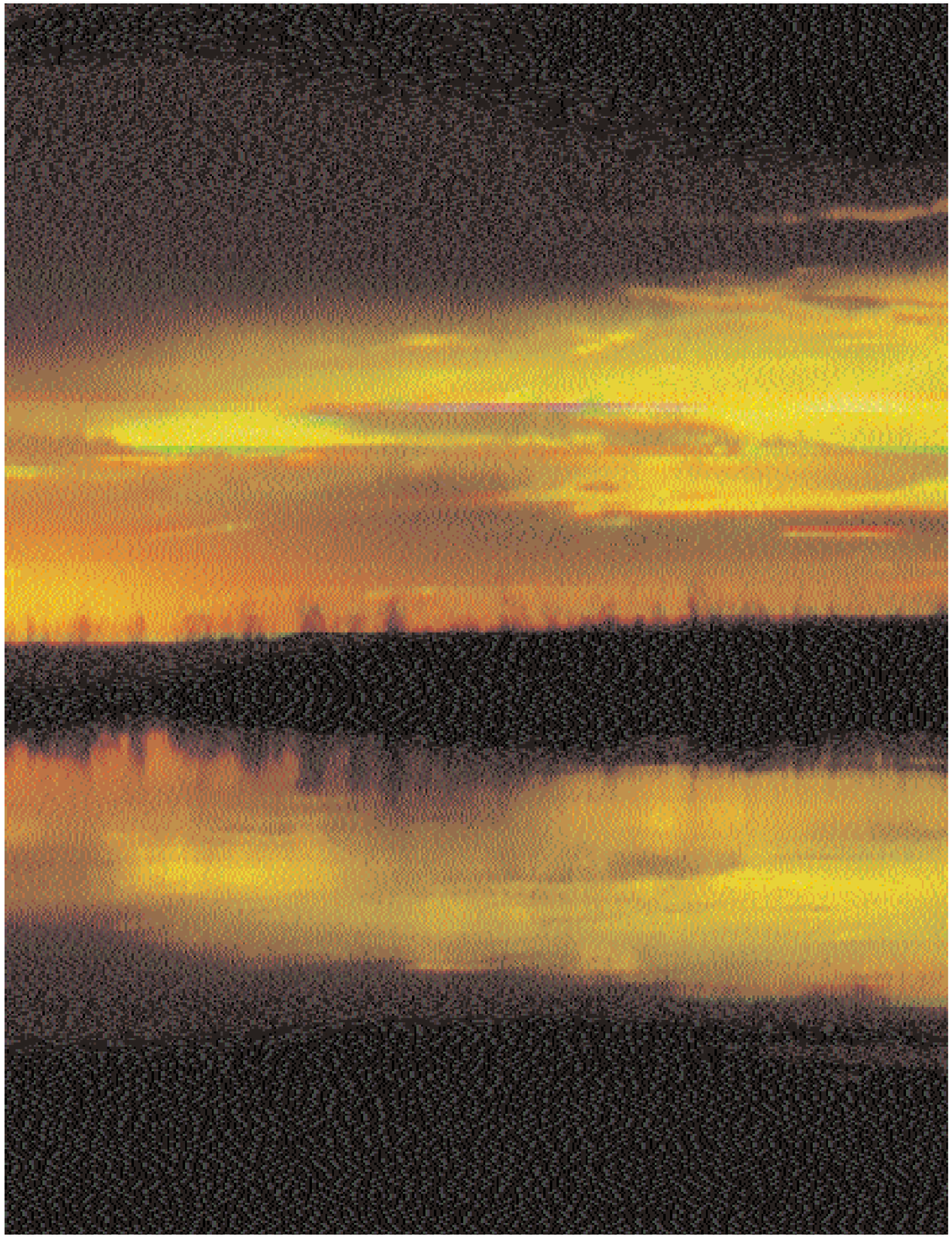
SAND AND WATER

A profile of
the Kavango Region



SAND and WATER

A profile of the Kavango Region

John Mendelsohn *and* Selma el Obeid

PREFACE

The few special places in the world where a large permanent river intersects a dry landscape are mostly in Africa. Contrasts between life along and away from the river are stark. Natural resources close to the water are plentiful and life is comparatively easy, while the absence of water in the surrounding countryside presents challenges that far fewer plants, animals and humans can meet.

Kavango is just such a place, and this is the region in Namibia where the Okavango River navigates its course from a catchment rich in water in Angola to a large wetland in water-deprived Botswana. *Sand and water: a profile of the Kavango Region* presents a summary of facts and figures most important to the region's geography. The book also draws out key processes to help provide an understanding of constraints and opportunities in Kavango.

The book was produced as part of the Ministry of Environment and Tourism's continuing programme of compiling profiles for all regions in Namibia. The broader goal of this endeavour is to have information available to better integrate and execute developmental and environmental planning. Funds for the project covering Kavango were generously provided by the Governments of France and the United States of America, as well as by the Ministry of Environment and Tourism. Many people and organisations gave their support, and it is a particular pleasure to acknowledge the substantial contributions made by Reino Aisindi, Yves Baudot, Chris Brown, Antje Burke, Marina Coetzee, Kathi Damon, Tristan de Lafond, Katharina Dierkes, Maria Fisch, Clinton Hay, Werner Hillebrecht, Piet Horn, John Kinahan, Johan le Roux, Uzo Okafor, John Pallett, Charlie Paxton, Vilho Shikukumwa, Flip Stander, Roger Swart, and Alex Verlinden.

The project also benefitted from help by the Central Statistics Office, Directorate of Surveys and Mapping, Directorate of Veterinary Services in Rundu, Lux Development, Ministry of Agriculture, Water and Rural Development, Ministry of Environment and Tourism, Namibia Nature Foundation, Namibia Scientific Society, National Archives of Namibia, National Library of Namibia, National Museum of Namibia, World Wildlife Fund, Paul Amweelo, Helmut Angula, Chris Appleton, Peter Bateman, Ben Beytel, Dudley Biggs, Arnold Bittner, Patricia Blom, Moses Chakanga, Dave Cole, Pieter de Wet, Stefan de Wet, Helge Denker, Fritz Dittmar, Hansman du Toit, Antje Eggars, Alex Endunde, Ian Galloway, Manie Grobler, Goodman Gwasira, Klemens Hatutale, Leon Hugo, Peter Hutchinson, Brian Jones, Lina Kafidi, Boni Kahare, Levi Kamalanga, Klaus Kazumba, Mbaye Kébé, Werner Killian, John Liebenberg, Michel Mallet, Jack Matanyire, Joseph Minnaar, Christian Mundinda, Sepiso Mwangala, Elias Nambase, Pelad Namfua, Teo Nghitila, Lindsay Norman, Nils Odendaal, Mark Paxton, Pippa Parker, Sevelinus Rengura, Bernd Rothkegel, Ted Rudd, Bernard Schurz, Linda Sheehan, Colgar Sikopo, Alfons Siyere, Jannie Swartz, Sophia Swiegers, Tom Tolmay, Alexander Toto, Fiona Trewby, Loffie van Landsberg, Gunter Von Schumann, Vesna Vukovic and Wolfgang Werner.

The book has been designed in a style that we hope will stimulate the interest of a wide audience: teachers and their pupils, political leaders and senior government civil servants, planners, decision-makers, business people, and the general public. A wide variety of statistical data and geographical information was assembled during the compilation of the book. For those who can make further use of this information, it can all be downloaded from **www.dea.met.gov.na**

We trust that the information will be of use, and also hope that those who assemble new or updated sets of data will add these to the web to make good information on Kavango and Namibia freely available.

John Mendelsohn

Selma el Obeid

A publication for the Ministry of Environment and Tourism, Namibia.

Funding of the project to produce this publication was provided by the governments of France (through the French Embassy), Namibia (through the Ministry of Environment and Tourism) and the United States of America (through USAID), while the Namibia Nature Foundation and World Wildlife Fund gave overall support. The views expressed in this book are those of the authors and do not necessarily represent the views of any of the organisations mentioned above.

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Struik Publishers
(a division of New Holland Publishing (South Africa) (Pty) Ltd)
Cornelis Struik House
80 McKenzie Street
Cape Town 8001

New Holland Publishing is a member of the Johnnic Publishing Group.

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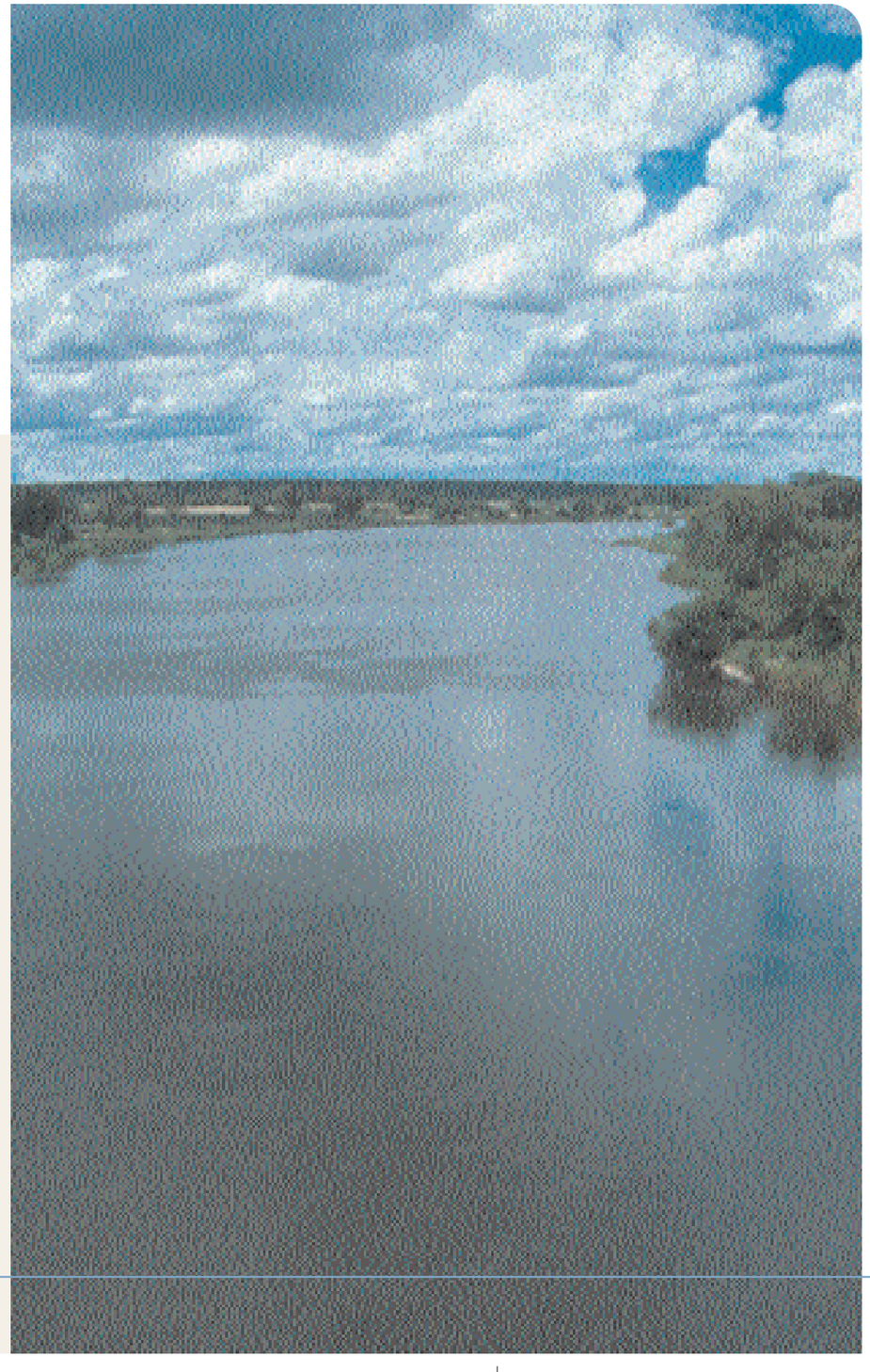
RAISON
Research and Information Services of Namibia
P O Box 1405
Windhoek
Namibia

First published in 2003
1 2 3 4 5 6 7 8 9 10

Publishing manager: Pippa Parker
Managing editor: Helen de Villiers
Editor: Lindsay Norman
Concept design: Janice Evans
Designer: Patrica Blom
Cover design: Patricia Blom

Reproduction by Hirt & Carter Cape (Pty) Ltd
Printed and bound by Sing Cheong Printing Company Limited, Hong Kong

ISBN 1 86872 884 6



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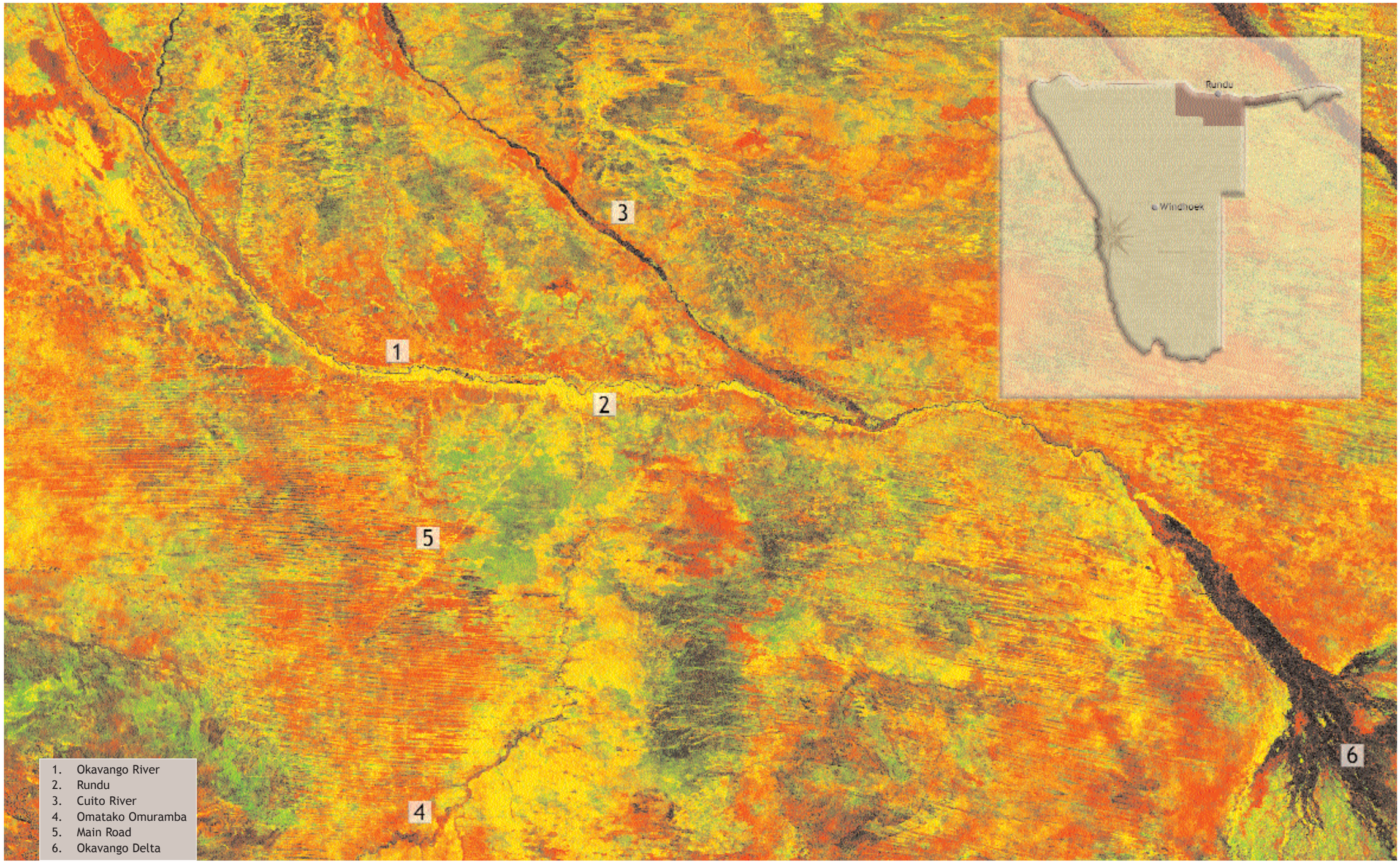


