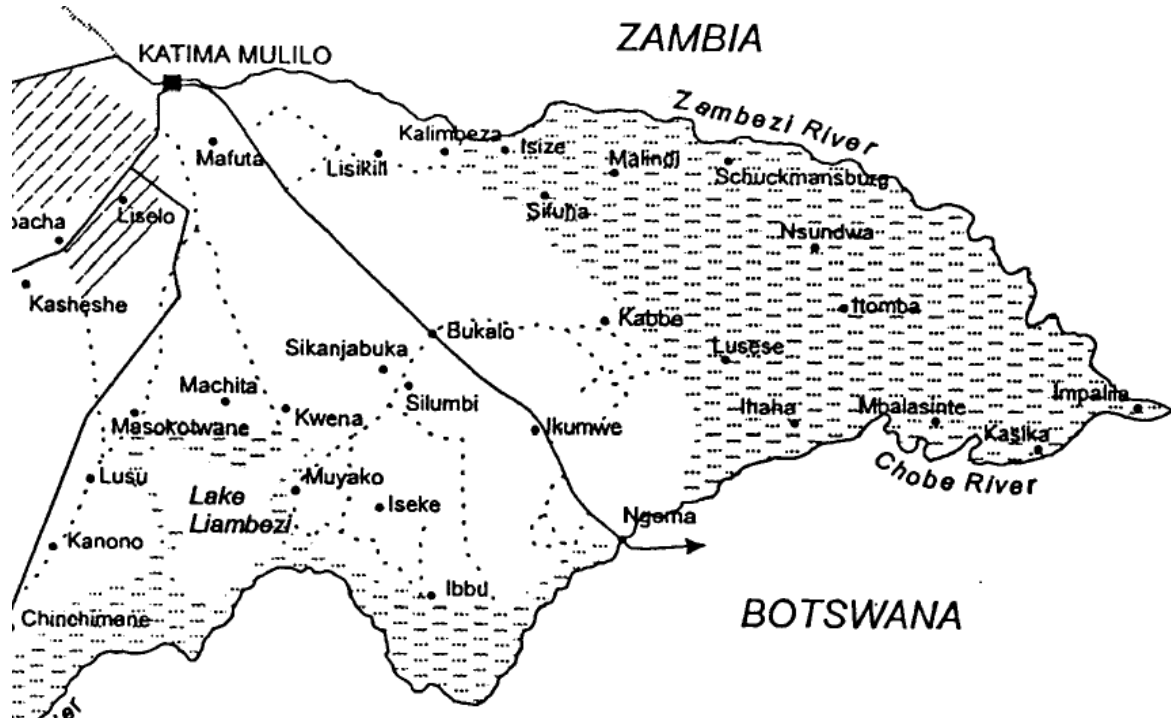
*Current problems in the agricultural sector may initiate an increase in fishing activities and if this is not managed, there is a real possibility of degradation of the fishery resource. Given the critical cash generating role of fisheries in the livelihood systems on the floodplains, any long term reduction in profitability or catches (as might occur if there is serious over-fishing) is likely to have significant consequences for the security and sustainability of the entire livelihood system.*

*This paper calls for, among other things, further work to investigate the options and feasibility of developing some type of co-management regime (involving fisherfolk, government and other stakeholders in the management of the fishery) to ensure that the fishery is managed sustainably and continues to play an important role in the floodplain livelihood system. The complications and opportunities arising from the transboundary nature of the resource are considered.*

## 1. INTRODUCTION

The Caprivi Region is one of the 13 administrative regions of Namibia. The region is the finger-like projection in the north east of the country and is bordered by Botswana to the south, Angola and Zambia to the north and Zimbabwe to the east. The region is about 450kms from west to east and from north to south it varies from 32kms to 100kms. The whole region is very flat, sloping from the highest areas in the west to the lowest point on Impalila Island with a difference of only 200 metres or so.

**Figure 1 Eastern floodplains of the Zambezi, Caprivi**



Politically there are six constituencies, covering a total area of about 14,000km<sup>2</sup> and inhabited by about 80,000 people, as of the 2001 census. The average population density of 5.7 people/km<sup>2</sup> masks the fact that there are vast areas that are almost uninhabited. The highest density of population is in the east around the town of Katima Mulilo (over 14,000 – about 18 per cent of the region's population) the region's capital and administrative centre. The second highest concentration is along the recently upgraded Trans Caprivi Highway, which runs east to west from Kongola to Katima Mulilo, then to the south and east to Ngoma and the border with Botswana. Average household size for the whole region is almost five people per household.

Caprivi is rated as the poorest region in the country with the lowest Human Development Index, and the highest Human Poverty Index (UNDP, 1996). The region reportedly has the highest rate of infection rate of HIV/AIDS with one in four pregnant women attending the clinic in Katima testing HIV positive (MHSS, 2000).

There are three main tribal administrative structures in the region: that of the Mayeyi (based in Sangwali), the Mafwe (based in Chinchimane, and made up of a number of smaller sub-groups) and the Masubia (based in Bukalo). All of these tribal groupings fall under the Lozi Kingdom. A small group of San people reside in the west of the region.

The semi-arid Caprivi Region as a whole receives relatively good rainfall, 550–750mm on average. These average figures hide the irregular and unpredictable nature of the rainfall with the highest rainfall recorded at 1,005mm and the lowest being 288mm. The north–eastern areas (floodplains) receive more than the areas in the south–east. There may be a little rain in September or October but it is only in November that people can expect sufficient rainfall so crops can be planted. Rainfall peaks in January (or February), tailing off so that by the end of April there is little chance of any further rain. The region has hot summers, with temperatures peaking in October and reaching their lowest point in May or June, with frost sometimes in low-lying areas.

### *1.1 Fisheries in Caprivi*

The inland fishery in Caprivi is important for a number of reasons, particularly as it provides a crucial source of employment and income for households on and adjacent to the floodplains and is an important source of protein in the region to both fishing and non-fishing households. In addition, trade in fish products is a very important activity to some of the poorer households who have no other resources at their disposal

The inland fishery is characterised by hundreds of small-scale fisherfolk using a range of unsophisticated gears, targeting a multi-species fish resource across a complex network of floodplain water bodies. Fishing is just one of a number of activities which make up the livelihood strategy adopted by people on the floodplain. Although the simplicity of some of the gears suggest a subsistence nature to the fishery, much of the fish caught is traded and sold in Katima Mulilo – so there is a clear commercial side to many of the operations.

## **2. THE EASTERN FLOODPLAIN ENVIRONMENT**

Out of the six major land types identified by Mendelsohn and Roberts (1997), three are important in the eastern floodplains. The first is open water, covering approximately 166km<sup>2</sup>. Open water is defined as rivers and associated deep channels and backwaters. The floodplains cover more than 25 per cent of total land area and are flat lands dominated by old channels and grasslands which are flooded annually. The final land type is the Impalila woodlands, covering only 18km<sup>2</sup> (less than one per cent of total land area). These woodlands' vegetation is based on outcropping basalt rocks and cover Impalila Island.

### *2.1 River systems*

Of the permanently flowing rivers in Namibia, the following are present in Caprivi at some point in their course: the Zambezi, the Chobe, the Okavango, the Linyanti and the Kwando (or the Mashi), form an extensive network of drainage routes and at certain times of the year, when the flood is at its height, they arguably form one system.

The Kwando flows through the strip from north to south for about 35kms and then makes up the border with Botswana for a further 75kms before heading eastwards in a system of swamps and wetlands. The Kwando then covers about a further 100kms before drying up at Lake Liambezi. The Chobe River emerges from the Lake Liambezi area flowing in an eastward direction and joins the Zambezi at the eastern–most point of Namibia, Impalila Island. The Zambezi River itself forms the border between Namibia and Zambia between Katima Mulilo and Impalila (a distance of about 120kms). The Zambezi River is the seasonally dominant force and it is the state of the flow in that channel that determines the direction of the water flow in the Chobe, and consequently the Linyanti.



Lake Liambezi can be an integral component of the system. When the lake is full, it can be as much as six metres deep and cover an area of 10,000 hectares, but it has been dry since 1985. Water from the lake (having come down the Linyanti, and some possibly from the Zambezi through the Bukalo Channel) would then overflow and flow into the Chobe and then to the Zambezi. The floods of 2001 saw the Kwando River reaching a level it had not risen to since 1981. A number of channels and lakes, which had not had water for many years, had flowing water from the Kwando in August and September, 2001. Lake Liambezi received some water from this side in September 2001 and retained this water for a number of weeks.

This mosaic of rivers and floodwaters forms an intricate and often interconnected wetland habitat that extends across large areas of the Caprivi region. The area covered by the water at its highest level varies but, is estimated to cover about 30 per cent of the land area of Caprivi.

## 2.2 Aquatic environments on the floodplain

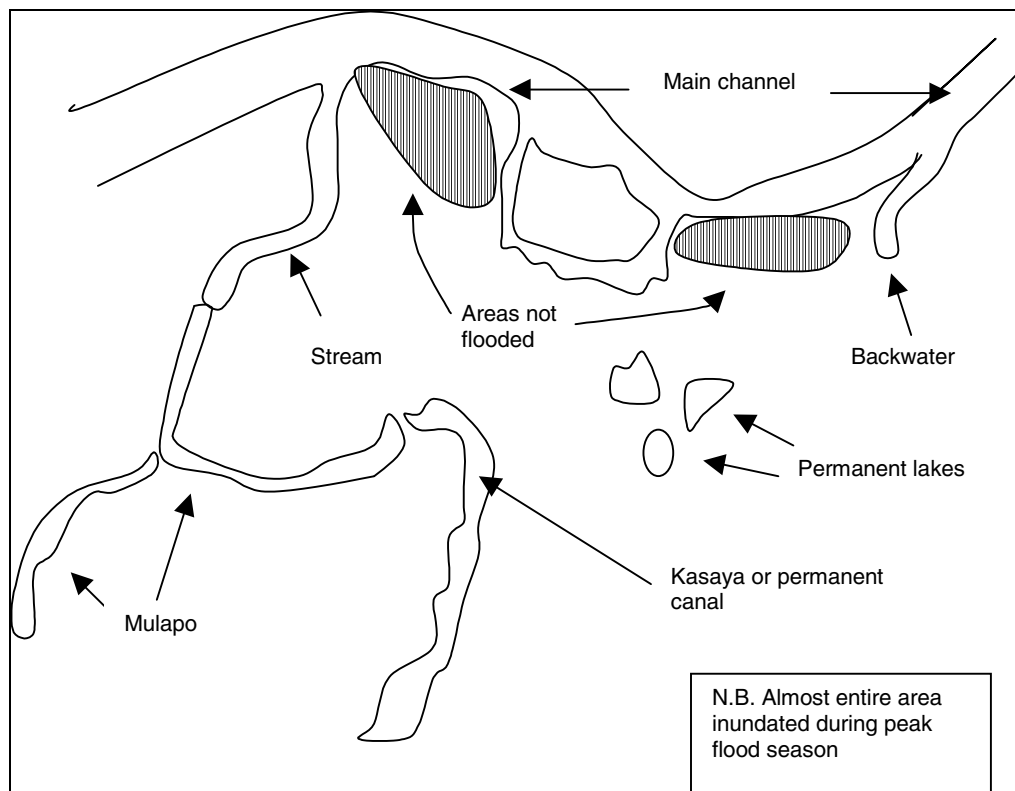
The water forms a variety of dryland and wetland habitats, which are exploited in a variety of ways at different times of the year, by different groups, and often with different methods. It is the complex and varied pattern of land and water interfaces in the natural environment which is the underlying source of so much complexity in the pattern of natural resource exploitation which makes up the floodplain livelihood system.

Figure 2 shows many of the aquatic habitats available. The main channel (*nuka*) is the main river channel usually of the Zambezi for the eastern floodplains. Streams (*kalamebas*) are the backwaters which are permanent and longer than just a backwater (which is sometimes just an inlet). A *kasaya* is a permanent channel or canal which is not necessarily always connected to the main channel. When the *kasaya* is connected to the main channel, it is connected through a *mulapo*. A *mulapo* is a seasonally filled depression which usually forms the link between the main river and the *kasayas*. As a seasonal depression, the *mulapo* does not always retain water. A series of permanent lakes (*lisa*) are dotted across the floodplain.

As the river level rises to 'bankfull' stage, water fills up the backwaters and starts to back-up into the interconnected systems of *mulapos* – filling up pools and spilling over into the next *mulapo*. Many of the permanent water bodies are then connected under a sheet of water. By June, the water begins to subside, the aquatic environment becomes progressively drier through the low water season and much of the area is transformed into an agricultural zone.

The rivers themselves have a relatively low primary productivity, but it is the annual inundation of the adjacent grasslands which makes the floodplain such a rich environment. The annual flooding can generate and sustain large fish populations as a result of the extensive opportunities for feeding and growth. During this period, biomass increases substantially and the main feeding season occurs. Similarly, fish tend to time their spawning so that the juveniles can be on the floodplain during the flood season and have access to plentiful food supplies. The availability of food during this season and the dispersed nature of the fish stocks ensure that during the drawdown period, as the water and fish move back to the main channel, fishing is a very lucrative activity (fish are concentrated and fat).

**Figure 2 Generic aquatic features of the floodplain**



### **2.3 Dryland environments on the floodplain**

The underlying basalt rock in the region is covered by a layer of Kalahari sands (10–50 metres thick) and is only exposed at certain sites on the eastern floodplains. The exposed rock has given rise to the distinct woodland at Impalila and also the rapids on the Zambezi in that area. As a result of the thick layer of sand, most of the soils in the region are sandy and there are only clay soils where the action of water has allowed such deposits to accumulate.

These clay deposits form rich organic soils which are the basis for the river-field agriculture occurring on the floodplains in the *mulapos*. The areas with higher concentrations of clay soils are those areas where the water is held for longer. The vegetation on the plains is a function of the soil and the annual floods, so although the area is dominated by grasslands, their exact nature depends on the frequency of the flood affecting that area. In amongst the grasslands there are islands of raised trees and forests which serve as a refuge for both human and animal populations during the inundation of the plains.

Although there has been relatively little large-scale modification of the floodplain environment, the agricultural activities of the residents have changed the environment – particularly through deforestation for fuelwood, by fire and the amount of grazing pressure on the grassland – particularly at water access points where the banks of the water bodies are eroded.

### **2.4 Land tenure**

Almost all of the land on and adjacent to the floodplains is communal, with access and management controlled as such. One variation on this institutional tenure system is the conservancy model. The Salambala Conservancy covers an area of some 93,000 hectares with a core area of 14,000 hectares. The concept behind the conservancies is to recognise that local people have certain rights to wildlife in the area and they should be able to reap the benefits of living with wildlife (e.g. through

nature-based tourism) and to ensure that wildlife is protected now and in the future. The areas of the conservancy and the natural resources inside (including forest, wildlife and presumably fisheries) should be managed by and for the benefit of the local people. The core area of the conservancy is set aside for wildlife and tourism, with permanent settlement and livestock prohibited. Activities in other areas of the conservancy can be determined by local users.

## 2.5 Flood variability

Given the obvious importance of the flood to the environment and livelihood related activities on the floodplain, an awareness of the variability inherent in the flooding is crucial. The river level in the Zambezi (as recorded at Victoria Falls) has been shown to have a number of distinct phases as can be seen in Table 1.

**Table 1 Flood levels at Victoria Falls, Zambezi River**

| Period             | Average flow             |
|--------------------|--------------------------|
| 1907/08 to 1923/24 | 756m <sup>3</sup> /sec   |
| 1924/25 to 1945/46 | 941 m <sup>3</sup> /sec  |
| 1946/47 to 1980/81 | 1392 m <sup>3</sup> /sec |
| 1981/82 to 1995    | 750m m <sup>3</sup> /sec |

*Source:* Mendelsohn and Roberts, 1997

Lake Liambezi was filling up in the period between 1946/47 and 1980. If the river floods again to the extent and frequency of this period, then large areas of currently cropped or inhabited land would be inundated. This may cause serious hardship for those living in the area at the same time as offering renewed livelihood opportunities.

The flood generally follows a pattern within a yearly cycle. In the Zambezi floodplains there are usually two flood peaks – one early in the season (perhaps) February or March as the ‘bankfull’ stage is reached, after which the river breaks its banks and the water spreads out laterally across the floodplain. The water level in the channel appears to drop – and then begin to rise again as the areas available to be flooded are inundated and the water can no longer be accommodated. By the middle of May (sometimes June) floodwaters begin to recede. It is estimated that the water remains at its highest level for only about two weeks, depending on conditions.

Any attempt to manipulate or change this established flood routine must be very carefully considered in terms of the potential costs and benefits. Impact on the timing or duration of the flood could upset a complex set of natural balances and drastically affect the socio-economic conditions of those people dependent on the flood.

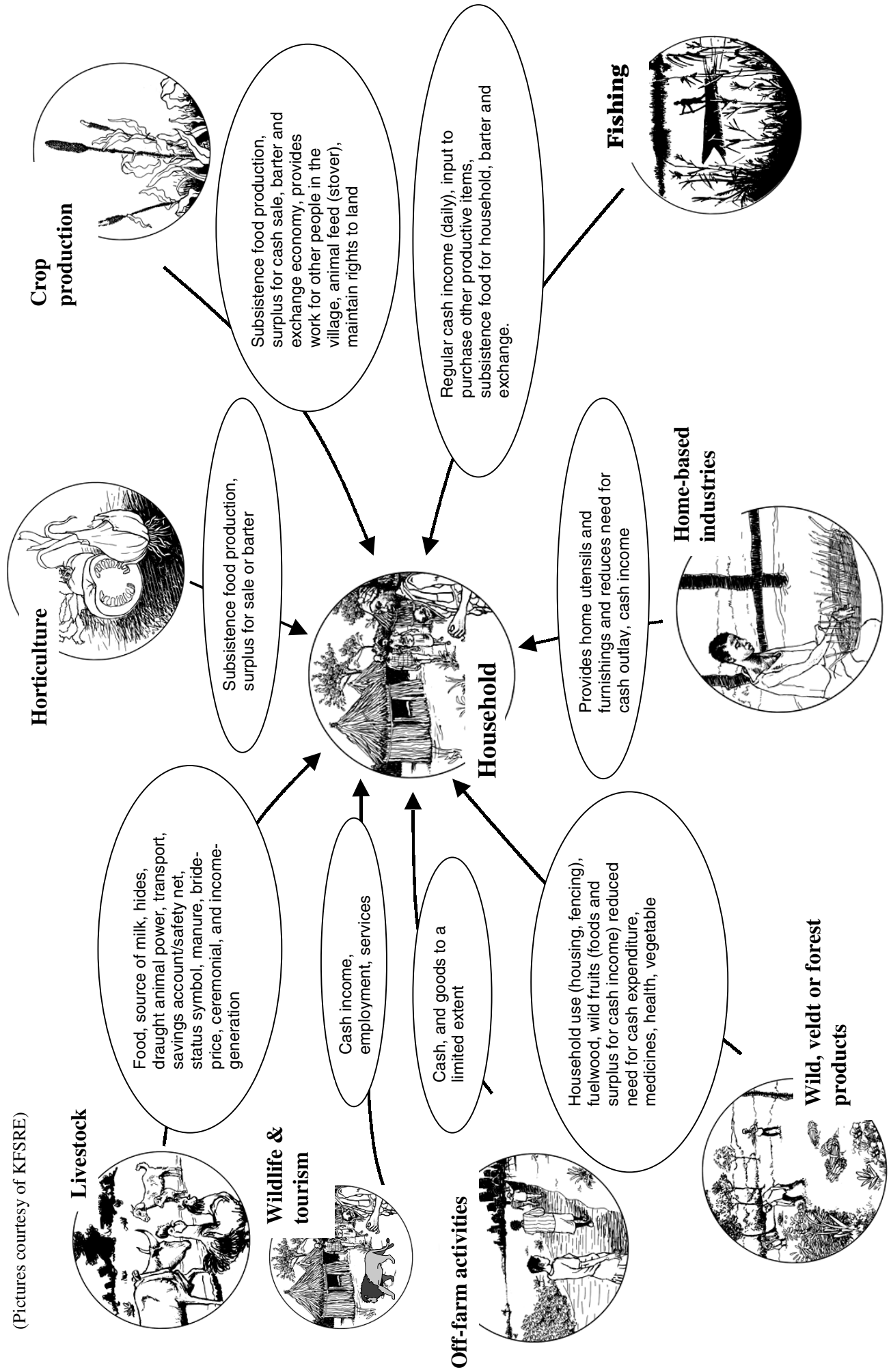
### **3. LIVELIHOODS ANALYSIS**

The diversity of the floodplain environment and the changing patterns of the land and water interface present a variety of different resources for exploitation by residents at different times of the year and in different ways. The exploitation of the fishery resource is only one of a number of interlinked activities designed to achieve positive livelihood outcomes for the resident communities (see Figure 3). On the floodplains of the Zambezi/Chobe, livelihood activities include livestock, cropping, home-based production, etc. Many households are involved in some or all of these activities at different times of the year, and to different degrees. The level of involvement in these activities may depend on the success or failure of other components of the system. Some of these activities are based on raw materials which are widely available in some type of open-access situation, so movement in and out of the activity is relatively straightforward once skills are obtained. In a changeable environment dependent on floods and rains, the diversity of livelihood activities available to residents is one of the strengths of the system and provides security for communities. A reduction in this diversity (sometimes seen as a requirement for commercialisation) may increase the insecurity of residents.

The conduct of research should not aim to increase understanding unless it encompasses consideration of the whole spectrum of activities undertaken within households. Attempting to conduct a sector specific analysis of the conditions on the floodplains, without recourse to other livelihood components would seriously devalue the analysis.

**Figure 3 Contributions of livelihood components**

(Pictures courtesy of KFSRE)



## 4. FLOODPLAIN FISHERIES

The diverse nature of the floodplain environment available for exploitation by different groups and in different ways ensures that the systems developed for harvesting fish from the river and water bodies will also be complex. As such it is difficult to generalise because the actual use of the fishery will depend not only on the variations of the flood, but also in the events which rule other components of the farmers/fishers life outside of the fishery sector in both the dry and wet season.

### 4.1 *Fish species*

The most common species identified as being caught by fishermen are shown in Table 2. The list below is an overview for the year with different fish more common at certain times of the year. A full list of species identified by fisherfolk across the plains is included as Appendix 1.

**Table 2 Common fish species identified by fisherfolk**

| Local name | English name                      |
|------------|-----------------------------------|
| Ndombe     | Catfish                           |
| Lubango    | Silver catfish                    |
| Ngweshi    | Tigerfish                         |
| Njinji     | Threespot tilapia                 |
| Muu/Imu    | Greenhead tilapia                 |
| Mbufu      | Redbreast tilapia                 |
| Situhu     | Banded tilapia                    |
| Siyeyo     | Green happy/pink happy            |
| Mushuna    | Thinface/Humpback largemouth      |
| Nembwe     | Nembwe                            |
| Ngenga     | Purpleface/ Brownsport largemouth |
| Ndikusi    | Western bottlenose                |
| Nembele    | Bulldog                           |
| Ninga      | Churchill                         |
| Singonggi  | Squeaker                          |
| Mulumesi   | African pike                      |

### 4.2 *Seasonality in the fishery*

The table below shows variation in the seasonal fishing effort and illustrates the different gears favoured at different stages of the flood.

**Table 3 The seasonal fishing cycle**

| Season          | Litabula   |     | Muunda   |   |     | Maliha  |       |  | Mbumbi                      |     |           |
|-----------------|--|-----|--|---|-----|---|-------|--|-----------------------------|-----|-----------|
|                 | Nov  | Dec | Jan  | Feb   | Mar | Apr   | May   | June   | July                        | Aug | Sept      |
| River condition | River confined to channels, filling up by February           |     |  | Lateral spillover onto the floodplains (max. levels in late May)  |     |   | Flood | Water levels dropping. Isolated streams by Sept. |                             |     | Low water |
| Fish ecology    | Breeding season in early rains                               |     | Spawning and feeding as flood rises and spills onto plain and juveniles enjoy food and shelter on the flooded grasslands |   |     |   |       | Adult stock confined to river                    |                             |     |           |
|                 | High natural mortality in the isolated pools and streams     |     | Fish widely dispersed across the plains, intensive feeding   |   |     |   |       | Fish moving down channels returning to the river |                             |     |           |
| Fishing         | Drag netting in isolated pools and channels very lucrative   |     |  | Gill netting in channels and on floodplain as water inundates most areas, traditional gears on the plains |     |   |       |  | Drag netting very lucrative |     |           |
|                 | Catch is low as fish are dispersed and water is running fast |     |  |   |     | Productive gill net fishing in the main rivers as fish are concentrated again |       |  |                             |     |           |
|                 |  |     |  |   |     | Women and children involved using traditional gears on the inundated plains   |       |  |                             |     |           |
|                 |  |     |  |   |     | Fishing intensifies (maximum participation) – flood recedes                   |       |  |                             |     |           |

### 4.3 Fishing inputs

The inputs required for fishing can be classified as gear, labour and access to a fishing site.

Partly as a result of the diverse range of habitats and environments provided by the floodplain, the fisheries on the floodplain are exploited with a wide range of gears and methods at varying levels of intensity. The reasons for the variety include a diverse range of habitats and ecological niches provided by the advancing and receding floods, the varied range of livelihood systems adopted on the floodplain resulting in differing levels of labour and capital invested in the fishery by different households, and difficulties of access to and from the floodplain at certain times of the year distorting the impact of demand on the fishery. In addition, the commercialisation of the fishery (and society) is at different levels in different locations on the floodplain, resulting in different sets of forces interacting – different levels of wealth will determine the gear available and applied to the resource, social standing will determine which water body an individual has access to and thereby which gear can be used.

Table 4 summarises the fishing gears into different groups adapted from the classification identified through research on floodplain fisheries in Asia (Hoggarth et al., 1999). The complete table of fishing gears is included as Appendix 2.

**Table 4 Main fishing gear in use across the floodplains**

| Chasing gears<br>(any time of year)          | Set and wait gears<br>(at high or low water<br>seasons) | Barrier gears<br>(when the water is<br>moving up or down) | Others<br>(various times)  |
|--|---|---|--|
| Drag net ( <i>lituwa</i> )                   | Gill net ( <i>tunyandi</i> )                            | Fish kraal ( <i>sibanga</i> )                             | Using livestock or children to churn up the water ( <i>kungonda</i> )            |
| Hook and line ( <i>kashito</i> )             | Large fish funnel ( <i>njamba</i> )                     | Fish fence or kraal ( <i>siyandi</i> )                    | Fishing with the first rains ( <i>milungo</i> )                                  |
| Spearfishing ( <i>muwayao</i> )              | Medium fish funnel ( <i>lifuha</i> )                    |   | 'Stun' fishing using natural poisons ( <i>kushewa</i> or <i>kusitera</i> )       |
| Mosquito net ( <i>moskitero</i> )            | Small fish funnel ( <i>mono</i> or <i>lukuko</i> )      |   | Fishing with the rising flood water ( <i>mubaya</i> or <i>lishule bunjenje</i> ) |
| Scoop net ( <i>kawangu</i> )                 |   |   |  |
| Push basket or slam trap ( <i>singunda</i> ) | Bottle fishing  |   |  |
| Bow and arrow ( <i>buta</i> )                | Fishing basket ( <i>katamba</i> )                       |   |  |
| 'Grass' fishing ( <i>kushundunda</i> )       |   |   |  |

'Chasing gears' are gears used in the active pursuit of fish – whether on the floodplain or in the channels and pools. 'Set and wait gears' are passive gears set for a period of time, left unattended and then retrieved or emptied and are consequently most effective only when fish are moving. 'Barrier gears' are those which can be left or attended, at sites that block the migration or route of fish (usually entering or leaving the floodplains) and are most often used when there is sufficient water movement. The difference between this group and the set and wait gears is that it is the flow of water that generally pulls the fish to the barrier gears.

All types of gear are not used throughout the year, but only in the periods when they are most effective and when the other activities of the household allow the time to use such methods. The efficiency of the different gears varies enormously depending on the time of year used, the skill of the operator, the nature of the site, local weather conditions and an element of luck.

### 4.3.1 Gill nets

Gill nets are the most widely used fishing gear on the plains and the following table shows details of the nets available and their specification. Gill nets are generally set in the evening and emptied the following morning. Many fishermen remove their nets from the water during the day to dry them and reduce the risk of theft or damage by animals. The number of nets per household varies enormously, ranging from one to fifteen in those households where net fishing is undertaken.



**Table 5 Fishing nets in the Caprivi region**

|                         | <b>‘Zambian’<br/>(Chinese made)</b>   | <b>Zambian<br/>(Kafue made)</b>  | <b>‘Botswanan’<br/>(Japanese made)</b>  |
|-------------------------|---|--|---|
| Availability            | Bought in cuca shops across the floodplains, in Katima market, sellers cross from Zambia and sell house to house. | Sometimes seen in Katima market. Available in shops in Livingstone and elsewhere in Zambia. Order directly from factory.                   | From the Botswana Agricultural Marketing Board (BAMB) only (they import from Japan).  |
| Type of net             | Two twine with mesh sizes from 1” to 3.5” seen in Katima market. Sold in panels about 50x2 yards.                 | Custom made two to six twine nets in Kafue (Zambia) from 1” to 7”, but most commonly seen size in Katima market is 4”. Usually 90x2 yards. | Nets are six twine. All sizes available from Japan, but only 4” and above available from BAMB. Sold in panels about 55x2 yards. |
| Price                   | Generally \$N25 in Namibia.   | \$N170 per net in Katima market.   | Sold in Botswana for approximately \$N100.  |
| Comments from fishermen | Cheap and may only last a few days. Difficult or impossible to mend.  | Best size and quality of nets. Durable and can be mended repeatedly.   | Good quality of net and can be mended on numerous occasions. Common basis for drag nets.  |

The basic panel of the gill net is mounted by using a variety of locally available or manufactured items: ropes are either purchased or made from hessian sacks, floats (on the head rope) made of reeds and rocks as sinkers. Twine for mending nets can be seen for sale in cuca shops across the floodplains and is available in the market in Katima Mulilo.