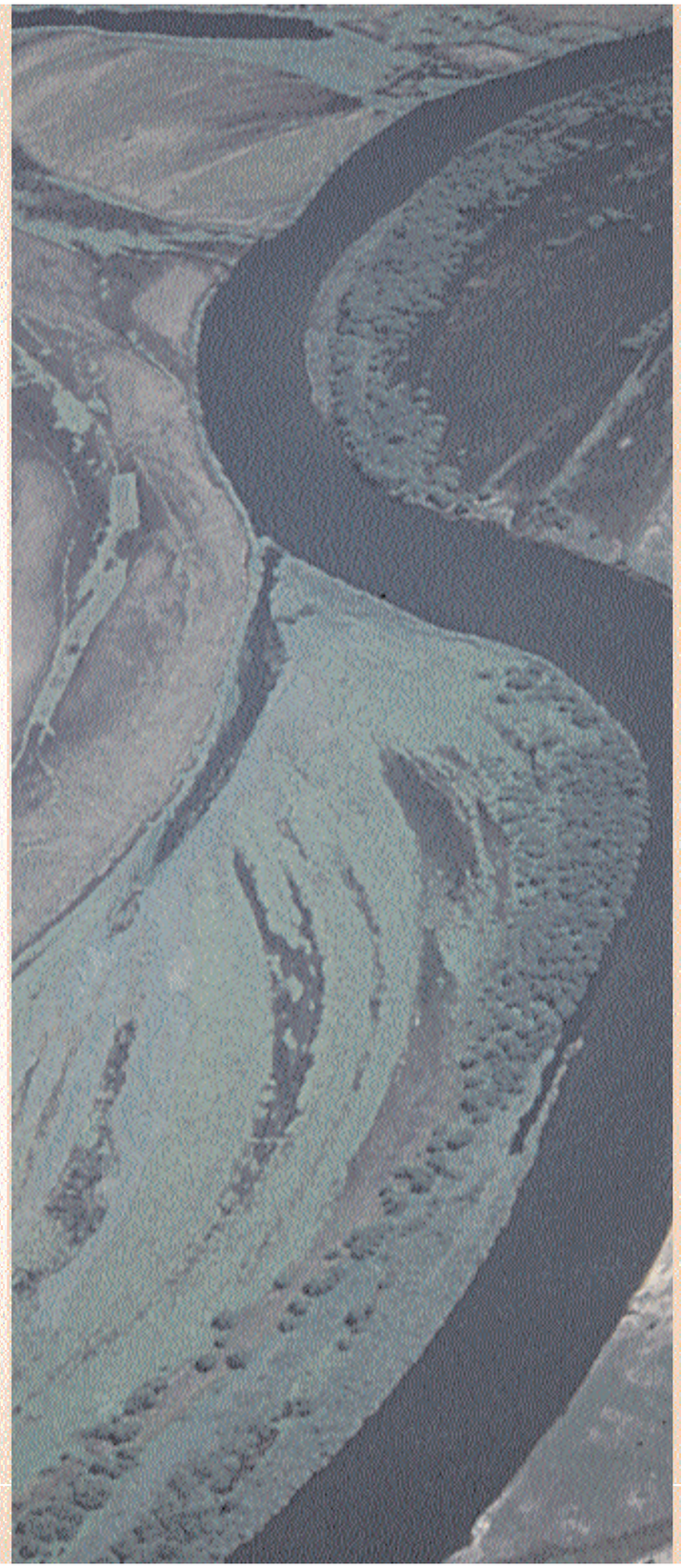
1. Okavango River
2. Rundu
3. Cuito River
4. Omatako Omuramba
5. Main Road
6. Okavango Delta

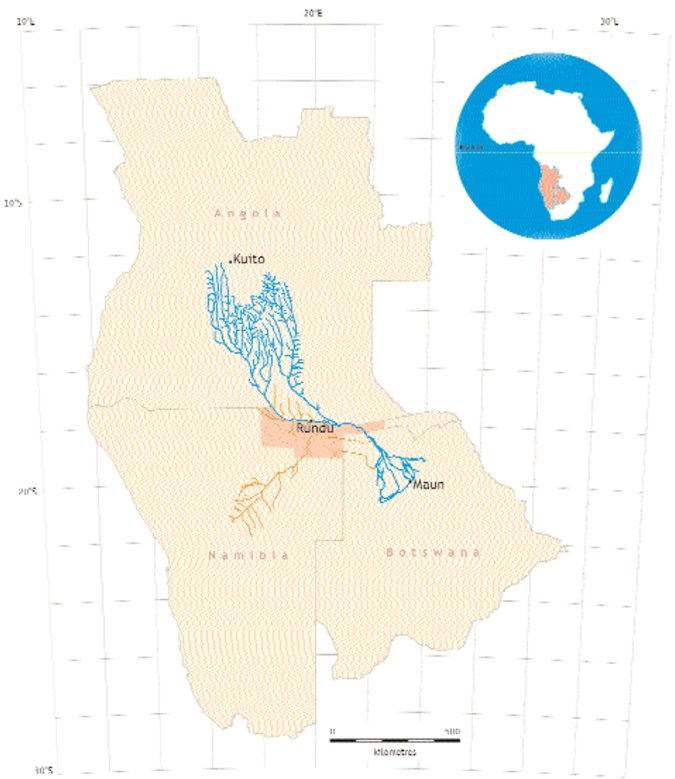
SAND AND WATER

OVERVIEW

Kavango has

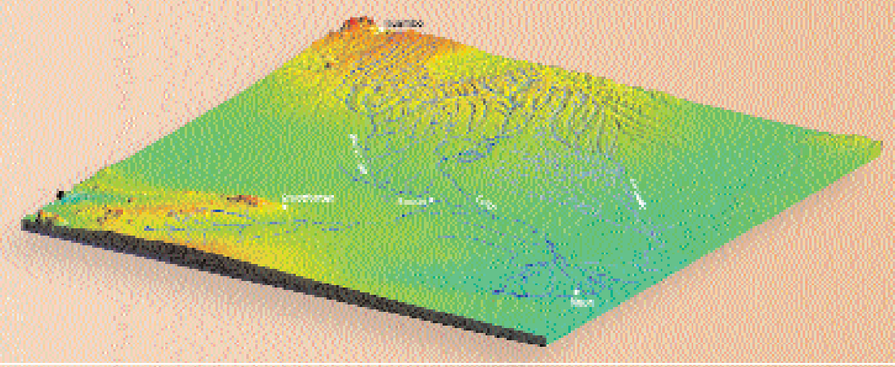
- About 201,000 people, comprising 11% of Namibia's population
- 80% of its people living in rural areas and 20% in the only urban area, Rundu
- Approximately 150,000 cattle (about 5% of Namibia's cattle)
- 71 primary, 47 combined and 12 secondary schools
- 42 clinics, 9 health centres and 4 hospitals
- An area of 48,456 square kilometres (5.5% of Namibia) of which:
  - 55% is communal land
  - 23% consists of large, private farms
  - 15% is conservation area





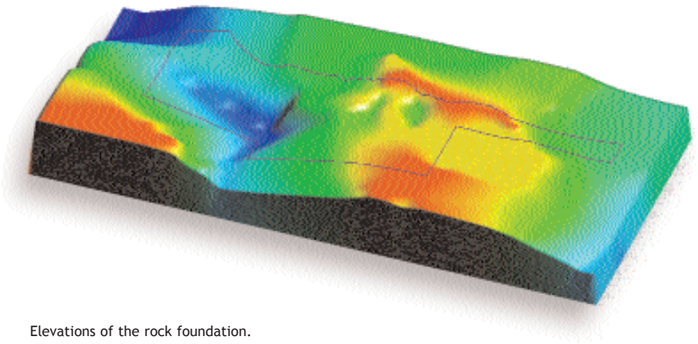
CENTRE STAGE IN THE OKAVANGO BASIN

Kavango lies in the middle of the Okavango Basin, which straddles the borders of three countries: Namibia, Angola and Botswana. Water flowing in from highland and higher rainfall areas in Angola passes through the Kavango into Botswana's Okavango Delta where rainfall is lower than anywhere else in the Basin. The two main Angolan rivers carrying water into the Okavango River are the Cubango and Cuito rivers. Drainage lines that are now dry – such as the Omatako Omuramba – carried water into the Okavango during much wetter times long ago.

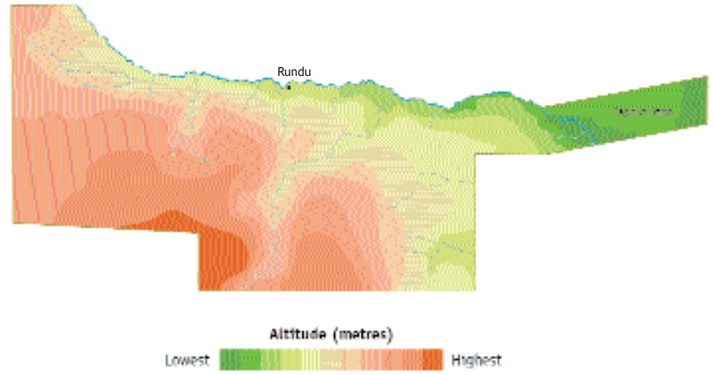


AN EVEN LANDSCAPE

Although Kavango is very flat, altitudes drop gradually from over 1,100 metres above sea level in the west and south-west to less than 1,000 metres in the Caprivi Strip. If the mantle of recent sediments that covers the region were stripped away, the surface of Kavango would look quite different. The foundation of basement rocks forms a valley several hundred metres deep from the western border south-eastwards towards and beyond Mururani. Deep areas in the far north-west form part of the Owambo Basin, while the highest foundation rocks are in south-eastern Khaudum and along the Okavango between Shambyu and Bagani.

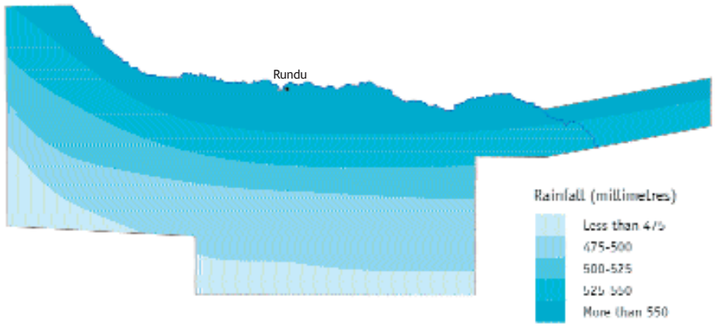


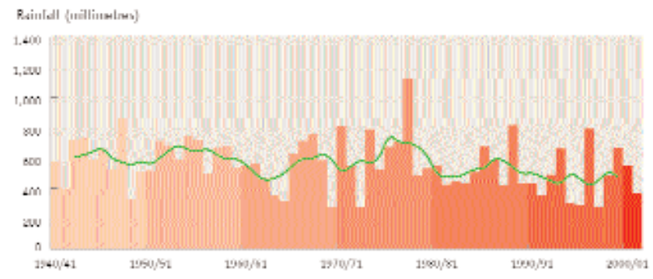
Elevations of the rock foundation.



RAIN: SELDOM TOO MUCH!

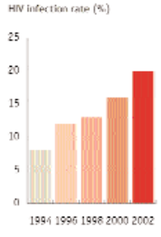
Although Kavango gets more rain on average than most other regions in Namibia, rainfall fluctuates greatly from year to year. Almost every year differs from the one before and after it, but some cyclical changes are evident: the dry cycle during the 1960s, the wetter period during the 1970s, and then a long recent dry spell since the early 1980s. The highest falls are in the north where annual totals exceed 550 millimetres on average. About 80% of all rain falls between December and March. Almost two metres of water potentially evaporate each year, about four times more than the total rainfall.