The longevity of the nets varies and is dependent on general maintenance and particularly the ability of individuals to mend the nets properly. ‘Older’ fishermen who can no longer fish may mend nets for a fee. Many fishermen state that nets can last up to three years if they are not severely damaged by wildlife.

### **4.3.2 Drag nets**

Individual panels of netting are joined together to make a drag net. The raw netting for these nets is usually the so-called ‘Botswanan nets’ or the nets manufactured in Kafue, because of their strength and durability when compared to the other net types (e.g. Chinese made). The number that are joined together will depend on the fisherman and the proposed fishing site. Nine are often joined, but as many as sixteen in one unit has been observed. Mesh sizes used for dragging vary but 3.5 inch and 4 inch are common across the floodplain, with mesh sizes of 2 inch and 1 inch also observed. Long single-panel drag nets have been observed and are usually bought from the marine net dealers in Walvis Bay.

### **4.3.3 Traditional gears**

The majority of the traditional gears, by their nature, are constructed using reeds and other locally available materials. A number of them have been adapted to suit alternative materials which are available locally – for example some of the smaller funnel-type gears are now made using a spirit bottle.

The traditional methods and gears for fishing are both active and passive. Common traditional gears – a variety of traps and funnels – can be seen on the plains when the flood is high and when the

waters are receding. Barrier gears can be used all year but are most productive when the water is moving up or down. No evidence was found of the communal fishing as practised in the Kavango Region, whereby a village or group of fishers come together to operate as a unit and divide the catch among the group. This may be one sign of the increasing commercialisation in the fishery and the importance of the individual effort for cash income, rather than communal activities.

#### **4.3.4 Mokoro/canoe**

A *mokoro* is a hardwood log, ranging in size from two to six meters, hollowed out to form a canoe. The limiting factor in the production of canoes in Namibia is the absence of suitable raw materials, so they are almost always imported from Zambia (sometimes still as logs), although there are some suitable trees on the west side of Caprivi. Prices for *mokoros* in Namibia range from \$N200 to over \$N1,000 depending on the size, quality and particularly the raw material used. Paddles are also made of hardwood and are usually obtained from Zambia (priced from \$N2 to \$N80/piece). With the increasing use of nets for fishing, the canoe has become a necessary tool for fishing households.

#### **4.3.5 Labour and skills**

Most of the gears described above and used on the floodplains can be operated by one person, with the obvious exception of the drag net, which is usually operated by two to five men. The number of men required for the task is largely dependent on the water body being fished, the size of the net and the other material inputs available. The net is commonly worked by members of the owner's family – sometimes the net owner will be involved and other times not.

Whether a drag or gill net is used, the owner of the net is frequently not the fisherman. If the net owners' family members are not fishing, he (or she) will employ fishermen to do the work. Often the fishermen will be herd-boys at different times of the year, or the men may be hired from Zambia. Payment may be made either in cash or kind. If payment is in cash, (perhaps \$N400/month) the fish caught go to the net owner; if payment is in kind, the fishermen will keep three days catch while the owner receives the remaining four days catch of the week.

The use of nets (gill and drag nets) is generally confined to males, apparently because *mokoros* must be used, and the hauling of nets can be physically demanding. In the past when the common fishing methods were more traditional techniques and canoes were not necessary, there was much greater involvement of women in the capture of fish. As fishing nets were adopted, and fishing became increasingly commercial, the labour became more specialised and women took over the role of marketing the catch and leaving men responsible for fishing.

However, women remain involved in fishing using many of the traditional traps when the floodplain is inundated. Men will usually build fish fences, but they will often be emptied by the women on a daily basis.

#### **4.4 Access to fishing locations**

There are some clearly identifiable restrictions on the use of certain water bodies for fishing as is explained in Section 7. Access to fishing sites can be gained on the basis of kinship or family ties, can be obtained for a payment, while other areas are entirely open-access at certain times of the year.

#### *4.5 Trends in the floodplain fishing system*

- Modern gears (fishing nets) are increasingly dominant across the region at the expense of the traditional gears and traps. The high number of nets observed in the channels also suggests that some gears are now more widely available in the region than previously.
- There is a widely reported increase in the number of fishermen, although no figures exist. This may be the result of a poor agricultural harvest in 2001 making many households vulnerable, and turning to fishing to help supply their basic needs.
- Some fisherfolk report that the number and size of some riverine fish is decreasing.
- Problems with wildlife are increasing – usually crocodiles damaging fishing nets or hippos attacking fishermen. It is not clear if the increasing number of reports reflect an increase in the number of incidents because there are more animals, or whether it is because of the increased number of fishermen on the water. The presence of hippos in fishing sites prevents fishermen from going into the water to tend the nets.
- There is increasing recognition of the value of the fishery to the region and also of the potential which is as yet untapped – including the potential to exploit new markets, to develop a local buying system in the region and to look at the potential of aquaculture in the region. Ministries tasked with a component of poverty alleviation and/or rural development are looking to increase livelihood diversification, which should include aspects of the fishery.
- People are becoming interested in fish as a result of a perceived increase in prices for fish, the increased importance of fish in the household diet and the increasing availability of fishing nets locally.
- Conflict with nationals of neighbouring states (especially Zambia) over access to the fishing resources appear to be increasing. Incidents of theft of fishing nets from the river are also increasing, and such incidents are usually blamed on the Zambians.

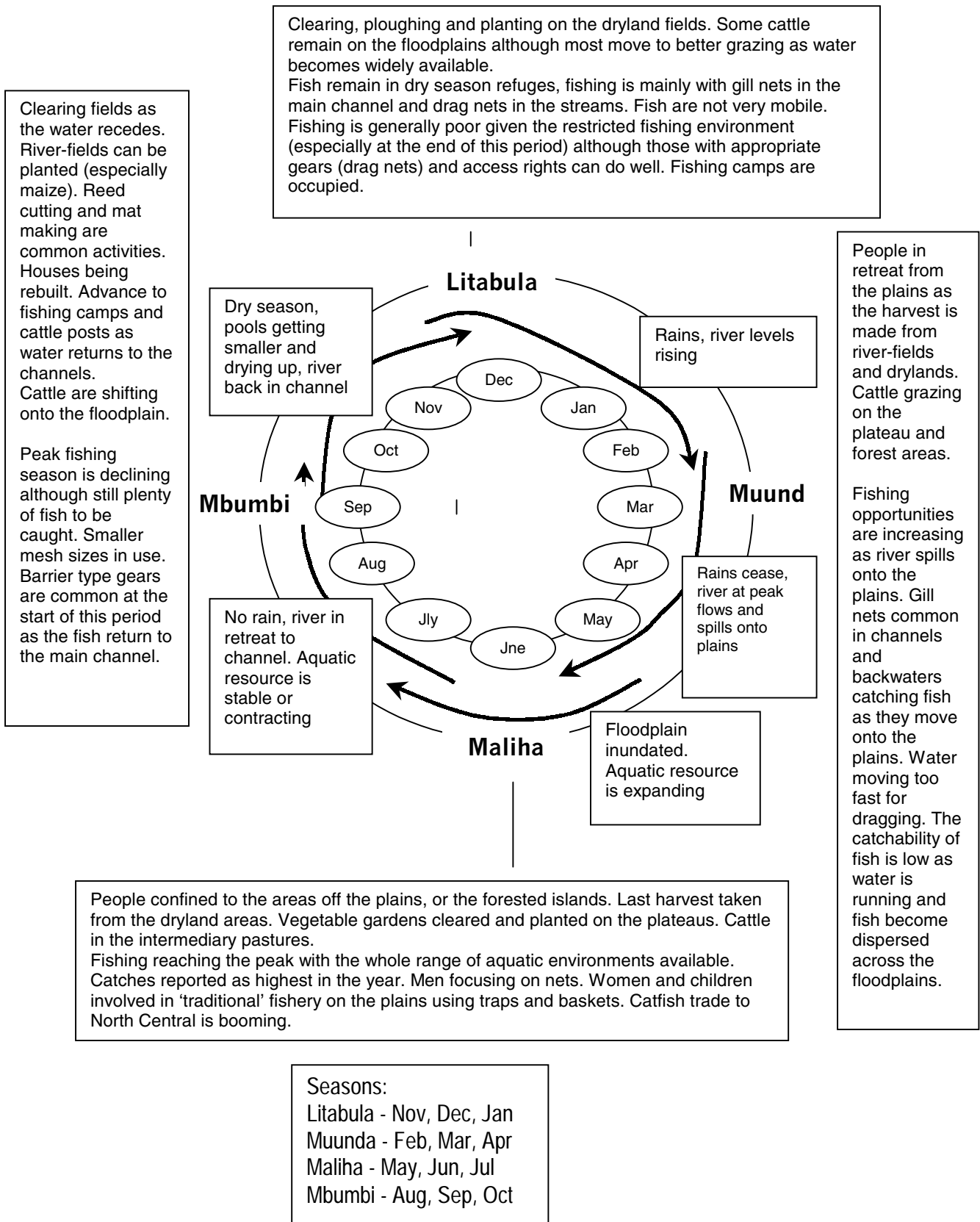
### **5. OTHER FLOODPLAIN LIVELIHOOD ACTIVITIES**

The production systems of floodplain dwellers have evolved in complex and diverse patterns in order to maximise the opportunities offered, whilst taking cognisance of constraints. The strategies adopted have been designed to provide all household needs including both cash and subsistence, whilst ensuring that the household is meeting their social responsibilities.

There are not only a diverse range of activities undertaken by the household members, but the linkages and interdependencies between them are numerous and complex. Different assets and access to different assets will enable different livelihood opportunities and choices for different households. When a household has a certain asset (e.g. cattle) then other options will present themselves (e.g. use of livestock for ploughing to generate income).

Figure 3 above provides a simple and graphic representation of the livelihood activities and shows what each of the components contributes to the overall livelihood. Figure 4 puts these activities into an annual cycle and Table 6 summarises the interactions between the different components.

**Figure 4 Monthly cycle of activities**



**Table 6 Livelihood activities and their timing**

| Season                | Litabula  |     | Muunda                      |     |     | Maliha   |     |   | Mbumbi   |   |   |     |
|-----------------------|---|-----|-----------------------------|-----|-----|--|-----|---|--|---|---|-----|
|                       | Nov   | Dec | Jan                         | Feb | Mar | Apr  | May | June  | July   | Aug   | Sept  | Oct |
| River condition       | River levels rising (through the rainy season) slowly to break banks by March and reach peak in May |     |                             |     |     | 'Drawdown' season as water moves back to channel   |     |   | Low water period lasting to November                       |   |   |     |
| Fishing               | Drag netting in isolated pools and channels very lucrative in the low water season                  |     |                             |     |     | Gill netting across floodplain as water fills the river and fish move to the plains for feeding and spawning |     |   |  |   |   |     |
|                       |   |     |                             |     |     | Women and children involved using traditional gears on the inundated plains                                  |     |   |  |   | Fishing activity intensifies as flood water recedes |     |
| River-field crops     | Harvest (Dec), may continue to Feb. Completed before floodwater rises in March                      |     |                             |     |     |  |     |   | Preparing and planting fields as the water recedes (Sept.) |   |   |     |
|                       |   |     |                             |     |     |  |     |   | Weeding activities   |   |   |     |
| Dryland crops         | Prepare and plant fields for first rains in November  |     |                             |     |     | Harvest complete by late May   |     |   |  |   |   |     |
|                       |   |     | Weeding activity is ongoing |     |     |  |     |   |  |   |   |     |
| Livestock             | Abundant grazing in lush forest areas with rain giving easy access to water                         |     |                             |     |     |  |     |   | Cattle move onto the plains as water recedes               |   | Grazing and water in short supply                   |     |
| Horticulture          |   |     |                             |     |     | Main planting period for vegetables  |     |   |  | Vegetable harvest   |   |     |
| Home-based industries | Ongoing throughout the year   |     |                             |     |     |  |     |   |  |   |   |     |
|                       | Wild fruit collection at peak in early rains  |     |                             |     |     | Collection of wood and poles from the forest areas   |     |   |  |   |   |     |
| Wildlife/tourism      |   |     |                             |     |     |  |     | Main sport season for bream fishery – angling |  |   |   |     |
|                       |   |     |                             |     |     |  |     |   |  | Peak tourism season, particularly on the Chobe River (thru Nov) |   |     |

Given the complexity of the combination of the different components of the system, it is useful to take each discrete activity that contributes to the well being of the household and consider it in isolation. Within these activities there are clearly some which are more important than others, but the importance is determined by the services/goods which the activity provides to the household. This will change from month to month, between years, between households and within households.

## 5.1 Crop production and horticulture

Crop production across Caprivi is loosely based around three types of land: the forest zone (*mushita*), the bushed valleys (*saana*) and the floodplains (*kwa nuka*). In terms of their use for crop production, the floodplains can be further divided into raised gardens (*mazulu*), village gardens (*mandamino*) and river-fields (*litapa*).

The annual inundation of the floodplains results in two very distinct systems being adopted on and adjacent to the floodplains – a rain fed system on the drylands and a river-field system, described in more detail below. As people move onto the plains to cultivate their river-fields, a fishing camp, vegetable gardens and a kraal are often also established.

People who use the floodplains talk of *litapa* as their most important resource – this is where the majority of their maize is grown (depending on location and access to different assets). Sorghum and millet are grown on the higher, non-flooded land. As the flood recedes (late June–August), people move onto the floodplain and cultivate the *litapa* using residual soil moisture so they do not have to wait for the rains in order to plant. In some areas of the plains the *litapa* can be planted in August, meaning that maize can be harvested in December (a common practice especially at the eastern end of the plains). Land disputes over access to, or use of, the river-fields are common and show the importance of such resources. *Litapa* can be made in the *mulapos*, which are used for fishing when flooded. If a river-field is ‘owned’, then the right to fish (or not) in the *mulapo* when it is flooded is also ‘owned’. Yields of maize on these *litapa* vary, but are usually in the upper bracket for the region (500–700 kgs/ha)<sup>1</sup>.

The production of maize on the floodplain is usually low input and low output, undertaken essentially for subsistence purposes (though a surplus may be sold in any one year) and sorghum is grown primarily for beer making. The dependence on maize seems to be a relatively recent situation, as in the past, millet and sorghum were grown much more widely on the floodplain.

The management of field fertility is generally poor and people rely on the floods to replenish many of the growing areas. There is very little crop or field rotation practised and the use of fertiliser or manure is rare. The area of cultivation on the plains varies but is commonly estimated at around five hectares per floodplain household. Reasons for the limited size are often insufficient labour for weeding or ploughing, and too few oxen to use draught power.

In an average year on the floodplains there is no significant surplus grain production and most grain is milled and sold or traded locally. Although agriculture in the region is commonly defined as subsistence for home consumption there are mills in Katima buying ‘mealies’, but most of this comes from other parts of Caprivi.

Although not as widespread as in Kavango Region, a number of households maintain small vegetable gardens (*mandamino* or *mazulu* – depending on the location). *Mazulu* is the term for anthills – a raised area of land where households cultivate a variety of crops (including maize and/or sorghum). *Mandamino* are small plots of land dotted around the fringe of a village, which are commonly used for vegetable production. These fields are rarely flooded and are often relatively small. There are a number of communal or community vegetable gardens in the region some of which have been in existence for a long time. Vegetables grown may include cowpeas, bambara nuts, groundnuts, dry beans, pumpkin, watermelon, various greens and sweet potato.

---

<sup>1</sup> These river fields are often irregular shapes and are thus difficult to measure accurately so exact yields are difficult to determine.

### 5.1.1 Trends in cropping and horticulture

- There is an increase in the number of conflicts arising over access to cropping areas suggesting that pressure on land resources is increasing. There appears to be a reduction in the use of the *kwalima* system, as it is seen to be the cause of more and more disputes which are taken to the Tribal Court in Bukalo. *Kwalima* is the term used when farmer A asks farmer B for permission to cultivate or occupy land belonging to farmer B. This is usually on a temporary basis until farmer B wishes to use the land again. This system is being increasingly abused and people, once given the temporary right to cultivate or occupy, are refusing to pass it back to the 'owner'.
- There is an increasing reluctance of floodplain dwellers to plant either maize or vegetables – particularly in the river-fields – because of the increasing damage caused by elephants and hippos in planted areas.
- MAWRD no longer supplies ploughing services (i.e. subsidised government tractor service for ploughing), so farmers are now forced to pay commercial rates. MAWRD has also ceased to sell and distribute seeds.
- Development projects from the MAWRD are encouraging the diversification of cropping patterns into new crops such as cotton and rice.
- The number of small vegetable projects in the region is increasing and the number of small vegetable gardens are evident across the floodplains. Fruit trees are increasingly seen across the region – in backyards rather than in orchards.

### 5.2 Livestock

Livestock production in eastern Caprivi is largely based around a system of transhumance, using grazing in forest areas, bushed valleys and on the floodplains. All grazing land in the region is classified as communal but there is a pattern of rights and access rules which reduces the open access nature of the resource and makes it more of a common property. Although there may be limitations on who can graze cattle where, there appear to be no restrictions on the number of cattle allowed to graze.

Most cattle are Sanga, with some Afrikaner and Brahman. During the wet season, cattle are grazed on the forest areas (*lupani*) where some of the best grasses are found at a time of year when there is ample water available. Between April and August, when forest areas are dry, animals graze intermediary pastures (bushed valley). In August/September, cattle are moved onto the floodplain along the Zambezi where they stay until the flood rises again. At this time, people will also be cultivating river-fields or gardens and fishing in nearby streams and/or pools.

There appears to be a concentration of cattle on the floodplains because the access to water is better at certain times of the year, although the grasslands are not very rich because of the leached sandy soils.

Behind this apparently smooth system of transhumance is a very intricate system which governs the movement of animals and people across the plains to and from the distant grazing areas. This system is founded on such variables as kinship, age, village and gender. The household will move across the floodplain for a number of reasons, not only to find better grazing areas, and the daily activities of the individual household members will change accordingly – usually men will fish, boys tend cattle and women tend fields. The access to this type of livelihood is limited to those with family rights to the land resources and fishing or grazing rights.

Although cattle usually receive the most attention in the livestock sector, indigenous goats are increasingly being kept in the region as a source of meat, though goats milk is rarely used. Small

stock are usually the responsibility of the women and children, and can move across the floodplain with the household in the same way as the cattle do. Indigenous chicken breeds are widely kept in villages, and are also usually tended by the women and children. Donkeys are very rarely seen on the floodplain.

The *mafisa* system is an important component of the livelihood strategy and involves the lending of cattle (occasionally chickens or goats) to family or friends who then look after the animals. This transfer of animals will usually be over a period of years, rather than weeks or months. When the owner collects the *mafisa* cattle he or she will leave one or two calves with the person who has been looking after the animals or another payment as agreed between the two parties. The *mafisa* system is widely used across the region and has a number of benefits. The system enables large herds to be split to take advantage of others' access to grazing and water resources, and if disease strikes some of the herd are likely to remain unaffected because they are in a different area. The system also allows for some improved breeding by mixing different herds and allows those with no stock of their own access to milk. *Mafisa* can also enable those with access to grazing or water resources to build herds if they otherwise have no stock.

Draught animals can be hired out for weeding ploughing, etc. However, members of the kin group often allow the use of their draught animals free of charge. This is an expected and assumed component of the relationship within and between kin groups.

### **5.2.1 Trends in livestock**

- The number of stock – both small stock and cattle – is increasing across the region.
- Erosion at the edge of the river and water points is becoming an increasing problem especially as the number of cattle is increasing.
- Attacks on livestock by lion and hyena have increased over recent years.

### **5.3 Fishing, fish processing and trading**

The variety of aquatic environments produced by the rise and fall of the floodwaters creates a variety of habitats, which allows a vast array of people to use the resource at different times and in different ways (see Section 4).<sup>2</sup>

### **5.4 Home-based industries**

Many home-based businesses rely on natural resources and are concerned with adding value to hunting and gathering activities. The most widely practised activities include thatching grass sales, production and sale of crafts (e.g. baskets woven from palm leaves, wood carvings, etc.), sales of reeds (for mats, fishing equipment), brewing and selling beer made from sorghum or millet, sales of timber for building or firewood and the sale of sour milk.

The collection of wild veld or forest products is particularly important for women, who do most of the gathering (especially for non-wood products), often assisted by children. Non-timber products include wild fruits, mushrooms, dyes for baskets or fishing nets and thatch grasses. Wood products are often obtained by the men assisted by children or herd-boys, and can often be a major component of livelihoods especially during the April, May and June

---

<sup>2</sup> For more information on postharvest fisheries, see Purvis, 2002.



#### **5.4.1 Trends in home-based industries**

- No long term trends have been identified with relation to home based industries, but the amount of involvement and the importance will vary enormously from year to year – depending on the success or failure of other components of the system.
- People on the floodplain often complain that large poles are in short supply locally. The favoured wood for the canoes (*mulombe*) is no longer available on the plains and consequently both canoes and/or the timber often has to be ordered from the western side of Caprivi or from Zambia.
- Fuelwood is still widely available in the forested areas and isolated wooded islands that stand above floodwaters.
- Support agencies (both government and NGO) are recognising the potential of adding value to natural resources and are supporting a range of activities designed to develop entrepreneurial efforts.

#### **5.5 Off farm activities**

Off farm activities are those sources of income which are generated (or earned) away from the farming household (in the broadest sense). Such activities usually refer to salaries, pensions and other remittances.

Government staff such as teachers, nurses, extension workers are powerful contributors to households in the region. Government staff often earn \$N2,000–\$N4,000 per month, while unskilled labour can earn as little as \$N400 per month. A national non-contributory pension scheme operates within Namibia, whereby all people over 60 and people registered as disabled receive \$N160 per month. The Government Pension Fund manages a contributory scheme for government employees, paying a variety of lump sums and monthly payments in the event of death and other eventualities. For instance, in the event of the death of a government employee, the scheme will make a one-off payment of \$N5,000 to the spouse/partner as well as a monthly allowance. Ex-members of the South African Defence Force (SADF) are also entitled to pensions (generally less than \$N200 per month).

#### **5.5.1 Trends in off farm activities**

- Remittances from the off-farm sector to the farm household are increasing. It is almost impossible to estimate the use to which the remittances are put, but it is thought that the destination of much of the off-farm revenue is in cattle purchases.
- Money from off-farm activities can also be a source of capital to start new business activities, and as such it may be very important decision-making factor regarding diversification in the rural sector.

#### **5.6 Wildlife and tourism**

Although tourism has historically played an important role in the economy of the region the extent of the net (direct) benefits or the contribution of tourism industry to people's livelihoods is not clear.

Tourism is limited to four main areas of the region: Katima Mulilo and the areas eastwards along the Zambezi River, along the Chobe River from Ngoma to Kasika and Impalila, along the Linyanti and Kwando Rivers from Kongola to Sangwali, and finally along the Okavango River around Divundu. The tourism industry is largely based on passing trade and people either camping or staying in lodges for between one and three nights. Under certain institutional arrangements, wildlife can contribute to the livelihoods of floodplain dwellers in a positive way, by attracting

tourists who then spend money in the region or through sales of some animals as trophies (i.e. a hunter will pay to shoot an animal). The most widely adopted institutional set up adopted in Caprivi whereby communities can benefit directly from increasing wildlife numbers is the Conservancy system.

In terms of wildlife, most large mammals in the region are confined to the reserves in the western part of the region and the smaller game species (lechwe, kudu and reedbuck for example) are now rarely seen on the floodplains. However, particularly during the drier months (August to November/December) once the flood has receded and before the rains, large numbers of elephant and buffalo are regularly seen on the eastern floodplains. Many of these animals adopt a daily migration from the Chobe National Park (Botswana), across the Chobe River and onto the floodplains of the Caprivi. Such animals can cause severe damage to crops and can threaten human life, while predators such as lion and hyena can attack and kill livestock.

### **5.6.1 Trends in wildlife and tourism**

- Sightings of wild animals (especially large mammals) have been increasing over recent years. While this should be of benefit to the tourist industry, the damage caused by these animals is significant and there is an increasing degree of animosity towards wildlife among farmers. (Damage includes predators killing stock, elephants and hippo trampling and eating crops, fishing equipment being damaged by hippo and crocodile, as well as threats to and attacks on humans.)
- There was considerable disruption to the tourist industry in the region as a result of the civil war in Angola spilling across the Okavango River into Namibia during 1999. Many potential visitors to the region were by-passing Namibia and travelling through Botswana, Zimbabwe and/or South Africa. In recent months, the number of incidents of cross-border hostilities has been significantly reduced and the military escort between Kongola and Divundu has been lifted. Tourists and other visitors are slowly returning to travel the road through Rundu, Katima and then on to Botswana via the Ngoma border post.

## **6. OTHER FACTORS INFLUENCING LIVELIHOODS**

Integrated with these discrete activities in the floodplain production system, there are a number of issues or activities identified as cross-cutting themes. Perhaps the most important are transboundary issues and migration and the future impact of HIV/AIDS in the region.

### **6.1 Transboundary issues and migration**

Almost all livelihood strategies on the floodplain involve some local or regional migration. Migration with livestock to cattle posts on the floodplain occurs between August and February. Sometimes people from two villages on the dry land will merge to make one village on the floodplains – some of the household members will remain on the higher ground. Whilst on the plains the households will cultivate river-fields and take advantage of river/fish resources where possible.

Migration from villages to take up permanent waged or salaried employment is also common, though many migrants return to the village in retirement. People use much of their disposable income to invest in cattle for their retirement as they see working as just a break from the village and all things they do are tied to the day when they retire and return to the village. People are constantly investing money in the village (in cattle or fishing nets) rather than in more formal institutions such as banks.

Given the location of the Caprivi Region and particularly the eastern floodplain areas on the borders of four countries (Namibia, Botswana, Zambia and Zimbabwe), cross border links are not surprising when it is recognised that many of the families in the area are split by rivers that form international boundaries. Some cross-border issues are often resource reallocations within kin groups. Labour migrates across the borders (especially from Zambia to Namibia) to provide services such as fishing, herding and agricultural labour. Zambian women often cross into Namibia, travelling as far as Katima Mulilo to sell fish and when access to Namibian markets is difficult (e.g. due to bad weather, floodwaters), produce from Namibian households is sold in Zambia. This trade is particularly important in the northern and far eastern floodplain. For example, in Impalila, households may decide where to sell their fish on the basis of the produce they need to buy and therefore the currency they need. If they want to save for school fees in Namibia, produce will be sold in Katima; if they want money to buy cooking oil and bread (for example) in Botswana, then it will be sold in Kasane; and if they want to buy fishing nets in Zambia then the produce will be sold in Zambia.

## **6.2 HIV/AIDS**

It is now widely recognised that HIV/AIDS will have an increasing impact on the lives and livelihoods of all sectors of the Namibian population. The HIV prevalence among pregnant women in Katima Mulilo in 2000 was 33 per cent (MHSS, 2000). Although this is high, other sites also had high prevalence – with Windhoek at 31 per cent, Oshakati and Walvis Bay both at 28 per cent. The current death rate in Caprivi from the disease is low compared to the infection rate, suggesting that the biggest impacts are yet to be felt. From the point of view of the production system on the eastern floodplains, the epidemic has the potential to influence livelihoods in a number of ways. By reducing the amount of family labour that may be available for productive, agricultural activities, households may be forced to hire labour, thus draining cash resources. Those households already suffering from shortages of labour will be hit hardest, and those currently on the margins will be pushed further down the socio-economic scale. Caring for the sick will increase the workload for those remaining in the household and will be a further drain on cash resources. Diversification is often recommended as a method to reduce vulnerability for many households, but with a shrinking supply of labour it is unlikely that diversification (which usually requires some degree of risk) can take place.

## **7. FISHERIES MANAGEMENT, INSTITUTIONS AND POLICY**

### *7.1 Current status of fishery management on the floodplains*

Although the central government is tasked with the overall responsibility for inland fisheries management in Namibia (mandated to the Ministry of Fisheries and Marine Resources, MFMR) there is currently very little implementation of management measures on the ground. This situation could change with the enactment of the *Inland Fisheries Act and Regulations* in 2002 (MFMR, 2002).

If any group is said to be responsible for inland fisheries management on the floodplain area it must be the local or traditional leaders. There is, in fact, very little intentional fisheries management on the floodplains, but rather a series of practices and traditions, combined with local conditions, which seem to have prevented the unrestricted expansion of the fishery. These local conditions – which may have had the effect of protecting the resource in the past – are changing, thus necessitating a planned and implemented system of fishery management in the future.

## 7.2 Central government management of inland fisheries

Since Independence in 1990, the responsibility for freshwater fisheries has moved from the Ministry of Agriculture, to the Ministry of Wildlife, Conservation and Tourism (MWCT) to its current location in the Ministry of Fisheries and Marine Resources (MFMR). Currently, the Freshwater Fisheries Institute (FFI) of the MFMR is based at Hardap Dam, near Mariental some 250kms south of Windhoek.

The MFMR are active in the Caprivi Region, conducting stock assessment surveys and more recently conducting a tagging survey in order to learn more about behavioural patterns of some of the more important floodplain fish (Økland, 2000). The FFI is aware of the importance of the involvement of communities in both research and management and has started to involve fisherfolk on Impalila in a pilot project for the recording of gill-net catches. In association with the Namibia Nature Foundation and WWF–LIFE (World Wide Fund for Nature – Living in a Finite Environment) Program, the MFMR has recently embarked on a project to conduct more structured and regular surveys and research activities to improve the understanding of the social side of the fishery in the Caprivi Region (Naesje, 2002). The ‘Shared resource management on the Zambezi/Chobe systems in north east Namibia: Current practices and future opportunities’ project aims to conduct research and consultations to move towards the co-management of the riverine resources by the resource users and government and the states on opposite side of the rivers.