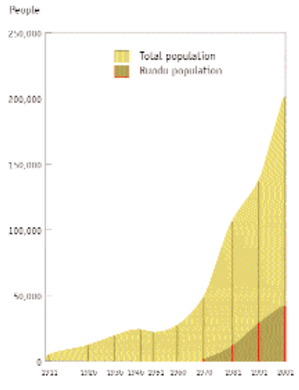


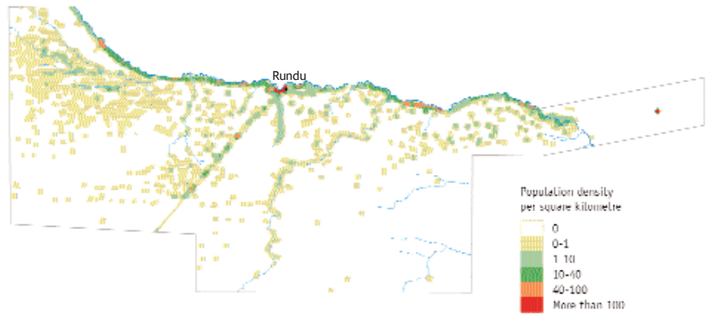


AN EXPANDING RURAL AND URBAN POPULATION

The population of 201,093 people counted in 2001 had grown more than 40 times from some 4,500 people reported about 90 years ago. Almost everyone then lived along the river and, although many people now live inland where water has been supplied, about 155,000 people still live within 10 kilometres of the river. This includes about 41,400 urban people in Rundu who make up 20% of the total population. A large proportion of Kavango's population consists of recent immigrants from Angola. Approximately 20% of all sexually active people are infected with HIV.

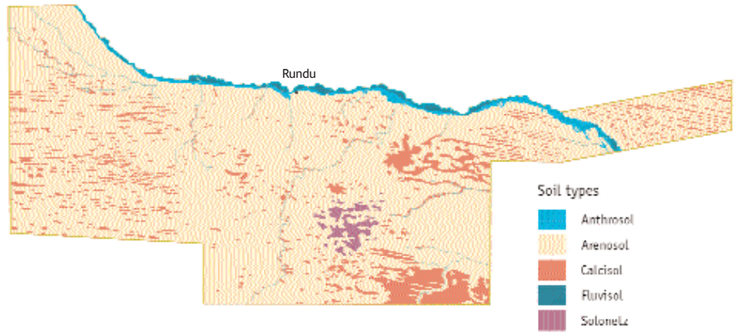






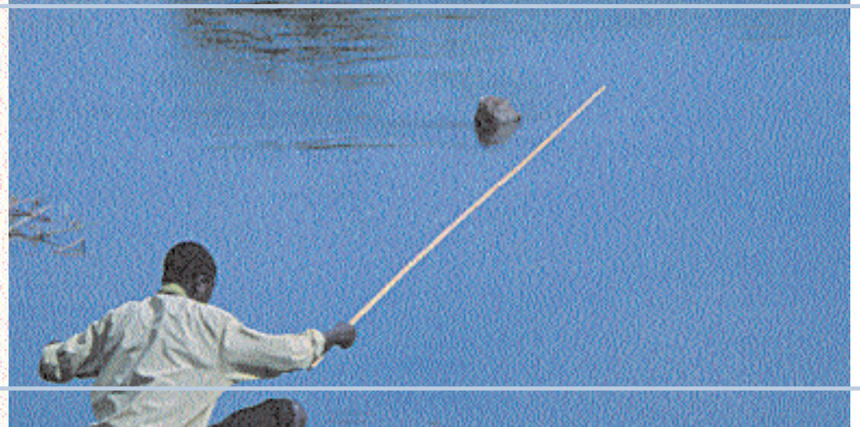
LARGELY SAND

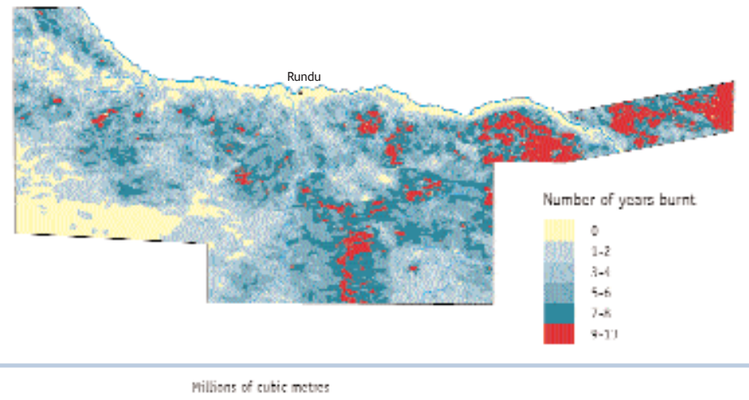
Soils in Kavango are dominated by wind-blown sands deposited as a mantle across the landscape during much drier times long ago. The sandy, porous texture allows water to drain away rapidly, leaving little moisture in the soil and also holding very few nutrients. Crops do not grow well in these sands as a result. The loose structure of the sand means that there is little run-off or water erosion. Smaller areas of soils somewhat better suited to crops occur along the Okavango, omurambas (dry rivers) and inter-dune valleys.



A BURNING ISSUE

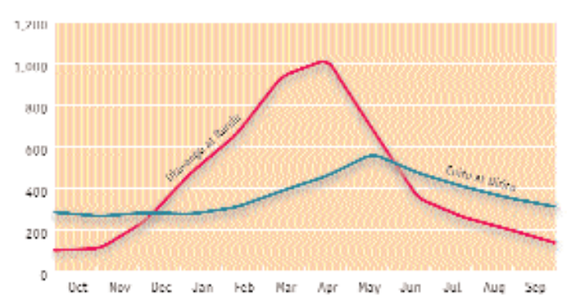
Large areas of Kavango are damaged each year by bush fires that sweep through the countryside. Such frequent and extensive fires – an average of about one-third of the region burns every year – cause many environmental problems, including shortages of grazing, the death of many trees and the loss of nutrients in the soil.





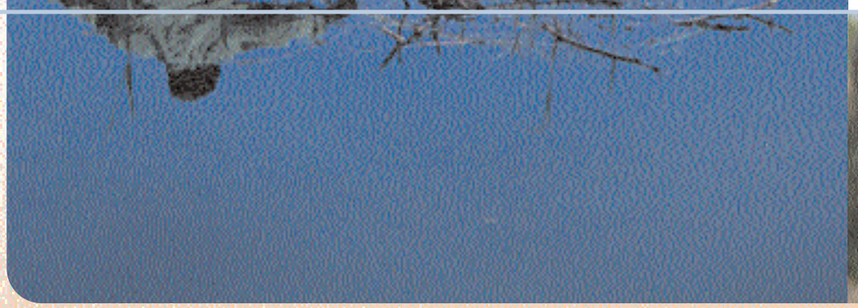
A LIFELINE IN MOTION

Of all the water (about 9,800 million cubic metres on average) that the Okavango carries out of the region and into Botswana every year, about 55% has come from the Cubango and 45% down the Cuito River. Flows in the Cubango change a great deal from season to season and year to year, depending on rainfall, while water levels in the Cuito are much more stable. Water coming down both rivers is very clear and clean.



MAKING A LIVING

Livelihoods have changed rapidly in recent decades. Much of the wild fruit, fish and wildlife that supplied people with food years ago has now gone, but many people now feed themselves by buying food using money earned from jobs and businesses. Although most rural households are engaged in subsistence farming, the value of farm produce is many times less than that of cash incomes. Mahangu yields are usually very low and little livestock is sold. Life in Kavango is not easy, and the chances of improving the quality of rural life are small.

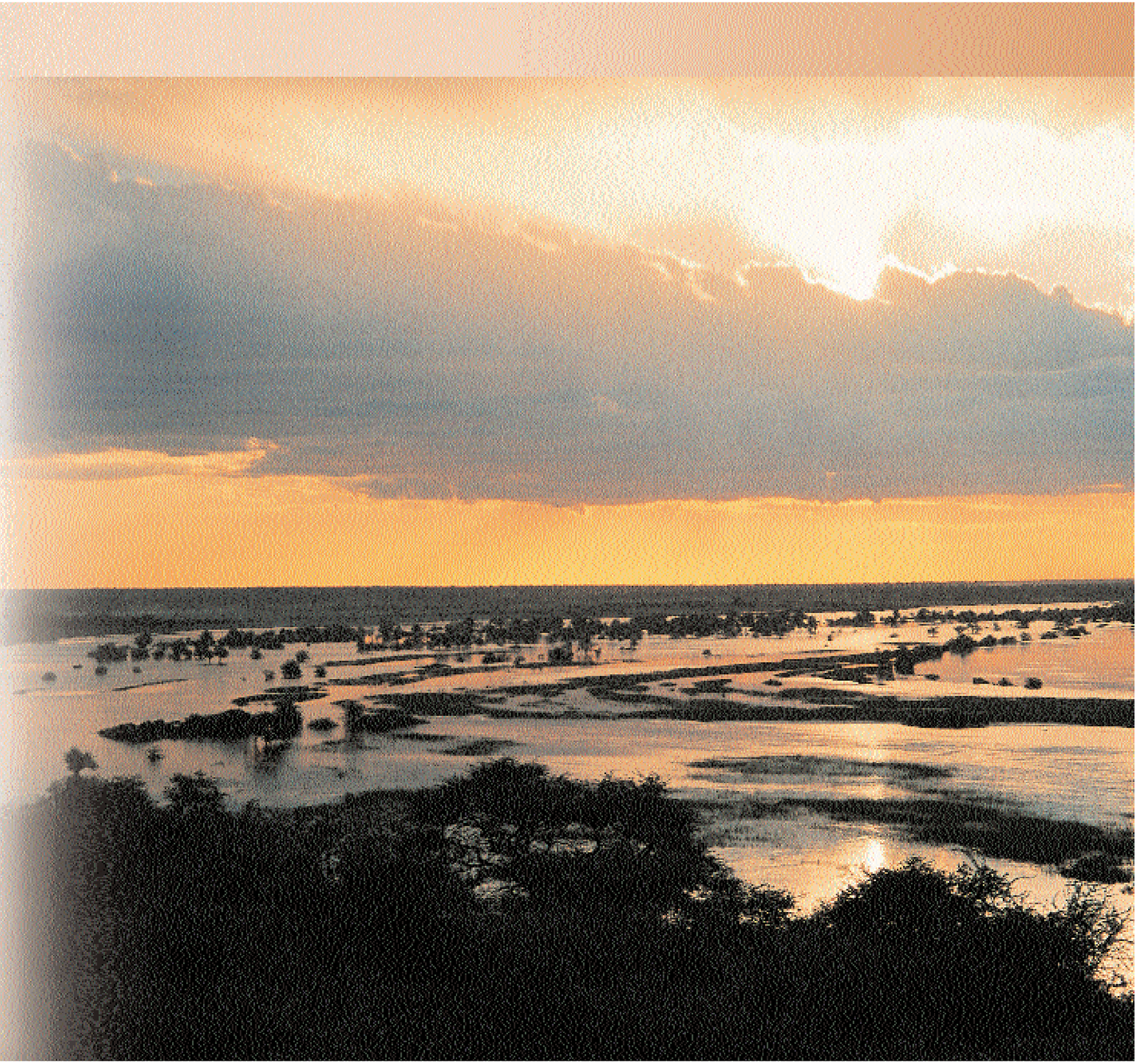


SAND AND WATER

CHAPTER
ONE

INTRODUCTION

Place of sand and water



Imagine a flat expanse of sand stretching several hundred kilometres in all directions. Cover the sand with grass and trees, and add a few gentle ridges and dips formed here and there by old dunes and rivers that are now dry. The mantle of sand quickly soaks up any rain, leaving little or no surface water in this vast landscape. Life would not have been easy for anyone who made their home in this thirsty landscape.

Now slice a valley through the landscape, a valley long and deep enough to bring a flow of clear and clean water, year-in and year-out. What had been a rather featureless and hard landscape becomes a place where sand meets water. All kinds of new opportunities open up for plants, animals and people to live in a place where few of them would normally be found. The valley and its river is, of course, the Okavango. And the region is Kavango, an area covering about 48,500 square kilometres or roughly 5.5% of Namibia. The 201,000 people who live here make up about 11% of Namibia's population.

Where did the original population come from, and who now lives in the Kavango? How do people farm, and why is farming generally unproductive? From where does the Okavango River get its water, and how important is the river to the region? Where is underground water most available, and what effect does the provision of this water have on land uses? Why have fish stocks apparently declined? Of what value is tourism to Kavango? How is the region governed and who controls the use of land? What, why, when, who and how?

Sand and water: a profile of the Kavango Region has been compiled to bring together a summary of information on the region and to answer some of those questions. There are obviously many other questions: some answered and others not. In presenting this information, the book also seeks to evaluate and highlight what are probably the most important processes in the region. This is important because bald facts and figures do not always speak for themselves. Rather, the facts and figures are products of processes and practices, and these are the things that require explanation.

From the image of a river cutting through a large expanse of sand, it should be clear that the region broadly consists of the Okavango River valley and the extensive area of sandy woodlands to the south and north. Comparisons are often made between these two zones in the book, and 'the river or Okavango' and 'inland' areas are shorthand terms used for them. The veterinary cordon fence is an important border and feature, and its position in the region is shown in FIGURE 1. Areas south of the fence within the region are controlled by the government and its parastatal, the Namibian Development Corporation (NDC).

Within Namibia the Kavango Region is one of 13 regions designated for purposes of administration and political representation. The borders of the region have changed four times (see page 36), while its name has also changed over time from Okavangoland, Okavango to Kavango. 'Okavango' was the name given to the river by the explorer Charles John Andersson in his book *The Okavango River*, published in 1861, but he probably misunderstood the name and incorrectly added the prefix 'O'.[1] Nevertheless, Okavango River is now widely adopted within Namibia and elsewhere, and this is the name used here.