The legislation currently governing the management of freshwater fisheries in Namibia is a mix of pre-Independence legislation and the Constitution of the Republic of Namibia. The Namibian Constitution (Article 95) notes that ‘the state shall actively promote and maintain the welfare of the people by adopting ... policies aimed at ... maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilisation of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future’.

---

The Nature Conservation Ordinance of 1975 (No. 4)

Section 66: ‘No person shall, without the written permission of the Executive Committee, place or release any fish in inland waters (excluding aquariums and ornamental dams).’

Section 67: ‘No person other than the holder of a permit granted by the cabinet shall angle in any inland waters: provided that ... (b) any member of a particular population group may angle in waters situated on the communal land of the population group concerned’ without such a permit.

Section 68: gives a variety of regulations on the number of hooks and type of hooks that can be used but ‘the provisions of this section shall not apply to any member of a particular population group who catches fish in inland waters situated on the communal land of the population group concerned’.

Section 70: ‘... no person shall place in, or cause or allow to be dropped into, any inland waters in which fish are or might presumably be present any explosive, poisonous or intoxicating materials’.

---

Namibia’s Green Plan states the goal as ‘to protect and manage its wetland systems by means of rational and integrated land-use planning in accordance with the philosophies of the Ramsar Convention, based on the principles of (a) preserving biotic diversity, (b) monitoring life-support systems and, (c) ensuring the sustainable utilisation of wetland resources’ (MWCT, 1992).

More recently the Government of Namibia set out their policies with regard to inland fisheries in a white paper (MFMR, 1995). The *White Paper on the Responsible Management of the Inland Fisheries in Namibia* sets out the following principles for management:

- a) As a broad principle the approach is to allow sustainable utilisation of resources but to also protect the biodiversity of the Namibia inland fish fauna.
- b) In consideration of the diverse nature of the different systems, different management approaches are devised to deal with the circumstances particular to the different river systems.

- c) The protection of the interests of subsistence households in terms of the availability of fish from the rivers as a supplement to diets is given priority and the need to control the commercialisation of the resources is emphasised.
- d) The control of fishing and the protection of the resources through gear restrictions is adopted. Preference is given to passive gear over active gear and traditional gear in preference to modern nets.
- e) It is accepted that control and law enforcement is to be carried out by police officers and law enforcement personnel already employed by other Ministries with the assistance of traditional communities and the traditional authorities. A limited number of fisheries extension/liaison and law enforcement officers will represent the MFMR in rural communal areas.
- f) The principle that local people in communal areas should share in the income generated by commercialisation or the use of communal resources is followed.
- g) Future research policies on inland fish and the founding of a multi-disciplinary research station to eventually serve the region is addressed.
- h) The need for regional co-operation on inland waters and related matters between states in the region that share river basins is emphasised.

In order to facilitate the introduction of these policies, the government is in the process of drawing up an *Inland Fisheries Act* and Regulations. As of late 2002, the proposed legislation (*Inland Fishery Act*) has been submitted to Parliament for final debate and amendments before becoming law. The Regulations will follow the Act and are proposed to be specific to each of the different inland fishing zones in Namibia.

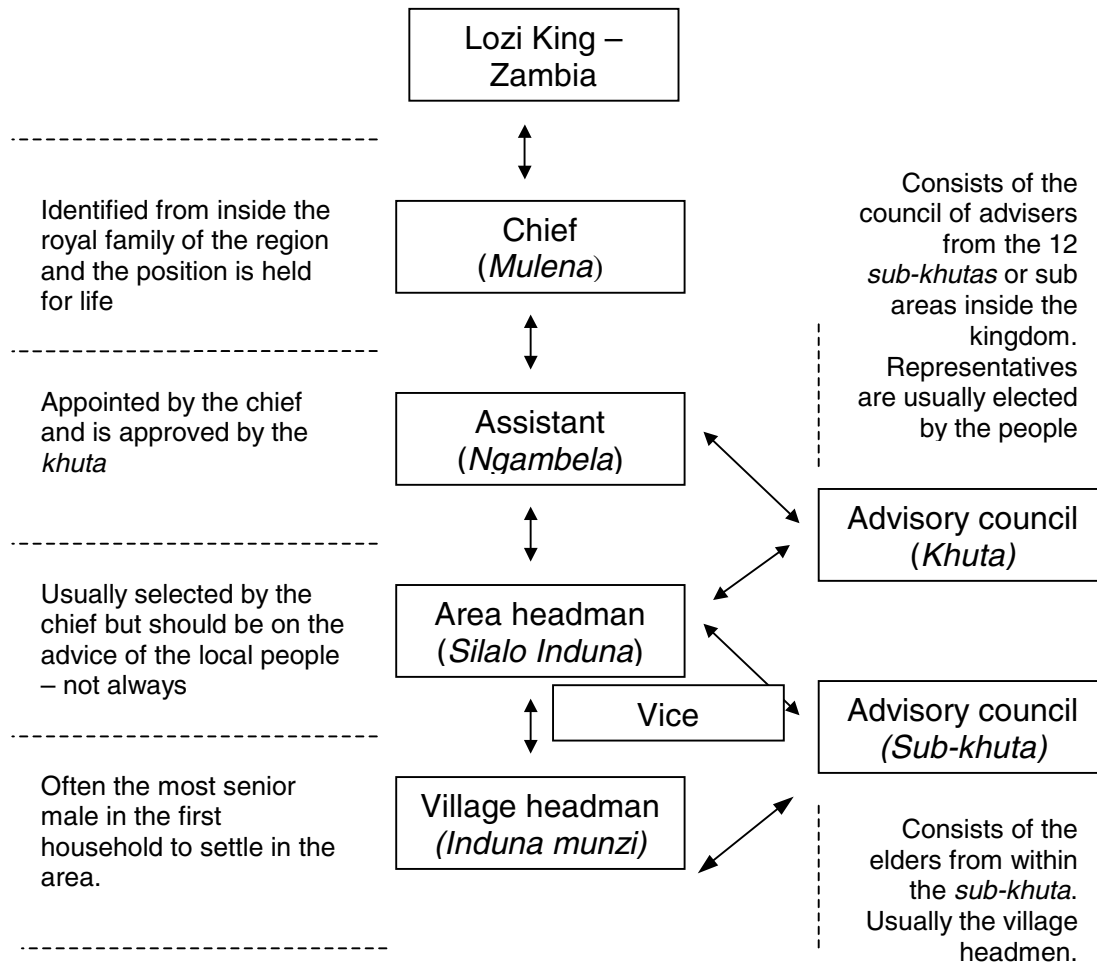
At present there is no obvious enforcement of any of the national fisheries legislation.

In addition to the national legislation and rules, Namibia is a signatory on at least two relevant protocols to assist in the management of freshwater fisheries: the Southern African Development Community Revised Protocol on Shared Watercourses (SADC, 2000); and the Food and Agriculture Organisation Code of Conduct for Freshwater Fisheries (FAO, 1997)

### ***7.3 Traditional/local fisheries management***

The basis for the traditional management of a range of natural resources on the floodplains comes from the tribal structure within the Masubia tribe, as part of the Lozi kingdom. The Masubia area covers most of the eastern floodplains except for the area immediately to the east of Katima Mulilo, which is something of a transition zone between the Subiya and the Mafwe groupings. Figure 5 below shows the hierarchical structure of the Masubia authority, although the other groupings in the region show a similar make-up, with *khutas* and *sub-khutas*.

**Figure 5 Masubia Traditional Authority on the eastern floodplains**



In summary, the tribal headquarters is in Bukalo, which is the location of the chief and his advisory council (*khuta*) and the Prime Minister (*ngambela*). Within the entire Masubia area there are a number of districts or wards (*silalo*). Each *silalo* has an elected head (*silalo induna*) and another identified individual who is tasked to represent the district at the main *khuta* in Bukalo. The *silalo induna* holds order over a *sub-khuta* at the district level for which he is assisted by the second *induna*. The *khuta* and *sub-khuta* perform tasks related to territory (e.g. land disputes, access rights), administration and justice (e.g. civil cases of marriage). Within the area of the *sub-khuta* there are a number of villages (*munzi*) and each *munzi* will have an *induna* (*induna munzi*).

Fishery management policies emanating from this traditional structure are limited to a broad restriction on the use of certain gears and access rights to fishing sites. Although the degree of implementation and enforcement varies, in general the regulations are not widely or effectively enforced.

**Table 7 Fishery management restrictions from traditional authorities/family groups**

---

|                   |   |
|-------------------|---|
| Gear restrictions | <p>Drag nets are reportedly illegal as a result of legislation or a proclamation from the traditional authorities for the Masubia tribe. Fines may be levied (up to \$N400 is reported) for their use. Isolated cases where nets have been confiscated, but in general drag nets are widely used.</p> <p>Some fishers report that drag nets of 2" or below are illegal whereas those with a larger mesh size (3" to 4") are permitted.</p>  |
| Access rights     | <p>The floodplain depressions (<i>mulapos</i>) which are flooded annually and then planted with maize are, in general, carefully protected fisheries. They are 'owned' by individuals apparently because of their value as crop land during the drier season. Anybody wanting to fish in these <i>mulapos</i> should request permission from the 'owner' and will usually offer a percentage of the catch as payment.</p> <p>The permanent water bodies on the plains (<i>lisa</i>) also have a system of ownership and although there is still one ultimate 'owner', he is obliged to allow his relatives to fish in that stream. People outside the family group must request permission. These access rights are handed down through generations and generally shared by the sons.</p> <p>No restrictions to access exist on the main Zambezi and Chobe river channels although permission can be nominally sought (by non-residents) from the <i>silalo induna</i> responsible for that area (ward). Permission for access to the riparian land is not required for access to fishing sites. In general, conflicts over the placing of nets appear not to be a problem at the present time.</p> <p>On the inundated plains, a variety of gears are employed and there are few restrictions on activities for residents.</p> |

---

Conflict and the issue of competition over fishing space with other fisherfolk was not identified by fisherfolk as a major problem. When there were complaints of too many fishermen or too many nets, these were usually directed at Zambian fishermen. The main complaint was that Zambians would set their net next to an already set net. Where ownership and access rules exist on the basis of family groups, they seem to be fairly well obeyed. For example during the dry season, the streams and pools provide a very valuable resource and ensure that a household can have a fishing income (in addition to ensuring an adequate food supply) throughout the year compared to others households who have no such access rights. Fisherfolk are prepared to use force to protect such rights, and cases of other local people breaking the rules are uncommon. Outsiders rarely approached the owner for access to a stream or attempted to gain access unlawfully. Often the only group reported to flout such rules of access were Zambians who might drag a pool during the night.

The degree of control of the fishery appears to be closely linked to the seasonal patterns of exploitation. At the time of year when the floodplains are inundated, access to fishing is relatively unrestricted (but fish are dispersed and difficult to catch). As the plains dry out, the fish become more concentrated in streams and pools and as the business becomes more lucrative, controls become more rigid. This seasonal change in control suggests that restrictions on access are less about the welfare of fish stocks, but rather ensure that the owner of the stream has privileged access to the water when fishing at that site is most lucrative.

The Masubia authority is closely linked to the broader Lozi kingdom, based in Zambia. Fishery management systems adopted on the Zambian side of the river appear to have a definite influence on the fishery on the Namibian side. The most influential of these systems is the implementation of a closed season between Sesheke and Mwandu (about half way to Impalila). The river and backwaters on the Zambian side are closed to fishing (except by traditional methods) from December 1 to 28/29 February. Many stakeholders in the Namibian fishery believe the ban is

poorly enforced, and it only appears to work because many Zambians come to Namibia to fish at this time of year.

#### 7.4 *Inadvertent management practices or traditions*

It is apparent that the impact of the intentional (traditional) fishery management effort – especially on the main channel and backwaters during the flood – is poor and in many cases not at all evident on the plains. However, restrictions on access as a result of family ownership are enforced. The ‘inadvertent’ practices, which in some ways may achieve some of the same objectives as fishery management, may have had considerable impact (MFMR, 1995 and Scudder and Conelly, 1985).

**Table 8 Inadvertent management practices or limitations on fishing**

| <b>Closed seasons<br/>(periods when fishing effort is reduced or absent)</b>   | <b>Closed areas<br/>(areas where fishing effort is reduced)</b>  |
|--|--|
| Water running too quickly during the rising flood for certain gears.<br>Water running too quickly for the safe use of a canoe.<br>Fishing effort reduced when people are busy with other livelihood components.<br>No night fishing by Namibians because of fear of animals. | Areas known to be inhabited by crocodiles or hippos are not used.<br>Sections of the river patrolled by the Botswana Defence Force (legitimately or not) are rarely used by Namibian fishers.<br>Aquatic vegetation may prevent canoes from moving, or hinder the setting of nets.<br>Areas (especially on the Chobe) where tourist traffic is heavy can restrict the setting of gill nets |
| <b>Gear restrictions<br/>(areas or times when certain gears cannot be used)</b>  | <b>Traditions<br/>(cultural or social factors reducing fishing effort)</b>   |
| Nature of the river and the river bed prevents the use of some dragging equipment.<br>Investment required for drag nets may be beyond the reach of many households.<br>Quality fishing nets are becoming more available locally but, still no regular supply.                | <i>Linyonga</i> (barb/labeo) is said to be linked with evil and should not be landed.<br><i>Mbufu</i> (redbreast tilapia) should not be consumed by women.<br><i>Ndombe</i> (catfish) is not eaten by members of the Seventh Day Adventist Church.   |

#### 7.5 *Other features limiting (managing) fisheries on the plains*

There are a number of environmental conditions not related to fisheries which may have had an important influence on the development of the fishery and the patterns of exploitation of the fishery. In turn these influences may have had a greater impact on the current shape of the fishery than specific fisheries-related restrictions.

Such features or limits may include:

- poor condition of roads on the floodplain making access difficult even in the dry season;
- lack of regular and reliable transport to villages on the floodplain;
- poor market and storage facilities across the floodplain and in the market at Katima Mulilo;
- the availability of other sources of protein may serve to reduce the demand for fish;
- multiple sources of livelihood for fishing households may prevent an increase in fishing effort without sacrificing some other activity in their work calendar;
- subsistence level households must be involved in a multitude of activities, so there is unlikely to be room for an increase in fishing effort unless appropriate access rights for various resources are held for other times of the year.



In addition to the external regulatory mechanisms (external to the family) there is some evidence to suggest that regulations or informal restrictions exist within family groups. In streams or pools where access is limited to family members, fisherfolk report that certain areas must remain unfished, untouched by drag or gill nets because of their value for the breeding fish during low water periods.