The Kavango and the section of river that runs through it forms part of the Okavango Basin, and many aspects of the region need to be viewed in the context of this larger Basin (FIGURE 3). Most importantly, the Kavango and its section of river fall neatly in the middle of the Basin. Upstream and to the north is Angola, which is the source of all water flowing through Namibia. The water enters Namibia along two

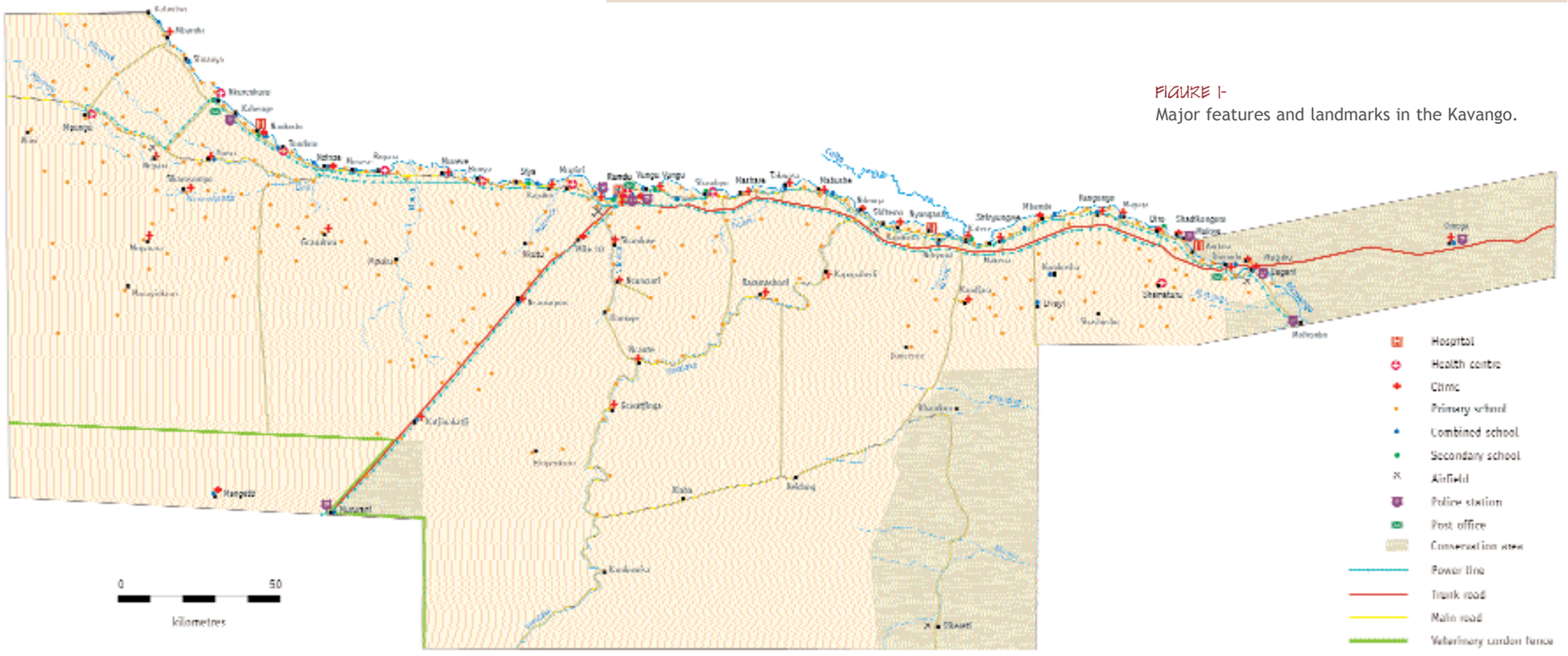


FIGURE 1-
Major features and landmarks in the Kavango.

People in the region are represented by nine regional councillors, one for each of the nine constituencies (FIGURE 2). This table provides estimates of the areas and number of people in each constituency. The Rundu Urban constituency is smaller than the town itself, and many people living in the town fall within the surrounding Rundu Rural East and West constituencies. About 41,400 people lived in Rundu in 2001.

The nine constituencies with an estimate of their populations in 2001[2]

Name	Area(square kilometres)	People
Kahenge	8,786	30,600
Kapako	6,091	26,100
Mashare	9,120	16,200
Mpungu	8,140	18,700
Mukwe	5,513	26,300
Ndiyona	8,066	19,600
Rundu Rural East	596	19,000
Rundu Rural West	155	24,600
Rundu Urban	14	20,100

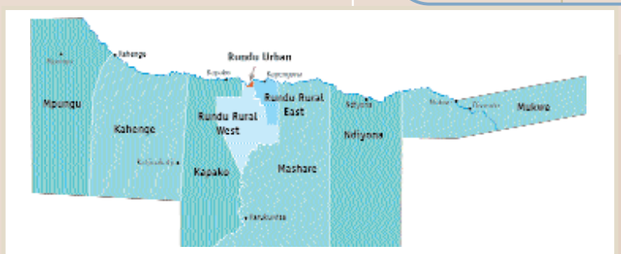


FIGURE 2-
Kavango is divided into nine constituencies, each of which is represented by a regional councillor.

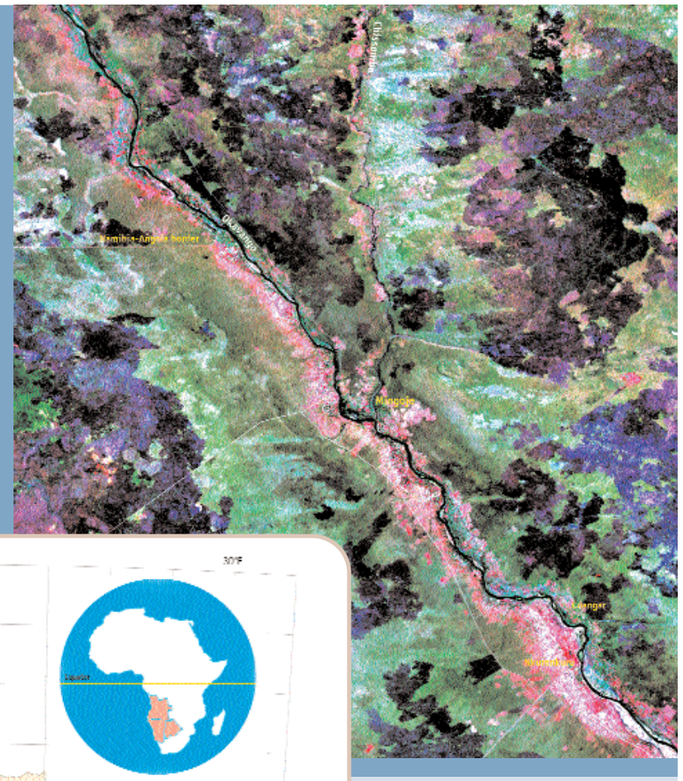
There are few large rivers in the world that deliver such clear, clean water as the Okavango.

major waterways: the Cubango and the Cuito River both of which have extensive networks of tributaries spread across their catchment areas. Rainfall in these areas is much higher than elsewhere in the Basin, and the relative abundance of surface water means that the Okavango's water has much less importance for Angola than elsewhere.

To the south and east of Kavango and downstream are Botswana and the famous Okavango Delta into which the river feeds. The countryside around the Delta is arid because it receives little rain, and the river system really becomes more and more of an oasis the further downstream it flows. Large numbers of tourists, paying handsome fees to stay in lodges and other resorts, are attracted to the Delta, and the area has also been the subject of many films and books portraying its spectacular wildlife and scenery. All of this has given the Delta considerable international fame and enormous value for Botswana. The importance of Okavango water to Botswana is now so great that almost any plan that Namibia or Angola might have to use and diminish the supply of water is contested and controversial. Not surprisingly, Botswana has much greater concerns about the strategic planning and management of the Okavango Basin than Angola or Namibia.

The region of Kavango therefore sits firmly between the major supplier (Angola) and major user (Botswana) of Okavango water. Water is certainly used in Angola and Namibia for subsistence farming and domestic uses, and to supply the needs of a few small towns and irrigation projects, but the political and economic influence of all these local users is very much weaker than that of various external groups. These include the Botswana government (for its interest in tax revenues earned for the country as a whole), the Namibian government (because of the potential to use Okavango water for irrigation projects, hydroelectric power and to supplement Windhoek's water supply), and external shareholders (for the profits they earn). As demands for water increase in southern Africa and more people begin to recognize the economic value of tourism to beautiful places, making the best use of water in the Okavango Basin is obviously a difficult, but extremely important challenge.

Perhaps the most striking aspect to the Okavango River valley is the massive difference in numbers of people living on the northern Angolan bank compared to the southern Namibian side. The band of cleared fields (coloured pink in this satellite image) is broad on the Namibian side because so many people live there, whereas the small number of people in Angola have cleared only scattered fields. The number of people living across the river in Angola is not known, but judging from the areas cleared for farming it might amount to 10% of the population along the bank in Namibia. Since about 155,000 people live within 10 kilometres of the river in Namibia, perhaps 15,000 people live on the Angolan side.



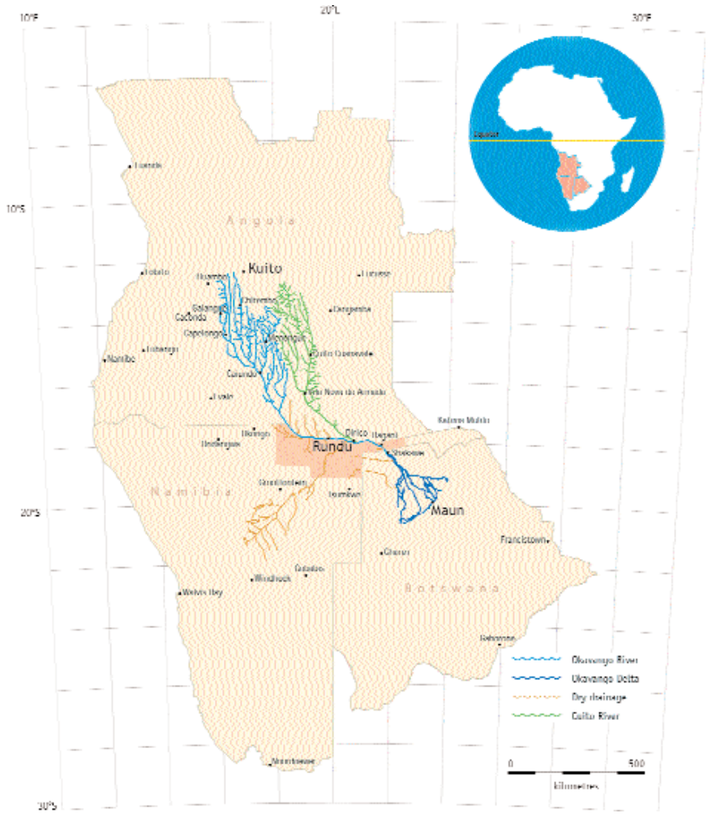


FIGURE 3-
The origins of the Okavango River drainage in Angola, its passage through Namibia and its ending in the Okavango Swamps or Delta in Botswana. The river forms the border between Namibia and Angola along a river frontage about 415 kilometres in length.

SAND AND WATER

CHAPTER
TEN

PROSPECTS

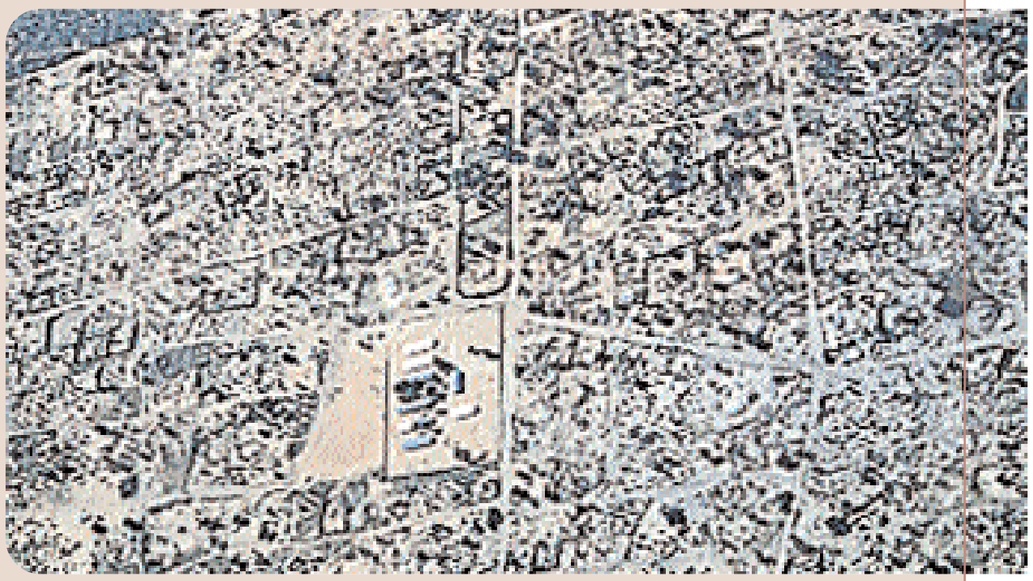
Into the future

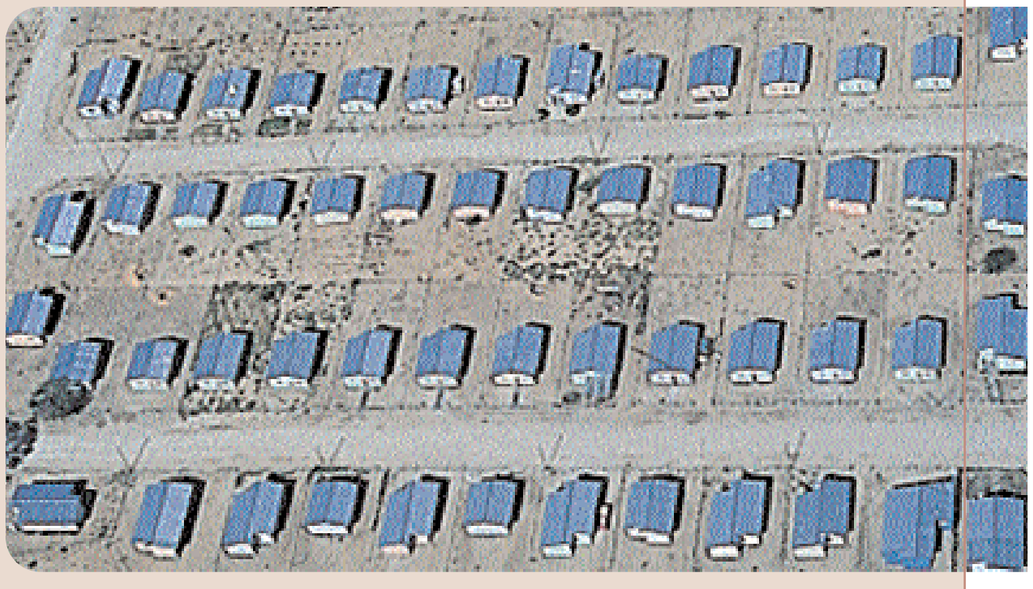
Everyone is keen for Kavango to develop: its infrastructure, economy, levels of education, medical health, and the like. Most people would also want development to occur on a sustainable basis so that the gains made now are not at the expense of future generations. This is particularly true for environmental resources, which have often been so depleted that little remains in many places. But how should development proceed, what aspects have the best potential to improve, what is possible and what can't be done? Will many people remain in poverty because development initiatives are misdirected? These are questions that should be on the minds of all leaders in Kavango, senior government officials, foreign development agencies and everyone else concerned about the future of the region. But before looking at issues of development it is useful to review how Kavango got to be the way it is, since it is on this foundation that the Kavango of the future will be built.