### *7.6 Future fisheries management*

It appears that family ownership, local environment and farming systems activities are more effective restrictions on the expansion of the fishery than those from central government or traditional authorities. An understanding of the forces limiting the intensification of the fishing industry is crucial when planning future fishery and/or floodplain management. Of equal importance are the changes occurring in the livelihood systems of floodplain dwellers, which suggest a different future for the fishery. Many of these trends were identified earlier in Section 5. These changes include:

- A push for people to move from subsistence to commercial operations in many sectors – as the latter style of production is often seen as a sign of ‘development’.
- An increasing number of wage earners in Caprivi with money to invest in villages being discouraged from continued investment in cattle (largely because of over-stocking), so looking for alternative sources of protein for their relatives and cash for themselves.
- An improvement of the roads in the region.
- Expansion of rural electrification enabling storage facilities to be constructed in places previously without electricity.
- The authority and respect afforded to traditional authorities being eroded in many places.
- Increasing mobility of people and goods means that the supply of inputs (such as fishing nets) will no longer be restricted.
- In recent years, problems in the cropping sector have increased (droughts, early floods, late rains, etc.) and people have increasingly turned to exploiting fisheries.
- Population increases resulting in more pressure on the resources in terms of mouths to feed per fisherman.
- Farming households are increasingly seeing their investment in crops and vegetables lost because of damage by wild animals, so they see fishing as an increasingly viable alternative.

In addition, anecdotal evidence suggests that there is willingness to intensify and develop the fishery. The trends identified in the fishery in Section 4 and the points noted above reinforce the idea that some type of system for effective fishery management (within the context of the livelihood system) is imperative. It is critical that the legislation being planned is relevant, appropriate, implementable and enforceable. The legislation should provide the legal framework for local communities to develop, in consultation with Government, an effective system for the co-management of fisheries. The important role of the local resource users must be more than just as enforcement officers, they must have an active role in the formation of local management measures for their areas. Similarly the importance of cross-border management initiatives should not be under-estimated.

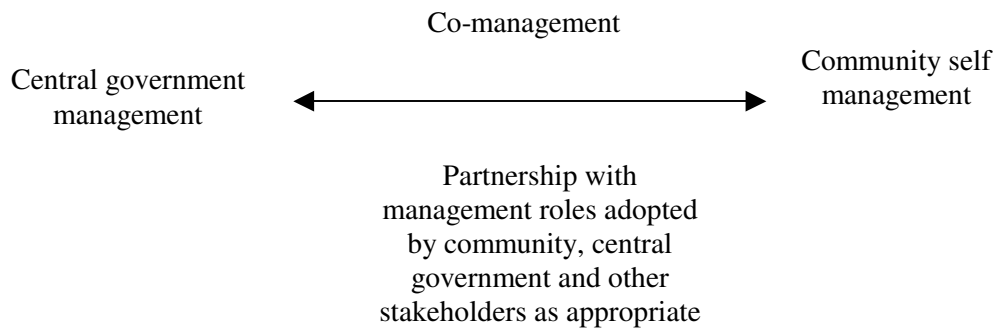
### *7.7 Co-management as the future for fisheries management*

Co-management has been described by many authors as a ‘partnership arrangement using the capacities and interests of the local fishers and the community, complemented by the ability of government to provide enabling legislation, enforcement and conflict resolution, and other assistance’ (cited in Hoggarth et al., 1999). In the Namibian context, the term co-management is often used to refer to the collaborative management of the riverine resources between the different

countries sharing rivers. Co-management will have a spatial component as well as a hierarchical aspect.

Essential to the adoption of a co-management approach is the involvement of local resource users and the relationship between the resource users and the local, regional and national government. The exact nature of the co-management agreements will be very context specific and could occur at some point on the scale shown below, which illustrates the two extremes of management.

**Figure 6 Range of co-management options**



*Source:* Hoggarth et al., 1999

Although the exact nature of co-management is yet to be determined with the local stakeholders and Government, it is clear that any plan for management of the riverine fisheries must be developed in conjunction with local communities. Similarly any change in management structures must have legislative backing and/or framework to be enforceable. In order to work effectively with local communities, the Government must recognise that improved management must incorporate or allow for a raised living standard of the participants, the floodplain dwellers.

The diagram in Appendix 3 shows one possible framework for the implementation of a co-management system. The details must be added as a result of renewed and detailed consultations with fishery stakeholders in the region.

## **8. CONCLUSIONS**

Despite the current general weakness of management (or restrictions) in the floodplain fishery, it appears that a variety of conditions or situational factors (e.g. infrastructure limitations) have been operating to limit the degree of exploitation of aquatic resources. However, there are signs that some of these situational inadvertent management practices limiting the fishery are being transformed by external forces. The move to commercialisation and the increasing need for cash to achieve food security are, in particular, increasing pressure on the resource.

Much of the fishing effort on the floodplain is undertaken as part of a collection of complicated livelihood strategies designed to achieve food security and other objectives, for the household. Changes in the effort applied to the resource are as likely to be the result of a change in another part of the livelihood as they are a deliberate, conscious decision to increase fishing effort to raise income. Consequently, the fishing component cannot be examined or managed in isolation.

Post-harvest losses maybe significant in the region, and the value of the fish caught is not optimised. The post-harvest sector has received very little attention and although the region has the largest fresh fish market in Namibia, conditions for the sale and storage of fish are basic. The market for inland and marine fish in the region appears to be strong and shows no sign of saturation, with more fish being made available and prices remaining strong.

There is no doubt that freshwater fisheries are becoming more important on the rural development agenda in the region. All aspects – market development, processing techniques, new gear types, fish farming, etc. – are being discussed in various fora. Similarly, there are numerous proposals for development on the floodplain which have the potential to influence the fisheries – irrigation is increasingly being demanded, proposals for plantations using water from the Zambezi, etc.

The recently establishment (June 2002) of an inland fisheries office of the MFMR in Katima Mulilo is evidence of the importance now attached to the freshwater fisheries in Caprivi by Head Office in Windhoek. It is hoped that this office, with the support and initiative of stakeholders in the region, will begin to address many of the issues raised in this paper.

It is clear that many of the objectives of different Ministries are very similar – MFMR want a stabilised fishing effort at subsistence level (in the name of sustainable management), MAWRD are encouraging livelihood diversification away from traditional activities on the floodplain (e.g. into new crops, post-harvest storage systems) and the Ministry of Trade and Industry (MTI) is actively encouraging people to become involved in fish farming, rather than fish catching. This may result in fewer people involved in the fishery in the future, if returns from other activities are higher.

Inland fisheries management has until now been low on the ministerial agenda in Namibia – perhaps not surprising given the obvious value of the marine sector to the economy and nation as a whole. One consequence of this situation is that capacity and, to some extent, interest in the inland fisheries sector has been low in the MFMR. Although research efforts continue in the regions, connections with fisherfolk and the communities dependent on the resource have been minimal. This situation is changing, with the project outlined above being one example (see Section 7.2).

The floodplain system is extremely complex and changes from month to month and year to year depending on various natural factors, not least of which is the nature and duration of the flood. Any attempt to restrict fishing effort will have to be flexible enough to respond to changes brought about by differences in the natural regime either of flooding or rainfall.

The complexity and variability in the fishery has been emphasised, and caution should be taken in any effort to value the fishery or quantify the fishery in terms of value to the Namibian economy. Generalisations across the floodplain and between households are difficult to justify in an environment which is so fluid. Any effort to conduct this type of valuation must be matched by efforts to manage and develop the fishery itself adopting the precautionary principle.

The different styles and priorities in resource use across the riparian states calls for further analysis. The existence of links and interdependencies are evident, but the nature and role of such links is not clear.

## **9. RECOMMENDATIONS**

### ***9.1 Proposed legislation***

The preparation of a new *Inland Fishery Act* in Namibia should be taken as the opportunity to provide enabling legislation allowing some delegation of responsibility for fisheries management to resource users in the Caprivi Region. The reasons for this are varied, but not least because of the complexities involved in the floodplain system and MFMR may remain under-resourced to manage the fishery. Appropriate legislation could provide the framework for regional and local authorities and users to take on some of the roles of fisheries management (with appropriate support), though ultimate responsibility should remain with the MFMR. This should enable local solutions to local problems in inland fisheries throughout Namibia (see Appendix 3 for an example of a such a structure). However, the details of a co-management system must be worked out between the regions, the resource users and the MFMR in Windhoek. A number of recent consultative activities in the eastern floodplains have clearly identified the demand by local people to be effectively involved in the management of the resource on which they depend (Purvis, 2002)

### ***9.2 Assessment of suitable co-management framework***

Although the moves towards co-management of the fishery resource are strong, the details of stakeholders' roles and responsibilities are unclear. A more detailed assessment of options for co-management and the implications for the stakeholders is required. Any system of co-management has to be based on knowledge of the resource, understanding the objectives of stakeholders, existing management systems and a realistic assessment of available resources for implementation, amongst others. Further work in this area is required.

### ***9.3 Creation of a Regional Fisheries Authority***

As mentioned above, and even in the absence of appropriate legislation, the Regional Council must begin to address fisheries issues in the region, with input from local fisherfolk and other resource users. The reasons for this include:

- the important role that fisheries play in the regional economy (e.g. income, protein source, indirect income and employment through the tourism industry);
- the efforts being made in the region to develop commercial-scale fish farming;
- the high level of interaction between fisheries and other livelihood activities;
- the relatively recent establishment of an Inland Fisheries Office in Katima Mulilo; and
- the increasing calls for fishery related development in the Region

In the shorter term, the co-ordinating function and the facilitation of information flows could be managed by the Regional Development Co-ordinating Committee (RDCC). The establishment of a regional grouping is the first stage in building links between the fisherfolk and the head office of the MFMR and beyond.

### ***9.4 Piloting of management activities***

Given the obvious demand for, and possibilities of, improved management of the floodplain fisheries in the region, it is an appropriate time to investigate the potential for different management approaches and techniques. If co-management between resource users and government is seen as the way forward, the MFMR (with donor support) should aim to pilot some of these options. Similarly, co-management of the fishery involving representatives from both sides of the rivers should be investigated through practical efforts for implementation. It is only through the piloting of management tools that the work from the scientific and social components of research can be brought together to produce a practical move towards sustainable management of fisheries.

### ***9.5 Improved cooperation with adjacent states***

Given the transboundary nature of the resource and the movement of resource users it is critical that any future management activities be undertaken in consultation with representatives from the fishery stakeholders in Zambia and Botswana. The MFMR and other stakeholders clearly recognise the importance of transboundary co-operation in the management of shared resources (MFMR, 1995; SADC, 2000). It is a challenge to all parties involved to move from policy statements to implementation for the benefit of all parties. Joint research activities involving players from adjacent countries should be undertaken to improve co-operation and practical resource management options. Consistency in research methods employed in the neighbouring countries should be actively encouraged.

### ***9.6 Increased staffing and capacity building of Inland Fisheries Office in Katima Mulilo***

The establishment of an Inland Fisheries Office in Katima Mulilo is recognition of the importance attached to the fishery in the region, both from regional organisations and the MFMR itself. This office is a building block from which future activities will develop and as such efforts must be made to increase both staffing levels and the capacity of existing staff. A strategic plan (including human resource development) should be developed for the office.

### ***9.7 Learn lessons from other natural resource management initiatives***

Efforts towards improved and sustainable management of the fishery resource are following work in other sectors (e.g. wildlife and forestry) towards a similar goal. The work in the fishery sector should not happen in isolation and must learn lessons from the pioneering efforts in the other sectors. Incorporation of fisheries issues in the recently established Community Based Natural Resource Management Working Group of Caprivi must be maintained. Whilst recognising that fisheries are different in many ways, practical lessons for implementation of co-management systems can be drawn from other sectors (e.g. in terms of community mobilisation, capacity building, institutional development, fund management, etc.).

### ***9.8 Increase alternative livelihood activities for fishing communities***

As highlighted in this report, many of the reasons for the current situation in the fishery in the region stem from activities outside of the fishery sector. Fishing activity should be examined in conjunction with other livelihood activities. Solutions to problems in the fishery sector (e.g. increasing effort, increasing use of damaging fishing gears) may lie outside the sector itself. Efforts to identify lucrative livelihood activities and income generating projects (IGPs) as alternative or complimentary strategies to fishing should be expanded.

### ***9.9 Assess the potential for fish farm development***

The potential for fish farming in the region is being assessed by different Ministries and interest groups in the region. As an activity that can be closely linked to agricultural production, and with potential 'fit' with other livelihood activities, it must be examined realistically. Despite the existence of the capture fishery in the region, demand, technical capacity or willingness to co-operate will not necessarily be present for aquaculture developments. There are many issues to consider and proper assessment and piloting is necessary.

### ***9.10 Improve postharvest efficiency***

Improvements in the postharvest sector may encourage a greater level of fishing effort and potentially give rise to resource problems and conflicts over access. Thus, any interventions in this sector should be carefully considered and targeted. However, given that there are substantial postharvest losses, the sector may hold potential for positive interventions. Interventions in the postharvest sector should be accompanied by corresponding management measures to mitigate negative impacts.

### ***9.11 Development of long-term monitoring systems***

The MFMR is currently working with communities and other stakeholders to undertake a comprehensive baseline survey of the fishery activities on the Zambezi/Chobe systems. The lessons of this work must be used to establish a sustainable level of activity (biological and socio-economic) and a monitoring and evaluation programme to ensure the resource is not over-exploited in the long term. Information and results must be appropriate and used for both scientific and local education/awareness raising purposes.

## 10. REFERENCES

- FAO. 1997 *FAO Technical Guidelines for Responsible Fisheries, Inland Fisheries*. Rome: FAO.
- Hoggarth, D.D., Cowan, V.J., Halls, A.S., Aeron-Thomas, M., McGregor, J.A., Garaway, C.A., Payne, A.I., Welcomme, R.L. 1999. 'Management guidelines for Asian floodplain river fisheries. Part 1. A spatial hierarchical and integrated strategy for adaptive co-management'. *FAO Fisheries Technical Paper No. 384/1*. Rome: FAO.
- Hoggarth, D.D., Cowan, V.J., Halls, A.S., Aeron-Thomas, M., McGregor, J.A., Garaway, C.A., Payne, A.I., Welcomme, R.L. 1999. 'Management guidelines for Asian floodplain river fisheries. Part 2. Summary of DFID Research'. *FAO Fisheries Technical Paper No. 384/2*. Rome: FAO.
- Mendelsohn, J and Roberts, C. 1997. *An environmental profile and atlas of Caprivi*. Windhoek: MET.
- MFMR. 1995. *White Paper on the Responsible Management of the Inland Fisheries of Namibia*. Windhoek: Ministry of Fisheries and Marine Resources.
- MFMR. 2000. 'The co-management of fresh water resources in the Okavango and Zambezi River systems – Proceedings of a consultative workshop'. Katima Mulilo, 14–16 November, 2000.
- MFMR. 2002. *Draft Inland Fishery Bill*. Windhoek: MFMR.
- MHSS. 2000. *Report of the 2000 HIV sentinel sero survey*. Windhoek: Ministry of Health and Social Services.
- MWCT. 1992. 'Namibia's Green Plan'. Unpublished draft. Windhoek: Ministry of Wildlife, Conservation and Tourism.
- Økland, F., Hay, C. J., Næsje, T.F., Thorstad, E.B. 2000. 'Movements and habitat utilisation of cichlids in the Zambezi River, Namibia – A radio telemetry study in 1999–2000'. *Nina Niku Project Report No.011*. Windhoek: MFMR.
- Purvis, J. 2002. 'Postharvest fisheries on the eastern floodplains, Caprivi'. *DEA Research Discussion Paper 51*. Windhoek: MET.
- Purvis, J. 2002. Consultation on future management of the fisheries resources of the Zambezi/Chobe rivers and floodplains, Caprivi region, May 2002. Unpublished project document. Windhoek: MFMR.
- SADC. 2000. *Revised Protocol on Shared Watercourses*. Southern African Development Community.
- Scudder, T and Conelly T. 1985. 'Management systems for riverine fisheries'. *FAO Fisheries Technical Paper 263*. Rome: FAO.
- UNDP. 1996. *Namibia Human Development Report 1996*. Windhoek: United Nations Development Programme.

## APPENDIX 1 FISH NAMES USED IN THE CAPRIVI

| Local name                          | English name             | Scientific name                     |
|-------------------------------------|--------------------------|-------------------------------------|
| Ijungwe                             | Upper Zambezi yellowfish | <i>Barbus codringtonii</i>          |
| Ijungwe                             | Dashtail barb            | <i>Barbus poechi</i>                |
| Imbuma (Mbuma)                      | Rainbow happy            | <i>Sargochromis carlottae</i>       |
| Imbuma                              | Green happy              | <i>Sargochromis codringtonii</i>    |
| Imu                                 | Greenhead tilapia        | <i>Oreochromis macrochir</i>        |
| Injenga                             | Greenwood's happy        | <i>Sargochromis greenwoodii</i>     |
| Kambanda                            | Southern mouthbrooder    | <i>Pseudocrenilabrus philander</i>  |
| Liminolale                          | Beira barb               | <i>Barbus radiatus</i>              |
| Linyonga                            | Barotse barb             | <i>Barbus barotseensis</i>          |
| Linyonga                            | Redspot barb             | <i>Barbus kerstenii</i>             |
| Linyonga                            | Straightfin barb         | <i>Barbus paliudinosus</i>          |
| Linyonga                            | Longbeard barb           | <i>Barbus unitaeniatus</i>          |
| Linyonga                            | Upper Zambezi labeo      | <i>Labeo lunatus</i>                |
| Linyonga (big)                      | Redeye labeo             | <i>Labeo cylindricus</i>            |
| Linyonga (rapid)                    | Red barb                 | <i>Barbus fascoliatus</i>           |
| Liulyungu                           | Banded jewelfish         | <i>Hemichromis elongatus</i>        |
| Lubango                             | Silver catfish           | <i>Schilbe intermedius</i>          |
| Mbala                               | Hyphen barb              | <i>Barbus bifrenatus</i>            |
| Mbala                               | River sardine            | <i>Mesobola brevianalis</i>         |
| Mbala                               | Silver robber            | <i>Micralestes acutidens</i>        |
| Mbala                               | Slender robber           | <i>Rhabdalestes maunensis</i>       |
| Mbala (big)                         | Striped robber           | <i>Brycinus lateralis</i>           |
| Mbala (big)                         | Barred minnow            | <i>Opsaridium zambezense</i>        |
| Mbufu                               | Redbreast tilapia        | <i>Tilapia rendalli</i>             |
| Mushuna (Naluca)                    | Humpback largemouth      | <i>Serranochromis altus</i>         |
| Mushuna                             | Thinface largemouth      | <i>Serranochromis angusticeps</i>   |
| Musiaka                             | Longtail spiny eel       | <i>Aethiomastecembelus frenatus</i> |
| Mwelu                               | African pike             | <i>Hepsetus odoe</i>                |
| Ndikusi (bottlenose)                | Western bottlenose       | <i>Mormyrus lacerda</i>             |
| Ndombe – Mbundamusheke/<br>Mangwana | Sharptooth catfish       | <i>Clarias gariepinus</i>           |
| Ndombe – Stama/ Nkoma               | Blunttooth catfish       | <i>Clarias ngamensis</i>            |
| Ndombe – Mabozwa/ Lihwetete         | Blotched catfish         | <i>Clarias stappersii</i>           |
| Ndombe – Kakokwe/Kaminga            | Snake catfish            | <i>Clarias theodora</i>             |
| Ndombe – Nenge/Silutupuri           | Broadhead catfish        | <i>Clariallabes platyprosopos</i>   |
| Nembele                             | Bulldog                  | <i>Marecusenius macrolepidotus</i>  |



| <b>Local name</b> | <b>English name</b>      | <b>Scientific name</b>              |
|-------------------|--------------------------|-------------------------------------|
| Nembwe            | Nembwe                   | <i>Serranochromis robustus</i>      |
| Ngenga – Mulumbu  | Purpleface largemouth    | <i>Serranochromis macrocephalus</i> |
| Ngenga            | Brownspot largemouth     | <i>Serranochromis thumbergi</i>     |
| Ngweshi           | Tigerfish                | <i>Hydrocynus vittatus</i>          |
| Ninga             | Slender stonebasher      | <i>Hippopotamyrus ansorgii</i>      |
| Ninga             | Dwarf stonebasher        | <i>Pollimyrus castelnauii</i>       |
| Ninga/kupandula   | Churchill                | <i>Petrocephalus catostoma</i>      |
| Njinji            | Threespot tilapia        | <i>Oreochromis andersonii</i>       |
| Sakulo            | Zambezi parrotfish       | <i>Hippopotamyrus discorhynchus</i> |
| Siabela           | Zambezi grunter          | <i>Parauchenoglanis ngamensis</i>   |
| Singongi          | Squeakers                | <i>Synodontis spp.</i>              |
| Singulungwe       | Blackspot climbing perch | <i>Microctenopoma intermedium</i>   |
| Situhu            | Banded tilapia           | <i>Tilapia sparrmanii</i>           |
| Siyeo             | Pink happy               | <i>Sargochromis giardi</i>          |

Note: The above list is a best-bet at this time. There is some confusion surrounding the local names applied to fish because of the variations in the language (mainly Lozi and Subiya), different names applied to different sizes of the same fish and detailed, traditional knowledge of some of the fish (e.g. the various names for different catfish) are being used less frequently by younger generations.

## APPENDIX 2 MAIN FISHING GEARS FOUND IN USE ACROSS THE EASTERN FLOODPLAIN

| Local name   | English name             | Brief description  | Notes/comments   |
|--|--------------------------|--|--|
| <b>Chasing gears:</b> active gears used in the active pursuit of fish whether on the floodplain or in the channels or pools. |                          |  |  |
| Lituwa   | Drag net                 | Made usually from 6–9 unmounted panels of gillnet joined to form one enclosing net. Made from the strong Botswana or Zambian nets. Mesh size varies with 4” common across the floodplains and nets between 2’ and 6” observed. Worked by between 2–6 people. | High investment but potentially high returns. Commonly reported to be illegal (1” to 2” nets) through restrictions from the <i>khuta</i> but 4” mesh nets are reported to be allowed. The physical state of the river and associated water bodies limits the use of drag nets at certain times of the year.                              |
| Kashito  | Hook and line            | Can be of the traditional style (line and stick) but also modern rods and reels can be found in use. Bulldogs ( <i>Nembele</i> ) commonly used as bait.  | Used all year round but particularly in the pools and channels during the dry season when fish are concentrated. Often see young boys using rod and line.  |
| Muwayao  | Spear fishing            | May be a multi-barbed wooden spear with metal tip or a multi-tipped spear. Single iron spike (barbed) on wooden pole.  | Used by variety of people during the flood when water is shallow – can be used with or without a canoe. Can be seen used by men in the main channels (with canoe) during the dry season. May be used with artificial light to improve the effectiveness. Operated from a canoe by two-person team (paddle and lightman, and spear user). |
| Moskitero  | Mosquito net             | Mosquito net pulled through the water catching all aquatic life. People often disturb the water in order to push fish into the net.  | A favourite method used by women and children in the shallow waters during the flood and sometimes in the main channel during the low water time. Often used to target specific species (e.g. <i>mbala</i> ) mainly for home consumption.  |
| Buta   | Bow and arrow            | Made of locally available materials.   | Seldom seen in use across the floodplain.  |
| Singunda   | Push basket or slam trap | Made from locally available materials and can be held in the current or actively worked against the current. Is slammed down onto the fish and the fish are then removed by hand or sometimes with a spear or stick.   | Particularly popular with women and children when the waters are receding from the floodplain. Looks very similar to a mono/ <i>lukuko</i> but is used differently.  |
| Kawangu  | Scoop basket or net      | Made from locally available materials – wooden frame and then ropes knotted to form an area of netting. Some have long handles and others not.   | Used to scoop fish out of the kraals ( <i>sibanga</i> – see barrier gears) – not used on its own as a fishing gear. Used by both men and women (individually).   |
| Lishino  | Scoop or draw basket     | Made from locally available materials and is much bigger than a <i>kawangu</i>   | Can be used in streams and is pulled through the water between two men or women.   |

## Kushundunda

A roll of dry grasses or reeds (like a roll of carpet) is carried at either end by a woman and they drag this through the remaining water in small ponds.

Used in the dry season when pools are shallow. Almost exclusively used by women.  
Can also be the term applied to the use of mosquito nets in a dragging motion.

---

**Set and wait gears:** passive gears set for a period of time, left unattended and then retrieved or emptied. Most effective only when fish are moving.

## Tunyandi

**Gill net**  
Bought in panels and mounted by the fisher using reeds on the head rope and sinkers (often) at the base. Ropes can be homemade (hessian sacks) or bought. Usually the panels are joined to form long stretches of net (commonly two pieces but up to 500 metres of net has been observed). Depth is usually two metres or so. Used in open waters or at the edge of the stream where less chance of becoming clogged. Set parallel or perpendicular to the river banks depending on the habitat and season.  
Variety of mesh sizes used ranging from 1” to 6”.

The most common gear used across the floodplain and fishers often operate with six or more nets. Can be bought in Katima market (irregular supply), Botswana and Zambia. Quality and price varies \$N25 to \$N170 for 50–90 yard lengths. Most effective when fish are on the move and least effective during the months of November to February when many fishers turn to the use of drag nets. Most ‘fishing’ households have two or more nets and rarely do fishing households operate with less than 100 meters of netting.  
To improve the effectiveness of gill nets during the dry season when fish are mainly stationary, people ‘hammer’ the water in an attempt to drive fish into the net.

## Njamba

**Funnel type construction made from reeds. Much larger than a lifula and has a second funnel inside to facilitate the holding of fish.**

Operated by men in fast flowing water (sometimes) and can be placed in a reed fence across a stream as the water is rising or falling.

## Lifula

**Fish funnel**

Made from locally available reeds and is about one metre long in a cone-shape with a diameter of 30–60cms at the open end.

They are set in lines (with reed fences in between) when the water is flowing. Usually used by men. In Impalila there is a specialised fishery operating in the months of June and July for Churchills/*Nginga* when the funnels are set in the fast flowing rapids either individually wedged in the rocks or set in lines attached by wire.

## Mono (Subiya) or Lukuko (Lozi)

**Funnel**

Is the smallest of the funnel type gears and is made of grass.

Reportedly used when the waters are receding off the plains. Also used in fences of reeds but not where the water is flowing fast. In Impalila the name is the same for a funnel type gear used in the rapids for a specialised fishery for *Nginga* (or Churchill) in June and July

## Katamba

**Fishing basket**

Knee high reed basket which is baited with mealie meal porridge and placed in the reeds.

Used mostly as the fish are moving onto the floodplains. Commonly made and used by women and children.

|   |                |   |  |
|---|----------------|---|--|
| ? | ?              | Rows of reeds that look like mats. One end of the reeds are sharpened to make it easier to put the trap into the mud. Set in the water in a ring with the ends folded inwards so the fish go in and cannot get out. Baited with meal and can be left for 30 minutes to eight hours. | Generally used by women and children when they are involved in other activities at the edge of the flood. Used mostly on the floodplains in shallow water as the flood is rising and falling. More common in the past and is now rarely seen in the eastern floodplains. |
|   | Bottle fishing | Baited bottle (base removed) placed in the mud or current to catch fish.  | Used by women and children in different locations depending on the state of the river.   |

**Barrier gears:** can be left or attended and are most often used when there is sufficient water movement. Difference to the set-and-wait gears is that the current pulls the fish to the barrier gears.

|         |                   |  |   |
|---------|-------------------|--|---|
| Sibanga | Fish kraal        | Made of local materials (reeds). The actual enclosure (the <i>sibanga</i> ) often set in threes at the end or base of the <i>siyandi</i>   | Catch mostly smaller fish as the water recedes from the floodplain. Often set by the men but cleared and tended by the women or children. Mainly used during August/Sept.   |
| Njamba  | Large fish kraals | Made of local materials and built across deeper channels in the floodplain.  | Mainly used in August to September and designed to capture fish as they leave the floodplain.   |
| Siyandi | Fish fence        | Made of local materials and directs fish into an enclosure which is difficult to leave. Fish are removed from the enclosure using a scoop net. The <i>siyande</i> are the 'mats' of reeds which are then placed in such a way that a <i>sibanga</i> is formed. | Is time-consuming to construct but once in place can take fish with little effort. Often set in the narrow channels between pools in conjunction with a gill net. Mostly to catch fish as they leave the floodplain. Most effective August to September when the water is receding. |

#### Others

|                           |  |  |  |
|---------------------------|--|--|--|
| Kungonda<br>Sindingulumwe | Fishing using livestock (variation using children) | Livestock are put into a pool or driven into a pool and cloud the water to such an extent that the fish are gasping for air and can be collected. A variation is when children play in a pool to cloud the water with similar results. | Used in streams and/or isolated pools during the dry season. For catfish and bream.  |
| Kushewa or kusitera       | Natural poisoning                                  | Wild picked fruits are ground and then sprinkled into the pool – the fish rise for oxygen and can be easily collected. Bark from a tree is stripped and placed in the pool and the fish rise to the surface looking for oxygen.        | Both methods are used in the isolated pools during the dry season. Apparently the effects are temporary and the poison does not kill all the fish in the pond unless the poison is too strong. |

Mubingo

- (i) The term may refer to a communal method of fishing using dragnets and signals the opening of the 'traditional' fishery in a pool isolated by the receding flood.
- (ii) The term is used in Impalila when a group of people are fishing in a pool owned by someone else – when fishing is complete a proportion of the catch is given to the owner and a proportion is reserved for the chief. This *mubingo* should be given to the owner each time the pool is fished.
- (iii) The term is also used across the floodplains for the event at the end of the dry season when most fish have been caught and the streams are going dry. The owner of the stream makes it known that the stream is open (previously closed) to all comers. The event is open to all with spears only, and commences at a certain time on a certain date. All the fish are cleared from the stream in this way.