Most of Kavango is covered in sediments laid down over the past 65 million years. Wind-blown sand makes up much of the upper layer of deposits, which means that soils in most areas are too poor to cultivate crops unless specific fertilizers are applied at appropriate times. Kavango's sandy mantle also means that surface water is extremely scarce, so much so that drinking water for people, livestock and other animals is not available in most places. This is why much of inland Kavango has been so sparsely populated. Only in recent years has this changed in some places where pumps now draw fairly abundant and good quality water from sediments underground. The layer of sand also has important effects in determining the types and structure of vegetation, and the nature of the wildlife. These living resources give Kavango beauty and also provide people with building materials, pastures and opportunities to gain economically from tourism, for example.

Rainwater is often scarce because the climate is characterized by a short rainy season of unpredictable falls of rain. However, water is permanently available in Kavango's greatest asset: the Okavango River. This lifeline has been meandering through the vast expanse of dry woodland and sand over millions of years. Its overwhelming effect has been to provide a home to all manner of things that would otherwise not be there: people and livestock, fish and wildlife and a rich diversity of plants associated with the riverine

The killing of countless trees – and other effects – caused by the hundreds of fires that sweep across Kavango and other parts of north-eastern Namibia is perhaps the most serious environmental problem in the country.





It is a simple fact that urban life offers most people better economic opportunities than rural areas. The surge of people moving to live in Rundu will continue, and preparations need to be made for tens of thousands of new urban dwellers in the years ahead. The seriousness with the preparations are taken will determine whether most Rundu residents live in squalid shacks or in a town that offers decent homes and other infrastructure. In short, can Rundu be a well-ordered economic centre or will it slump into yet another shambled mass of squatter townships?

environment. The social economy of most people evolved and revolved around the river and valley: its water, wild fruits, and abundance of wood, grazing pastures, wildlife and somewhat more fertile soils. The abundance of resources made life fairly easy for the relatively small number of people scattered along the valley. But there was also an abundance of risks. Crops failed as a result of inadequate rain or attacks by pests and predators, most people suffered from one or other disease, and slave trading and frequent tribal raids all added to expectations that much could fail. Perhaps it was this combination of abundant resources and the likelihood that investments could be lost that led people to adopt practices that required low inputs. Production was also low, of course, and the tradition of low input-low output strategies continues today, as so clearly illustrated by the unproductive farming methods.

Moving to more recent features of Kavango's foundation, social and economic conditions have changed very rapidly in recent decades. A high proportion of people now have access to schooling and health care, two of many services that few people enjoyed one or two generations ago. Improved medical care has led to higher survival rates and a dramatic increase in the population. Growth was accelerated by the many Angolan immigrants attracted by better economic opportunities, social services and infrastructure, and who also left to escape repressive conditions in Angola. The enlarged population has caused severe environmental degradation of the river valley due to the extensive clearing and cutting of its woodlands. Natural resources available to rural people living near the river have thus declined, such that there is no wildlife to be hunted, soils are less fertile, fish catches are lower and fruits and other plant products are much harder to harvest.

The decline in natural resources has been tough on many people, especially those unable to find their way into jobs and the modern cash economy. This is another recent change, because salaries and income from informal businesses have brought substantial improvements to many livelihoods. Not only have cash earnings replaced subsistence incomes, but the values of wages are many times higher than incomes from farming and the hunting and gathering of natural resources. This is true for both the value of products consumed at home and for any sales of surplus farm produce.

The possibility of making a living in new ways has placed Kavango in a transition between traditional livelihoods and these new opportunities. Everyone faces this transition, but it is mainly the 72% of all people who are under 30 who will carry it forward. One consequence of the new, relatively lucrative cash incomes is that rural households now vary greatly in wealth. Another is that many households have a variety of incomes contributed by different family members. And yet another change is that people who have become comparatively wealthy from cash incomes often invest savings back into farming activities. Much of this goes beyond subsistence agriculture, however, because their savings are used to acquire very large farms and/or herds of cattle.

In summary, some of Kavango's physical and social foundations offer opportunities, others are constraints and yet others are in rapid transition. This is the complex base upon which future development must work. If low inputs are characteristic of rural life in Kavango, how can rural livelihoods be improved to the extent that people achieve high outputs? From what natural resources can people possibly profit to a real degree, and how can entrepreneurial activities be promoted? Some improvements to rural lives have been made through the introduction of ploughs, tractors, improved mahangu seed and craft production, but the overall gains from these innovations and developments have been generally small. Other successes may come by promoting vegetable production and from developing small-scale farmers linked to large agricultural projects. Incomes from tourism and wildlife could be increased (a topic explored below) but these too would only benefit fairly small numbers of people.

Secure on her mother's back, so too have people enjoyed secure resources provided by river water flowing through a vast landscape of sand.

It is hard to escape the bleak conclusion that there is little chance of significantly improving the livelihoods of most rural people. This is particularly true if development agents continue to see land and small-scale farming as the means by which livelihoods can be improved. Kavango's low soil fertility, unreliable rainfall, farming traditions and difficulties in marketing (see page 99) simply make small-scale farming extremely unproductive.

Development initiatives would be more successful if they lessened the use of land for small-scale farming and instead encouraged people to seek other sources of income. In fact, many people are already making that choice by moving to Rundu (an average of 160 people move there every month) and other towns. Some funds and efforts to improve conditions in rural areas could be switched to the development of Rundu and other towns, where activities should concentrate on creating jobs, planning urban growth and developing infrastructure. Several villages – such as Mpungu, Nkurenkuru, Ncamagoro, Ndiyona and Divundu – can be expected to grow into towns in their own right. Giving priority to their development would attract people away from the hardships of rural life and it would ensure that the towns become viable, orderly centres.

Rundu should also develop into a regional and border centre trading into Angola. In the hope that peaceful conditions continue, significant development and economic growth can be achieved in Angola. South-eastern Angola is very remote, thus giving Rundu an advantage as an entry point to that area. Many more jobs and business opportunities could become available in Rundu, and useful steps could be taken to promote small and informal business opportunities to help draw people away from rural poverty.

Almost one quarter of the communal land in Kavango has been allocated as large farms to fewer than 300 people. In exploring various problems and advantages associated with the allocations (see pages 117), our overall conclusion is that the farms would probably bring more benefits than disadvantages to Kavango. What needs to be done, however, is to give the 'owners' some kind of secure leasehold or title over the farms. This will allow secure developments and investments to be made, which would hopefully lead to the farms being used more productively. Similar changes should be considered for smaller farms, since it is hard for any farmer to make major improvements to farming methods without cash acquired from other incomes or from loans. And yet loans cannot be raised over land if farmers lack secure tenure. In addition, farmers and other rural residents would probably take greater care and responsibility for land and natural resources over which they had secure ownership. Indeed, this raises the bigger question of whether the present informal and customary tenure system over communal land should continue. It is beyond the scope of this book to debate that fundamental question, however.

Considerable efforts have been made to develop Kavango's craft industry in recent years. Some items are sold at local roadside stalls, while most others find their way to outlets in Windhoek and elsewhere.

Although about 15% of Kavango is allocated to conservation, little of this area is gainfully used for tourism (see page 75). It is true that large parts of the game parks consist of rather monotonous woodlands where it may be difficult to see wildlife that attract tourists, but the fact remains that few efforts have been made to derive benefits from tourism. While the development and use of the parks for tourism is one obvious option, another is to capitalize on Kavango's position in being close to the Okavango Delta and tourist attractions in Caprivi and western Zimbabwe. Many tourists already visit these areas and more of them could be attracted to Kavango. There is also the possibility of encouraging more overland movements between Etosha National Park and the attractions in Botswana, Caprivi and Zimbabwe, and thus developing lucrative stop-overs in Kavango.

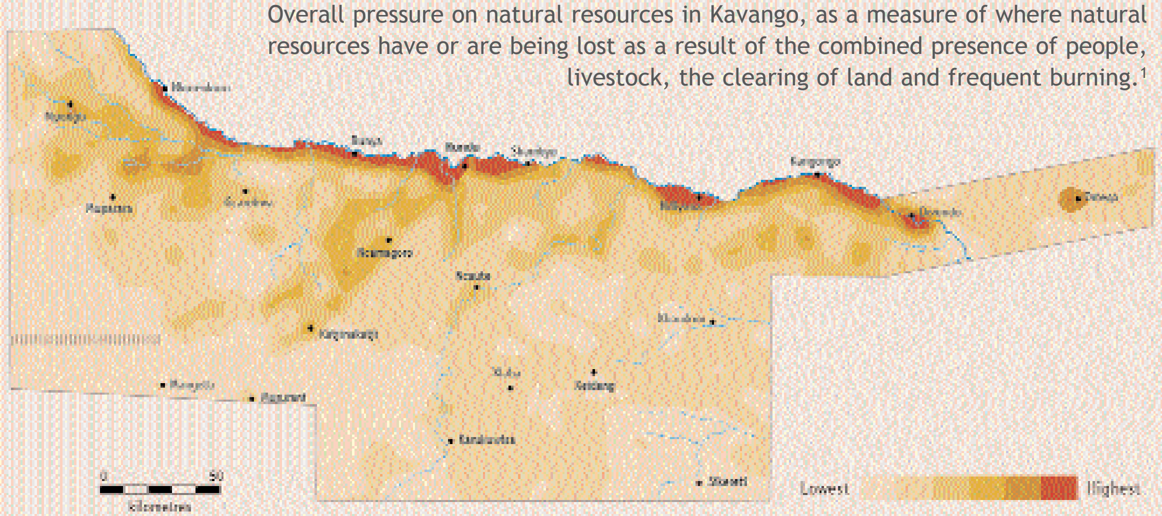
Most resorts that cater for tourists in Kavango lie between Divundu and Mahango Game Reserve, an area close to the Okavango Delta and well-placed for transit tourists. The proclamation and opening up of the Bwabwata National Park (FIGURE 39, page 73) should add further reason for tourism to expand in this area, but thought should also be given to the development of tourism in the Andara area. The mission at Andara is an interesting historical site, and so is the island of Thipanana where Mbukushu chiefs and rainmakers lived until 1900. The many other islands in this area are covered in dense riverine forest of a kind and beauty found nowhere else in Namibia. Serious attention should be given to affording these islands more protection, a step that would be easier if the area had greater value in attracting revenue from tourism.

FIGURE 77 provides an overall measure of pressure placed on natural resources in Kavango. Areas where pressures are greatest have already been badly degraded with the result that most of the original vegetation has gone. This is especially true along much of the river. The small riverine areas that remain in fairly pristine condition, such as the ones around Andara, should also be protected, perhaps as conservancies with the addition of community-run tourism and recreational fishing camps. The potential income from these sources could be higher than that created by any kind of small-scale farming, for the reasons suggested above.

There is also an urgent need to reduce the widespread and frequent fires that result in the loss of woodlands, pastures and soil nutrients (see page 68). Other problems are caused by the massive extent of burning, and this is perhaps the most severe environmental problem in Namibia.

Firebreaks need to be re-established and stiff penalties imposed on anyone who sets a bush fire. Although many more large trees are killed by fire than by other causes, the effects of the growing export of wood for craft production, timber and firewood should be evaluated and monitored.

FIGURE 77-
Overall pressure on natural resources in Kavango, as a measure of where natural resources have or are being lost as a result of the combined presence of people, livestock, the clearing of land and frequent burning.[1]



A final comment on Kavango’s most important asset: the Okavango River. Much of the water coming into the region from Angola simply flows out again, into Botswana. Given the extreme shortage of water in Namibia generally, many people see the flow of Okavango water as something of a missed opportunity: a resource to be taken and exploited. However, the impacts of any new uses of the water need to be assessed extremely carefully. The volume of water is limited, and flows fluctuate greatly from season to season and from year to year. The river water is also the key component that makes the whole Okavango valley in Namibia and Okavango Delta in Botswana so ecologically valuable and attractive to tourism. Many potential economic benefits are to be achieved from tourism and these may outweigh the short-term gains to be made from other uses of river water. Namibia needs to guard against any developments or processes that would add chemical pollutants to the river, such as from effluent or crop fertilizers. Special efforts should also be made to protect floodplains along the river, especially the very large flooded areas between Tondoro and Bunya, between Mupini and Shambyu, and around the Cuito confluence. Most fish breed in the floodplains and they need to be conserved if fish populations are to be maintained. Likewise, developments that would change patterns of flooding could damage fish populations.

From an international perspective, a variety of new developments in Angola could have an impact on the river. For example, the potential of the river as a water source for irrigation schemes and electrical power has long been recognized, and inappropriate designs of hydroelectric dams would alter patterns of flow downstream. (These are scenarios for Angola, but ironically Namibia is also planning several large irrigation schemes and a hydroelectric power station at Popa Falls.) Pressure to pursue such developments will come from within Angola and from external agencies keen to help exploit Angola's resources. Most changes will be in the Cubango catchment since this area is more populated and less remote than the Cuito catchment. One effect is that the flow and quality of water in the Cubango could be more influenced by developments than that of the Cuito. Angola, with its relative abundance of water from rainfall and many tributary rivers, will also be less concerned about the impacts of developments than Namibia and Botswana. In fact, Botswana has much the greatest interest in the wellbeing of the river because water is so scarce and the Okavango Delta has such great economic and ecological value. As custodian of the Okavango passing from a country rich in water to one where the river is a lifeline, great responsibilities lie ahead for Namibia and Kavango to ensure that the Okavango River remains in the best health.

SAND AND WATER

CHAPTER
TWO

FOUNDATIONS

Millions of
years to build

The Khaudum Omuramba snaking east towards the Okavango Delta.

As an administrative region with clearly defined borders, Kavango is very new, especially so in relation to the hundreds, thousands and millions of years over which this area has existed. What is to be seen today is largely a product of events and developments over all these years. Indeed, the region's natural features have been millions of years in the making.[1]

Several features dominate Kavango's landscape: its flatness, the mantle of windblown sand, the Okavango River, dry omuramba valleys (dry rivers are known as omurambas in Namibia) and the remains of old sand dunes. One way or another, all of these are associated with the fact that Kavango is part of the Kalahari Basin, a vast depression stretching from the northern Cape in South Africa upwards to close to the Congo River (FIGURE 4). But what formed this huge Basin, how did the region come to be covered by windblown sands, and when did the Okavango River first flow?

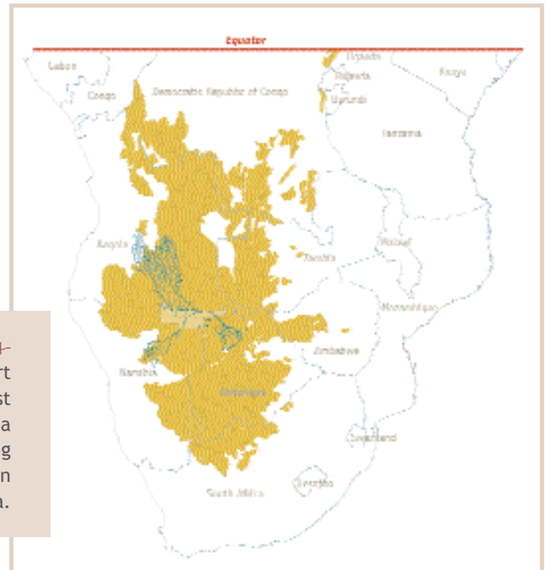


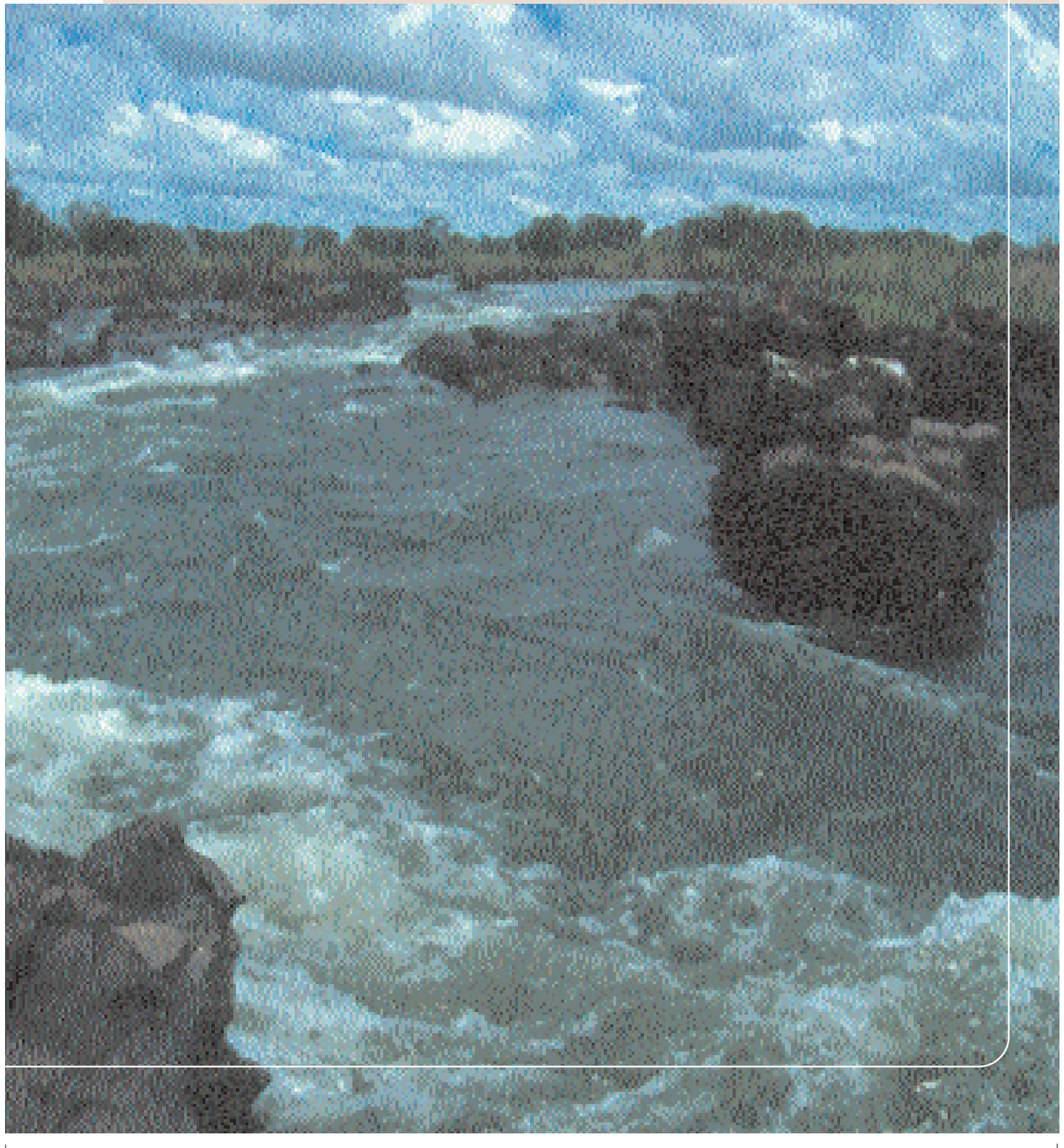
FIGURE 4–
Kavango forms part of the vast Kalahari Basin, a landscape covering much of southern Africa.

Time on Earth goes back to the formation of the planet some 4,600 million years ago, but what Kavango looked like for much of that time is not known. The best place to begin is with the formation of the basement to Kavango, a foundation of rock produced over a period lasting about 350 million years. All of this started some 900 million years ago when an ancient landmass began to split apart into several continental plates. Deep rift valleys formed between the splitting plates, and sediments washed down into lakes lying in the bottoms of the valleys. The splits later widened much further to form distinct continents separated by oceans. One of these is known as the Khomas Ocean, and thick layers of sediments were deposited on its seabed.

The continents then started moving closer about 700 million years ago. Sediments that first accumulated in the rift valley lakes and those later deposited on the ocean floors were squeezed upwards, the great forces of compression heating and moulding them into metamorphic rocks: limestones, quartzites, schists and dolomites. The name of the new landmass created about 550 million years ago by these and other colliding continents was Gondwana, and those metamorphic rocks formed the basement of what is now Kavango. However, the rocks lie at very different depths below the current surface of the region. Those in the south (near Mangetti) and in the east (around Bagani) are closest to the ground because this is where mountain belts had formed when the colliding continents pushed the seabed sediments highest. One belt now forms the hills near Grootfontein, Tsumeb and Otavi while another remains as the hills of the Khomas Hochland, which we now see around Windhoek. The Khomas Hochland belt actually extends in a north-easterly direction, through Botswana and up into Zambia, but most of the original belt in those north-eastern areas was later eroded away. All that remains visible today are small hills, such as the Aha Hills near Tsumkwe and the Tsodilo Hills to the east in Botswana, and rock outcrops in the south-east of Kavango and near Bagani, including those that form the Popa Falls (FIGURE 5). In actual fact, the surface rocks at Bagani and in south-eastern Kavango are thought to have been produced from the earliest deposits of rift valley sediments. They are called Nosib Group rocks, while Damara Supergroup is the name given to the whole assortment of rocks formed from sediments pushed up by the colliding continents.

Basement rocks lie much deeper in western Kavango, and in some places drill rigs must penetrate

Popa Falls, where the river cascades down several metres before resuming its normal slow and leisurely flow.



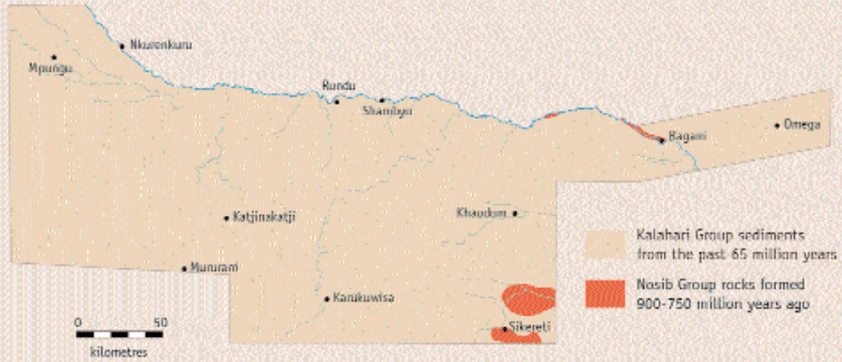
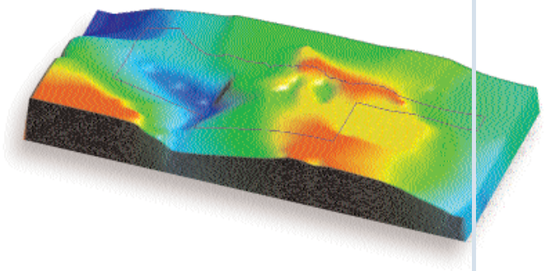


FIGURE 5-
Much of the region is covered by a mantle of Kalahari sand. The only exposed Nosib Group rocks in the east were perhaps formed from sediments deposited in an ancient rift valley between 900 and 750 million years ago.

FIGURE 6-
This is what Kavango would look like if the mantle of Kalahari sediments were stripped away. The surface in the image is thus the bedrock foundation. A deep valley, possibly carved by a glacier, runs from the western border south-eastwards towards and beyond Mururani. Deep areas in the far north-west form part of the Owambo Basin, while the highest areas are in the south-eastern part of Khaudum and along the river between Shambyu and Bagani.



400 metres of younger sediments (FIGURE 6) before reaching the bedrock. This is because the deepest rocks form part of the Owambo Basin, a basin that also formed when the two landmasses collided. Such basins are created when colliding continents push up to form mountain belts in one area but subside in another, the Earth's crust countering uplift in one zone by subsidence behind it.

The events of between 700 and 550 million years ago provided the basement and foundation to the region. A long period of erosion followed during which the Gondwana landscape was smoothed and carved by wind and water erosion. But there was also a good deal of erosion by ice when glaciers covered much of southern Africa between 300 and 280 million years ago. Huge sheets of ice then wore away rocks from the highlands and carried the sediments down to lower areas, including the Owambo Basin. Little is known of the exact distribution and thickness of the glacial deposits, but they possibly cover much of the basement in Kavango.

Massive volcanic eruptions occurred when Gondwana started to break apart about 180 million years ago. The upheavals spewed basalts across much of the southern African landscape, filling in valleys and basins and leaving exposed higher areas of basement, such as those now exposed around Bagani

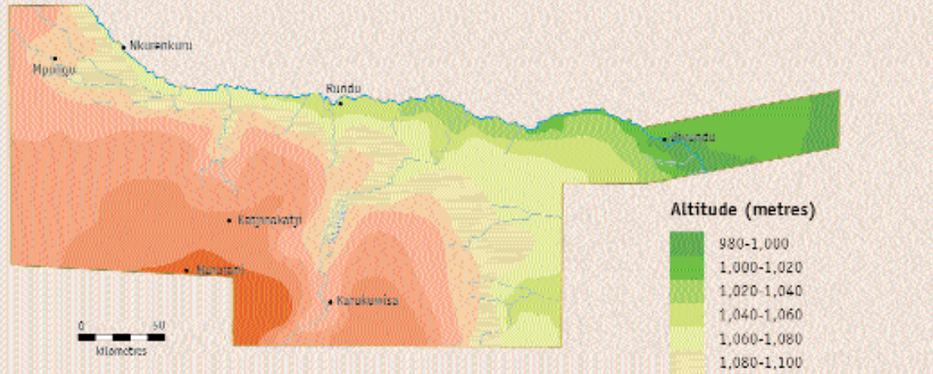


FIGURE 7-
Although Kavango appears very flat, elevations drop gradually from west to east and from south to north.

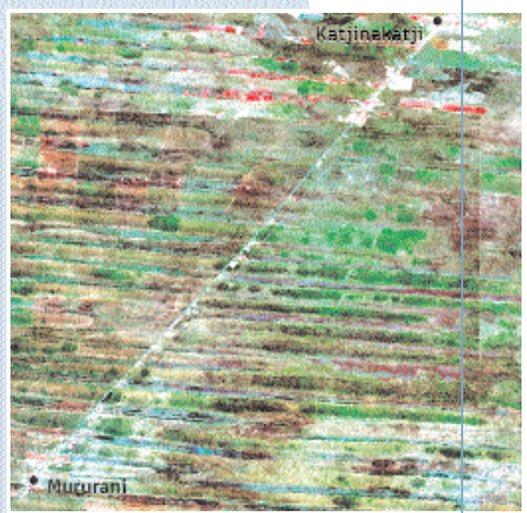


FIGURE 8-
Old sand dunes formed during drier episodes over the past two million years. The last dry period during which dunes were actively moulded probably lasted until about 10,000 years ago. The alignment of the dunes reflects the easterly direction from which prevailing winds blew when the dunes were formed. Dunes to the west of the Omatako were formed from sands carried down this omuramba, while those west of the Okavango Delta were likewise formed from sediments brought down into the Delta by the Okavango River. The small satellite image shows how old dunes cut across the main road between Mururani and Katjinakatji.

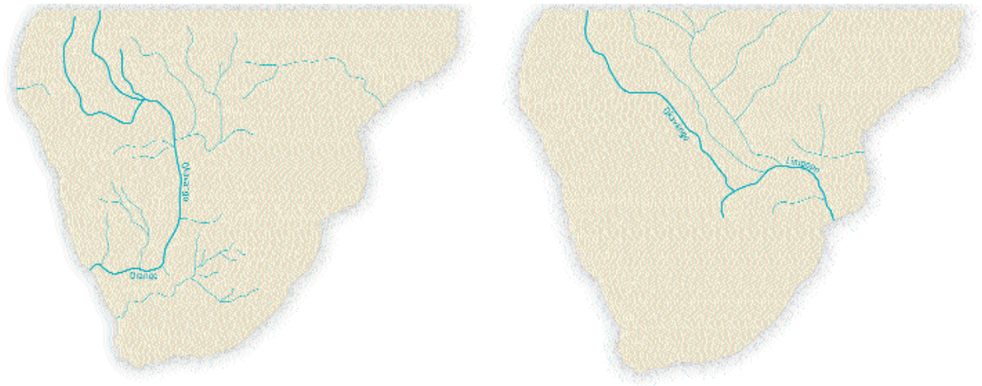


FIGURE 9-
The Okavango quite possibly flowed much further south before the formation of the Kalahari Basin 65 million years ago. The maps show different possible courses of the Okavango either into the Orange (left) or the Limpopo River (right).[2]

and in south-eastern Kavango. Large areas of these volcanic rocks lie hidden beneath the sands, probably as fairly thin layers less than 50 metres in thickness. One small outcrop of basalts can be seen just south of the region at Klein Dobe, north of Tsumkwe. These initial ruptures caused Antarctica and South Africa to part ways, but it was about 132 million years ago that new breaks formed between Namibia and South America. The movements of the earth's crust continue today as South America and Africa drift further apart.