Milungu

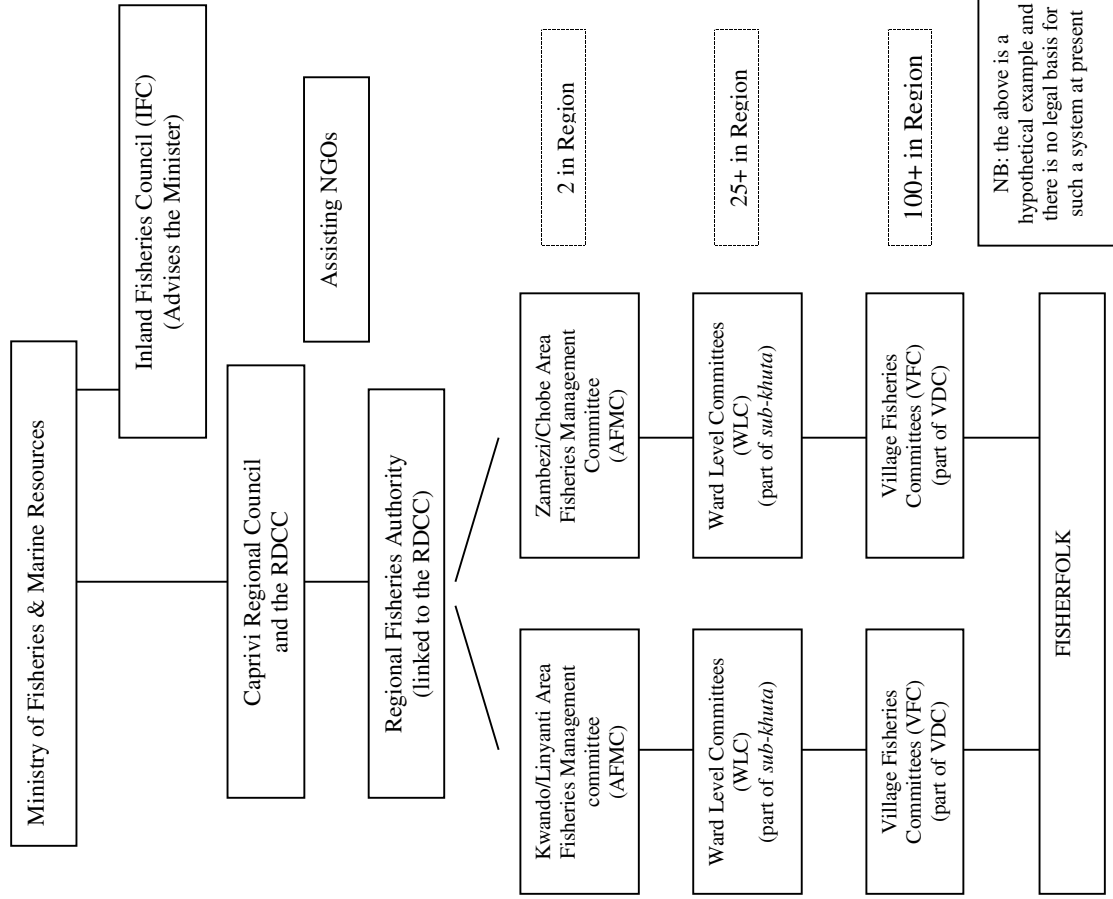
As the first rains soak the ground particularly along the channels, many fish will be stranded and can be collected from the pool area.

Mubaya or  
Lishule bunjenje

---

As the first floods come into the streams the water is laden with silt and sand – so fish are concentrated at the surface for oxygen. Often they die in large quantities and can be collected.

## APPENDIX 3 POTENTIAL STRUCTURE FOR ESTABLISHMENT OF CO- MANAGEMENT SYSTEM FOR FISHERIES IN THE CAPRIVI REGION



### Brief description

The MFMR, on advice from the IFC, can delegate Appropriate Authority to the Caprivi Regional Council, for fisheries management. The Regional Council establishes a Regional Fisheries Authority (RFA) (linked to the RDCC) to coordinate the process. The RFA establishes two committees to represent the interests of the people dependent on the two main rivers systems in the region (the AFMC–Zambezi and the AFMC–Kwando/Linyanti). These AFMCs draw membership from the next layer (and other stakeholders) which is the Ward Level Committees (WLCs) which are based on the boundaries of the *sub-khuta* (traditional authority management unit). The WLCs can be integrated into the *sub-khuta* establishment of the *sitalo induna*. Following the hierarchy of the Traditional Authorities, the next level is the Village Fishery Committees (VFCs) which relate to the village *Induna (Induna munzi)* level and also the Village Development Committees established under the MRLGH decentralisation.

The system explained above takes into account the existing system of management by traditional authorities, the creeping policy of decentralisation in the Regions and the characteristics of the floodplain resources.

### Potential advantages

- in line with community requests for representation at Ward level;
- recognises the existing system of management through the Traditional Authorities;
- builds on existing system of fisheries management at Ward level;
- builds on existing political/administrative units (RDCC, VDCs);
- ultimate responsibility lies with MFMR – can reclaim at any time;
- can incorporate differences in rivers and resource use within the region;
- loosely matches the management units on the Zambian side of the river;
- identifies constituted target groups for assistance through MFMR and/or NGOs;
- enables local committees’ involvement in research;
- allows for local resolution to local problems without burdening higher authorities;
- institutional support for enforcement of laws and creation of regulations;
- nested structure of institutions for the effective participation of all stakeholders.

### Potential disadvantages

- bureaucratically cumbersome and unlikely that all areas will establish and/or maintain such institutions;
- possibility of divisions on the basis of tribal differences;
- links to the institutions of the Traditional Authorities can repeat their historical biases (e.g. involvement of women).

NB: the above is a hypothetical example and there is no legal basis for such a system at present

## DIRECTORATE OF ENVIRONMENTAL AFFAIRS

### Research Discussion Papers available in this series

1. **Ashley, C. 1994.** Population growth and renewable resource management: The challenge of sustaining people and the environment. *DEA Research Discussion Paper 1.* 40 pp.
2. **Ashley, C, Barnes, J and Healy, T. 1994.** Profits, equity, growth and sustainability: The potential role of wildlife enterprises in Caprivi and other communal areas of Namibia. *DEA Research Discussion Paper 2.* 25 pp.
3. **Quan, J, Barton, D and Conroy, C (Ashley, C ed). 1994.** A preliminary assessment of the economic impact of desertification in Namibia. *DEA Research Discussion Paper 3.* 150 pp.
  - Northern commercial areas: Okahandja, Otjiwarongo and Grootfontein. 33 pp.
  - Communal and commercial areas of southern Namibia. 42 pp.
  - Northern communal areas: Uukwaluudhi. 35 pp.
4. **Ashley, C and Garland, E. 1994.** Promoting community-based tourism development: Why, what and how? *DEA Research Discussion Paper 4.* 37 pp.
5. **Jones, BTB. 1995.** Wildlife management, utilisation and tourism in communal areas: Benefits to communities and improved resource management. *DEA Research Discussion Paper 5.* 37 pp.
6. **Barnes, JI. 1995.** The value of non-agricultural land use in some Namibian communal areas: A data base for planning. *DEA Research Discussion Paper 6.* 21 pp.
7. **Ashley, C, Müller, H and Harris, M. 1995.** Population dynamics, the environment and demand for water and energy in Namibia. *DEA Research Discussion Paper 7.* 37 pp.
8. **Barnes, JI and de Jager, JLV. 1995.** Economic and financial incentives for wildlife use on private land in Namibia and the implications for policy. *DEA Research Discussion Paper 8.* 21 pp.
9. **Rodwell, TC, Tagg, J and Grobler, M. 1995.** Wildlife resources in Caprivi, Namibia: The results of an aerial census in 1994 and comparisons with past surveys. *DEA Research Discussion Paper 9.* 29 pp.
10. **Ashley, C. 1995.** Tourism, communities and the potential impacts on local incomes and conservation. *DEA Research Discussion Paper 10.* 51 pp.
11. **Jones, BTB. 1996.** Institutional relationships, capacity and sustainability: lessons learned from a community-based conservation project, eastern Tsumkwe District, Namibia, 1991–96. *DEA Research Discussion Paper 11.* 43 pp.
12. **Ashley, C and Barnes, JI. 1996.** Wildlife use for economic gain: The potential for wildlife to contribute to development in Namibia. *DEA Research Discussion Paper 12.* 23 pp.
13. **Ashley, C. 1996.** Incentives affecting biodiversity conservation and sustainable use: The case of land use options in Namibia. *DEA Research Discussion Paper 13.* 21 pp.
14. **Jarvis, AM and Robertson, A. 1997.** Endemic birds of Namibia: Evaluating their status and mapping biodiversity hotspots. *DEA Research Discussion Paper 14.* 103 pp.
15. **Barnes, JI, Schier, C. and van Rooy, G. 1997.** Tourists' willingness to pay for wildlife viewing and wildlife conservation in Namibia. *DEA Research Discussion Paper 15.* 24 pp.
16. **Ashley, C, Barnes, JI, Brown, CJ and Jones, BTB. 1997.** Using resource economics for natural resource management: Namibia's experience. *DEA Research Discussion Paper 16.* 23 pp.
17. **Lange, GM, Barnes, JI and Motinga, DJ. 1997.** Cattle numbers, biomass, productivity and land degradation in the commercial farming sector of Namibia, 1915 to 1995. *DEA Research Discussion Paper 17.* 28 pp.
18. **Lange, GM. 1997.** An approach to sustainable water management using natural resource accounts: The use of water, the economic value of water and implications for policy. *DEA Research Discussion Paper 18.* 39 pp.

*continued overleaf.....*

**Other Research Discussion Papers in this series (continued).....**

19. **Lange, GM and Motinga, DJ. 1997.** The contribution of resource rents from minerals and fisheries to sustainable economic development in Namibia. *DEA Research Discussion Paper 19.* 32 pp.
20. **Ashley, C and LaFranchi, C. 1997.** Livelihood strategies of rural households in Caprivi: Implications for conservancies and natural resource management. *DEA Research Discussion Paper 20.* 96 pp.
21. **Byers, BA (Roberts, CS, ed.) 1997.** Environmental threats and opportunities in Namibia: A comprehensive assessment. *DEA Research Discussion Paper 21.* 65 pp.
22. **Day, JA (Barnard, P, ed). 1997.** The status of freshwater resources in Namibia. *DEA Research Discussion Paper 22.* 46 pp.
23. **O'Toole, MJ (Barnard, P, ed). 1997.** Marine environmental threats in Namibia. *DEA Research Discussion Paper 23.* 48 pp.
24. **Jones, BTB. 1997.** Parks and resident peoples. Linking Namibian protected areas with local communities. *DEA Research Discussion Paper 24.* 39 pp.
25. **Environmental Evaluation Unit, University of Cape Town (Tarr, JG, ed.) 1998.** Summary report of a retrospective study of the environmental impacts of emergency borehole supply in the Gam and Khorixas areas of Namibia. *DEA Research Discussion Paper 25.* 27 pp.
26. **Auer, C. 1998.** Water availability and chemical water quality as important factors for sustainable wildlife management in the Etosha National Park and for domestic stock in farming areas of Namibia. *DEA Research Discussion Paper 26.* 30 pp.
27. **Barnes, JI. 1998.** Wildlife conservation and utilisation as complements to agriculture in southern African development. *DEA Research Discussion Paper 27.* 18 pp
28. **Blackie, R and Tarr, P. 1998.** Government policies on sustainable development in Namibia. *DEA Research Discussion Paper 28.* 21 pp.
29. **Blackie, R. 1998.** Communities and natural resources: Trends in equitable and efficient use. *DEA Research Discussion Paper 29,* in press.
30. **Tarr, P. 1999.** Knowledge, opinions and attitudes regarding Environmental Assessment in Namibia: Results of a national survey conducted in 1997. *DEA Research Discussion Paper 30.* 20 pp.
31. **Simmons, RE, Barnes, KN, Jarvis, AM and Robertson, A. 1999.** Important bird areas in Namibia. *DEA Research Discussion Paper 31.* 66 pp.
32. **Environmental and Geographical Science Masters Students, University of Cape Town (Blackie, R, ed). 1999.** A preliminary environmental assessment of Namibia's resettlement programme. *DEA Research Discussion Paper 32,* 29 pp.
33. **Robertson, A and Jarvis, AM. 1999.** Bird data in Namibia: A model for biodiversity information system development. Avifaunal database user manual. *DEA Research Discussion Paper 33.* 122 pp.
34. **Tarr, P and Figueira, M. 1999.** Namibia's Environmental Assessment framework: The evolution of policy and practice. *DEA Research Discussion Paper 34.* 20 pp.
35. **Margules, CR (Barnard, P, ed). 1999.** Biodiversity planning and monitoring in Namibia. *DEA Research Discussion Paper 35.* 27 pp.
36. **Nghileende, NP and Uisso, V. 1999.** The state of Namibia's freshwater environment. *DEA Research Discussion Paper 36.*
37. **Nghileende, NP and Uisso, V. 1999.** The state of Namibia's socio-economic environment. *DEA Research Discussion Paper 37.*
38. **McGann, JA. 1999.** The Environmental Investment Fund: An initiative for the conservation and protection of the environmental and natural resource base of Namibia. *DEA Research Discussion Paper 38.* 57 pp.

*continued overleaf.....*



**Other Research Discussion Papers in this series (continued).....**

39. **McGann, JA. 1999.** Towards the establishment of the Environmental Investment Fund: Opportunities, constraints, and lessons learned. *DEA Research Discussion Paper 39.* 47 pp.
40. **Jones, BTB and Mosimane, A. 2000.** Empowering communities to manage natural resources: where does the new power lie? Case studies from Namibia. *DEA Research Discussion Paper 40.* 32 pp.
41. **Corbett, A and Jones, BTB. 2000.** The legal aspects of governance in CBNRM in Namibia. *DEA Research Discussion Paper 41.* 25 pp.
42. **Barnes, J.I., MacGregor, J. and Weaver, L.C. 2001.** Economic analysis of community wildlife use initiatives in Namibia. *DEA Research Discussion Paper 42.* 20pp
43. **Poonyth, D., Barnes, J.I., Suich, H. and Monamati, M. 2001.** Satellite and resource accounting as tools for tourism planning in southern Africa. *DEA Research Discussion Paper 43.* 21pp.
44. **Suich, H. 2001.** Development of preliminary tourism satellite accounts for Namibia. *DEA Research Discussion Paper 44.* 20pp.
45. **Krug W., Suich H and Haimbodi, N. 2002.** Park pricing and economic efficiency in Namibia. *DEA Research Discussion Paper 45.* 23pp.
46. **Krugman, H. 2002.** Fundamental issues and the threats to sustainable development in Namibia. *DEA Research Discussion Paper 46.* 50pp.
47. **Humavindu, M.N. 2002.** An econometric analysis of fixed investment in Namibia. *DEA Research Discussion Paper 47.* 22pp.
48. **Suich, H and Murphy, C. 2002.** Crafty women: The livelihood impact of craft income in Caprivi. *DEA Research Discussion Paper 48.* 31pp.
49. **Humavindu, M.N. 2002.** Economics without markets: Policy inferences from nature-based tourism studies in Namibia. *DEA Research Discussion Paper 49.* 23pp.
50. **Barnes, J.I., Zeybrandt, F., Kirchner, C.H. and Sakko, A.L. 2002.** The economic value of Namibia's recreational shore fishery: A review. *DEA Research Discussion Paper 50.* 26pp.
51. **Purvis, J. 2002.** Postharvest fisheries on the eastern floodplains, Caprivi. *DEA Research Discussion Paper 51.* 29pp.