Another important event followed the break-up of Gondwana. The margins of what remained as southern Africa began to lift up, producing a rim of mountains and hills encircling the landmass but also leaving a vast and shallow bowl in its centre. Much of this depression now forms the Kalahari Basin (FIGURE 4) of which the Kavango is part. While earlier processes produced a basement to the region, it is really the sediments that filled the Kalahari Basin over the last 65 million years that characterise the Kavango of today. For example, these deposits give the region its flat surface by blanketing the ancient highlands in the east and lowlands in the west (FIGURE 7). Similarly, the nature of the sandy soil largely determines what animals and plants live here and what kinds of farming can be practised.

The layers of Kalahari sediments can be divided into two broad groups. The first and deepest group is much the thickest, and consists of layers of clays, conglomerates, water-borne sands, silts and calcretes. Most of these older sediments were deposited along rivers and in lakes and swamps, perhaps rather like the present-day Okavango and Cuvelai deltas. The watery character of those deposits make it clear that most of the Kalahari's history over the past 65 million years was very much wetter than the climate we see today.

The second, topmost and youngest group is a relatively thin layer dominated by sand deposited mainly by wind, a fact shown most vividly by the many old dunes in the region (FIGURE 8). The predominance of windblown sand in these layers reflects the generally arid conditions that have persisted over the past two million years, although isolated deposits of clays have been laid down by water flowing along the omurambas and in inter-dune valleys during periodic wetter cycles.

The Okavango River is thought to be about 65 million years old, but it could have had its beginnings as far back as 180 million years ago when Gondwana first started to break apart. It is also possible that the Okavango flowed much further south, and one theory suggests that it could have fed into what is now the Orange River. A different hypothesis suggests the Okavango could have flowed all the way into the Limpopo River (FIGURE 9).

The cycle in which the last two million years were generally drier than the previous 63 million years was part of a long-term change in climate. There have also been many other medium-term changes, such as those occurring in about 23,000 year cycles over the past 200,000 years (FIGURE 10). Rainfall during the wettest of these more recent cycles was often several times higher than the averages of today, and many other rivers must have flowed in the region. This is when water would have carved the Omatako, Ndonga, Khaudum and other omurambas into the landscape. By contrast, other rivers might have been completely covered up by sand during the driest of cycles. Rainfall was then a quarter and less of what it is today, and strong winds would have shifted great volumes of sand to build and mould the sand dunes that are now covered in vegetation. Most of these dunes were probably formed more recently in two very dry periods, one lasting from 23,000 to 21,000 years ago and another from 35,000 to 28,000 years ago.[3] Finally, there are also much shorter cycles of wet and dry periods, such as those occurring at intervals of 10 or 20 years (see page 40).

One unlucky consequence of the thick mantle of Kalahari deposits is the fact that it is very difficult to discover and mine any valuable minerals in the bedrock. However, there has been recent interest in the possibility of finding diamonds associated with four kimberlite pipes near Sikeretti in the south-east. Much more exploration remains to be done before such a possibility is shown to be valid or not.

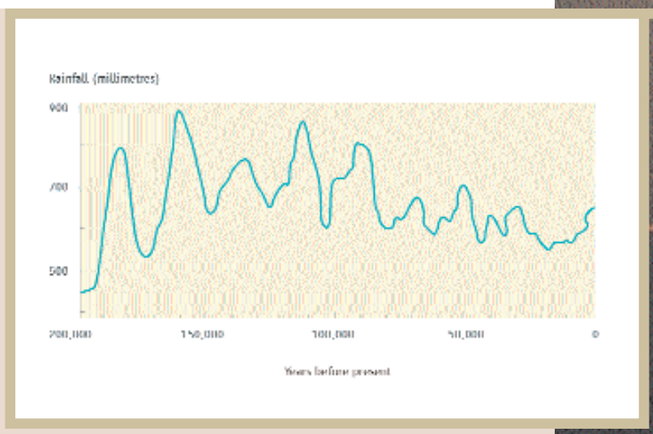
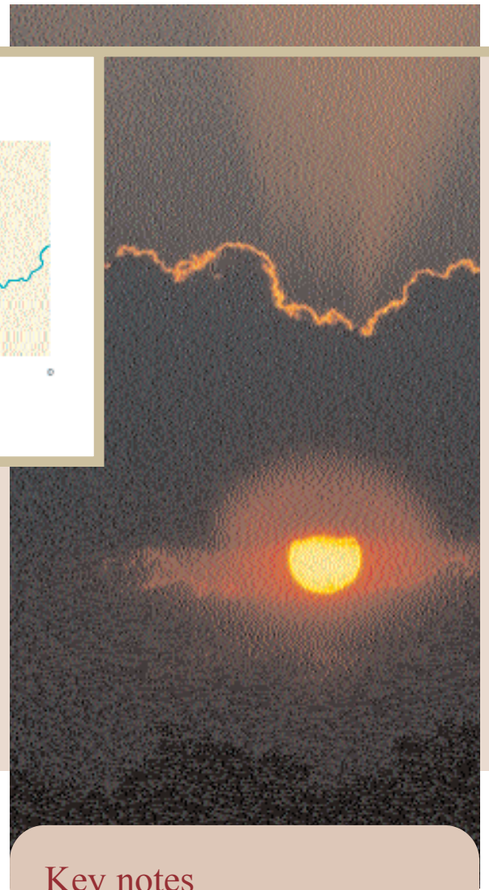


FIGURE 10-
Over time, the climate has fluctuated between wetter and drier periods. Such changes had marked effects on what sediments were deposited in the region, on the flow of rivers, on the types and abundance of plants and animals, and the livelihoods of people. The graph shows probable annual rainfall over the past 200,000 years for an area near Pretoria, South Africa. The figures are probably close to what happened in Kavango at the same time.[4]



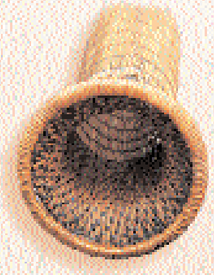
Key notes

- The basement of rocks to Kavango was formed during events that occurred between 900 and 550 million years ago.
- Kalahari sediments deposited during the past 65 million years largely cover the basement of rocks, which is much deeper in western Kavango than in the east.
- There are two broad layers of Kalahari sediments: the deepest and thickest consists of material deposited along rivers, and in lakes and swamps, while the top, thinner layer is largely of windblown sand deposited under much drier conditions.
- The Okavango River is at least 65 and possibly 180 million years old.

CHAPTER
THREE

EARLY LIFE

Thousands of
years in the making



People and their predecessors have been living in Kavango for hundreds of thousands of years, a figure that would go back much further if we include pre-human ancestors. What happened over all those years – especially during the last several centuries – has been of great importance in setting the scene for life today. This is particularly true of processes that helped mould current land uses, farming practices, traditions, outlooks and leadership systems, for example. Efforts to piece together that history are based on archaeological artifacts, oral history and records written down over the past 150 years.[1]

The earliest firm indication of human life in the region, however, comes from stone tools. These have been found upstream in Angola at Menongue and Galengue, at Dirico near the Cuito's confluence with the Okavango, and around Rundu. The design of the tools is typical of Stone Age artefacts produced tens and even hundreds of thousands of years ago. The producers of the tools were hunter-gatherers, probably living along the river where food and water was available all the time. Elsewhere and away from the river, people were doubtless more nomadic, moving between different sources of water, hunting grounds and fruiting trees.

Farming in the region could have started as long as 2,000 years ago, although the earliest definite evidence comes in the form of pottery made in about 850 AD at Kapako west of Rundu. The pots were used to store grain, and they provide the first evidence of crop farming in Namibia. This site also shows evidence of iron workings from that period, as well as layers of more recent pottery, which indicates that crop farmers have continued living there during the past 1,150 years. Pottery produced in about 1630 AD at Vungu Vungu was also used to store grain. More significantly, glass beads and smoking pipes were found at this site, indicating that people then had widespread trading contacts outside the region. The pipes possibly came from the Angolan highlands since the use of tobacco probably spread down the west African coast after its introduction to Africa in the 1500s.

Images from the past. The jaw of Otavipithecus namibiensis *(right above), an ape forming part of the line leading to the evolution of humans. This 13 million year-old fossil was found to the south near Grootfontein, and it is easy to imagine these and other ancestors venturing across the Kalahari woodlands to enjoy the productive waters and foods of the Okavango valley. Decorative cowry shells from tropical coasts (below) were brought to Kavango as currencies used in an extensive trade network in southern Africa. Major exports from Kavango included slaves. Clay pots (right) were often used to store grain, and pottery fragments found near Kapako from about 1,150 years ago provide the earliest evidence of crop farming in Namibia.*

Snapshots from the past – taken only 50 or so years ago – provide telling images of how a mix of cultivated grain and food obtained by gathering, hunting and fishing provided people in Kavango with most of their food.

From at least the 1500s onwards, people living in southern Kavango have been trading with communities along the Okavango River and perhaps in the Okavango Delta in Botswana. Evidence for this comes from pottery discovered near Sikereti, where hunter-gatherers probably used the pots to store honey and perhaps other items. The pots were thus not associated with grain storage or farming. More recent pottery made 150–160 years ago has been excavated at Kamutjonga, near Bagani, and is typical of pottery recently produced by Mbukushu people.

A fairly detailed history is available to explain the origins of the five major tribes that live along the river: the Kwangali, Mbunza, Shambyu, Gciriku and Mbukushu. Most accounts come from oral history, the memories of events passed down from one generation to the next. According to the legends, the riverine tribes originated from people living along the upper reaches of the Zambezi River. Small groups or clans left that area, moving first south and west to the Kwando or Mashi River. One clan then travelled west to settle along the Cubango River in Angola. Imbangala people in that area later forced this clan to move downstream to settle in western Kavango. The people had two leaders who were sisters, but a disagreement between the sisters divided the clan into two groups which were to become the tribes now known as the Kwangali and Mbunza. The Kwangali concentrated in the west of the region and were farmers primarily, while the Mbunzas lived further east as fishing people.

Lechwe and other wildlife have largely disappeared as sources of food, while more and more fishing traps are found to be empty.

Whilst the clan that gave rise to Kwangali and Mbunza people settled in the west, a different clan led to the present-day Gciriku and Shambyu people. The original clan also moved from the upper Zambezi, first settling along the Kwando River and then the Cuito River in Angola. They later moved down the Cuito to eastern Kavango and, again, a disagreement led to a division: the Shambyu living to the west and the Gciriku further east. The two groups speak slightly different dialects of the Rumanyo language.

Similarities between the Nyengo and Mbukushu languages suggest the origins of the Mbukushu are also in the upper Zambezi. However, early oral history states that they first settled in the area of Katima Mulilo from where the expanding Lozi empire later pushed them out. This was in the mid 1700s, and they first moved to the floodplain of the Kwando in Angola. Much of the community later moved south to finally settle in the region around Andara. Mbukushu chiefs were famous rainmakers who lived on the island of Thipanana near Mukwe until 1900. People came from far and wide to consult the rainmaker, and the island became an important centre of trade between the east and west coasts of southern Africa. Payments of black cows and oxen, ivory and young women to the rainmaker provided the Mbukushu people with considerable wealth.

These narratives tell us that the ancestors of the different riverine tribes moved into the region from distant origins. Opinions differ on when the movements occurred, some people suggesting dates close to the end of the 1700s or in the early 1800s, others as far back as the 1500s.[2] Some accounts claim that no one lived along the river before the immigrations of these clans, while others suggest that the river valley was already inhabited by Yeyi or Tjaube and Kxoe people. It is clear from the archaeological record, however, that the river has been home to people for tens and perhaps hundreds of thousands of years. They were hunter-gatherers for much of that time, but crop farmers have lived there for 1,100 and more years. What language those early people spoke or to what tribes they belonged is not known. But even if none of the archaeological remnants had been found, it would be hard to imagine the fertile Okavango valley being uninhabited until so recently. As an oasis in a vast area of arid Kalahari woodland, the valley must have been attractive to anyone that happened to be in this area of southern Africa. And if crop farmers have indeed inhabited the valley continuously over the past 1,100 years, many modern Kavango people could be the descendants of those early farmers.

For San people, the general assumption is that their ancestors have been living as hunter-gatherers in and around the region for thousands of years. Most aspects of their history relate to how they have been dispossessed, oppressed or killed, often being pushed from one area to other inaccessible or less favoured places. This is the main reason why the San population is small, scattered and marginalized. The most recent examples of such movements are the resettlement of San people from north-western Kavango to military bases in what was Bushmanland during the 1970s, and the exodus of Kxoe people to Botswana in 1999 following unrest in Caprivi.

What was life in the Kavango like 100 and 200 years ago? Most people were concentrated along the river where they lived in small villages scattered fairly evenly along the river valley. This was even the case as recently as 1943 (see page 114). Life was probably rather easy in many respects because abundant water, fish, relatively fertile soils, grazing, wildlife and useful plant products were available to the small population. The specialist on 'native affairs', Captain Kurt Streitwolf, estimated the total number of people living along the south bank in 1911 as being no more than 4,500, and the whole population on both sides of the river probably

Most people lived near the river in small villages, such as this one photographed in 1909. Mats made of plaited reeds were traditionally used for walls around each cluster of huts or households.

The mission at Nyangana as it was in about 1920. Many aspects of Kavango's recent development followed the establishment of missions at Kavango: Nyangana (1910), Andara (1913), Nkurenkuru (1926), Tondoro (1927), Bunya (1929) and Shambyu (1930). It was these missions that first introduced formal schooling and health services to Kavango.

amounted to about 10,000 people. This is 10 times less than the population in Owambo at that time. While droughts certainly occurred from time to time, the region apparently never suffered from any of the terrible famines that killed high proportions of the population in Owambo.[3]

However, there were also many hardships and risks to be faced. Indeed, several aspects of life in the region perhaps developed as a result of these challenges, obliging people to adopt low input-low output strategies. Diseases placed a severe burden on people and were probably the main reason why the population was so small. The most significant diseases and health problems were malaria, diarrhoea, relapsing fever, hook worm, pneumonia, bilharzia, and eye diseases. There were also epidemics, for example of influenza in 1918, 1925, 1928, 1932 and 1940, and of measles in 1928, 1948, 1953 and 1959.

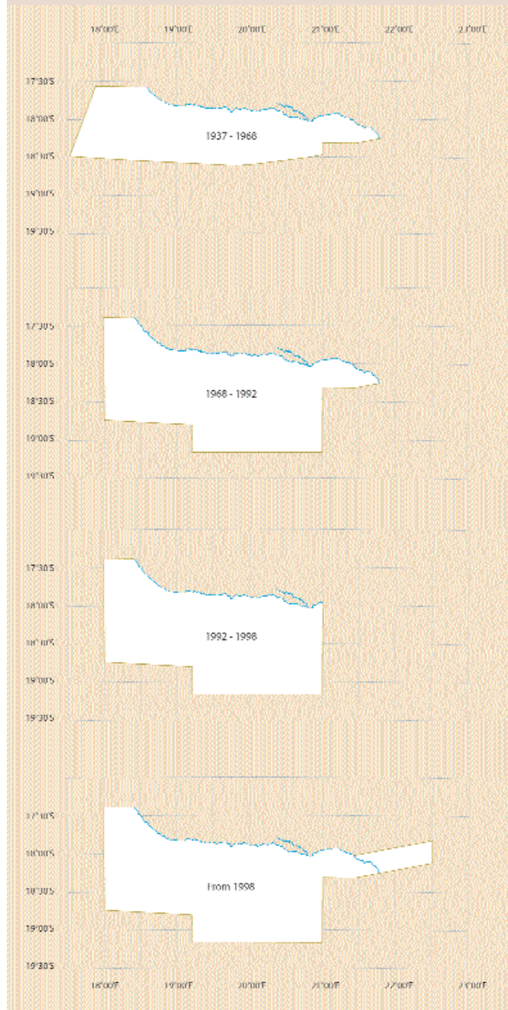
Farming was probably fairly productive as long as good rains fell every year. However, sporadic and long dry spells, and attacks by pests such as queleas, rodents, various insects and even large mammals, would have meant that a whole season's production was often lost. Predators such as lions and crocodiles depleted livestock herds. Cattle also suffered from foot and mouth disease, lung sickness and sleeping sickness. The rinderpest epidemic in 1897 killed most cattle in the region.[4]

Slave trading was evidently common practice until as recently as the 1920s. The Kavango chiefs traded most slaves with Angolan slave merchants who provided such goods as firearms, ammunition, beads and alcohol in exchange. Slave raiding was also practised by hunting parties that went out to steal women and slaves from other tribes. All of this must have created an atmosphere of insecurity for many people. Other raids were mounted to steal cattle and food, leading one explorer in 1899, for example, to report that the Gciriku had not planted crops or kept any cattle for two years for fear of losing them in tribute payments to the Tawana people from Botswana. This was after the Tawana had killed 80% of all able-bodied Gciriku men in 1893.

Attacks or the fear of raids by warriors of the Kololo people (from Lesotho) in 1858 and Jonker Afrikaner (from southern Namibia) evidently also had a major impact on the region. Everyone who had been living on the south bank apparently fled across the river leaving much of Kavango in the control of San people. This apparently remained the case until the German administration established a police presence during the early 1900s.

The establishment of a police station in 1910 at Nkurenkuru provided the German government with its first permanent presence in the Kavango. This coincided with the formation of the first mission station at Nyangana, also in 1910. Colonial control of the region shifted to South Africa after 1920 when South Africa was given a mandate to administer the then South West Africa Protectorate, while the Caprivi Strip to the east of the Okavango River was administered from Bechuanaland (now Botswana) between 1921 and 1929. The first superintendent of

FIGURE II-
The changing shapes of the region. From 1937 until 1964, the region extended west into what is now Oshikoto, and the triangular shape to the immediate west was reserved as a grazing area for Kwanyama cattle. From 1964 until 1992, the Okavango River formed the eastern border, while from 1992 to 1998 the eastern border was at 21ºEast longitude. The eastern border is now taken as 22º30'East.



'native affairs' was appointed in 1922, but it was only in 1937 that Kavango was formally declared as a tribal area, the 'Okavango Native Reserve' (FIGURE II). The administrative centre of the region remained at Nkurenkuru until 1936 when it was moved to Rundu, which was first established as a recruiting centre for labour. The region remained under the direct control of a succession of native commissioners until 1970 when new legislation provided for limited self-government by a Legislative Council. The Council changed the name of the region to 'Kavango', while the newly independent Namibian government again introduced 'Okavango' in 1992 before returning the official name to 'Kavango' in 1998.

The borders of Kavango changed after 1964 as a result of the Odendaal Commission's proposals, the main effect being a loss of area to Owamboland and an expansion to the south. These borders remained in place until 1992 when the newly independent government placed the Mukwe area under the administration of the Caprivi regional government. The current borders were declared in 1998.

Key notes

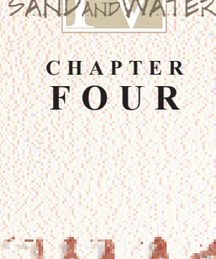
- People lived along the Okavango River as hunter-gatherers for tens of thousands of years.
- Farming started along the river at least 1,150 and possibly 2,000 years ago.
- Oral histories claim that the clans from which the Kwangali, Mbunza, Shambyu, Gciriku and Mbukushu tribes originated, stemmed from people living along the upper Zambezi River.
- Most people lived in small villages along the river 100 to 200 years ago, where they had abundant water, fish, relatively fertile soils, grazing, wildlife and useful plant products.
- The first permanent colonial presence in Kavango came about with the establishment of the police station at Nkurenkuru in 1910.
- Under South African rule, the region was proclaimed as the 'Okavango Native Reserve' in 1937. The borders of the region have changed several times since then.
- The six missions established between 1910 and 1929 introduced schooling and health services to Kavango.

SAND AND WATER

CHAPTER
FOUR

CLIMATE

The rain makers



An advancing storm of swirling dust and rain.

People came from far and wide to consult the famous rain-making Mbukushu chiefs in the 1800s. Today, our more technical approach to aspects of climate tells us that Kavango's climate is dominated by two weather systems. The first is the Inter Tropical Convergence Zone, a large band of moist air that shifts north in winter and south in summer. The southward movement in summer of the Zone from the tropics brings warm moist air, clouds and – with some luck – rain to northern Namibia. The other weather system is the belt of temperate high-pressure cells that lie to the south. These cells also move north and south, one cell usually lying over Botswana during winter while another lies in the Atlantic Ocean off the south-western coast of Namibia. Both cells bring cool and dry air to the region. In a sense, there is a power play between the two climate systems, the southerly high-pressure cells feeding dry air, which pushes away the warm moist air coming from the northern tropical zone. Winters and dry spells during summer are periods when the high-pressure cells dominate the area, while wet summers are those when the Inter Tropical Convergence Zone lies well to the south.[1]

RAINFALL

The presence and north-south movement of moist air to the north and dry from the south has two fundamental effects on Kavango's rainfall. First, a gradient in rainfall is created from the wettest areas in the north to the driest places in the south (FIGURE 12). Second, rainfall is extremely variable because the moist and dry air masses move in and out of the region so rapidly and unpredictably. Rains thus vary a great deal: from year to year, from month to month and even day to day.

The gradient of rainfall within Kavango is part of a much larger gradation covering the whole catchment area of the Okavango River (see FIGURE 20 on page 49). There are no major hills or mountains in this whole area and so the gradient is particularly even across the flat landscape. The whole area is also characterized by a clear distinction between the wetter summer months and dry winter period (FIGURE 13). No rain of any significance is received in Kavango between May and September. Chances of rain then increase progressively until January, the month in which the highest totals are recorded on average. February has slightly less rain, followed by less and less in March and April. About 80% of all rain falls between December and March, with another 15% being recorded in November and April.

Records over the past 60 years are available for most years at Rundu and Andara (FIGURE 14). The annual totals are extremely variable, ranging from less than 300 millimetres in the driest years to over 1,000 millimetres in very wet years. Almost every year differs from the one before and after it, but some cyclical changes are evident. This is especially true for the dry cycle during the 1960s, the wetter period

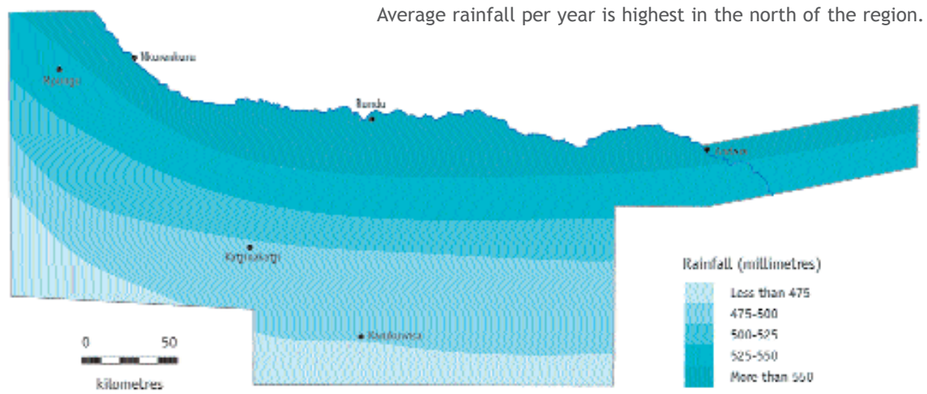


FIGURE 12-
Average rainfall per year is highest in the north of the region.

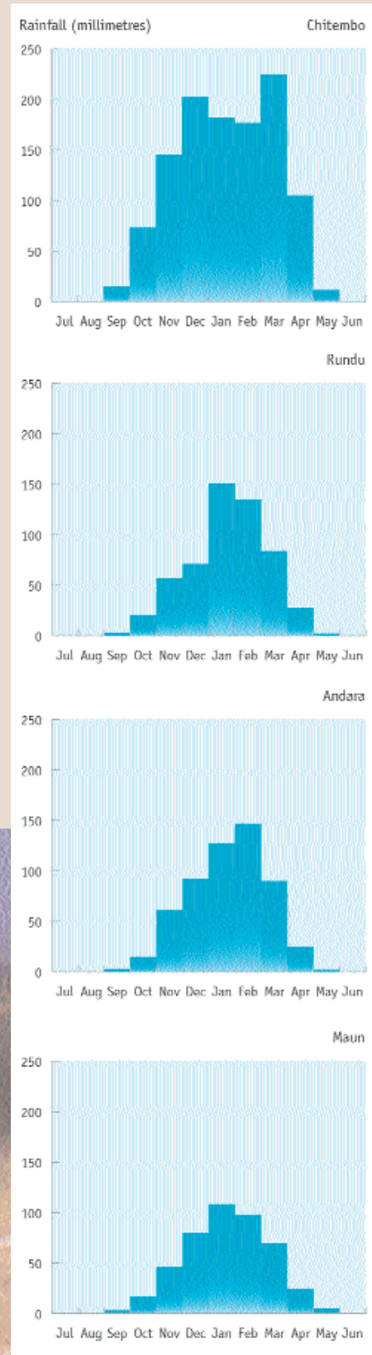
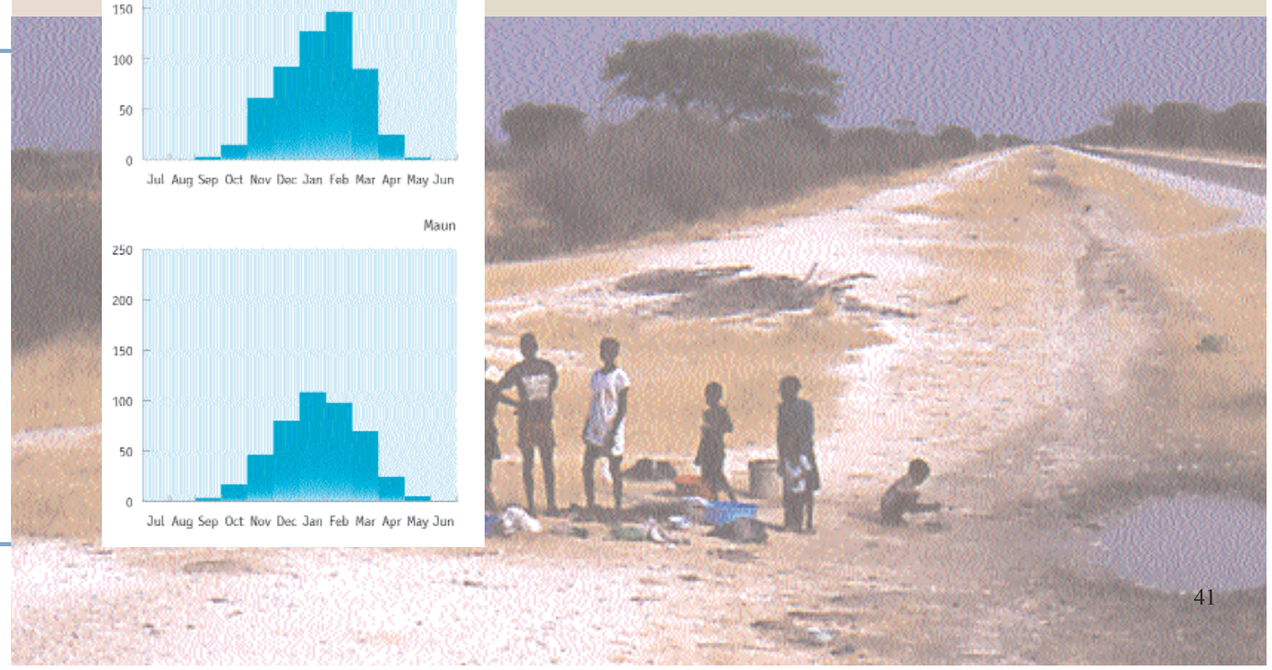


FIGURE 13-
Most rains fall during the summer months, both within the Kavango (Rundu and Andara) and to the north in Angola (at Chitembo) and to the south in the Okavango Delta (Maun).

Average, minimum and maximum annual rainfalls (in millimetres) at Andara, Rundu and Nkurenkuru.

Place and years of data	Average	Minimum (year)	Maximum (year)
Andara (52 years)	579	247 (1994/1995)	1,204 (1977/1978)
Rundu (62 years)	563	274 (1972/1973)	1,120 (1977/1978)
Nkurenkuru (36 years)	610	330 (1995/1996)	1,058 (1973/1974)

The first rain shower of the season in November 2002 produced this pool of water along the Mururani-Rundu road. These children immediately took advantage of the pool to wash clothes.



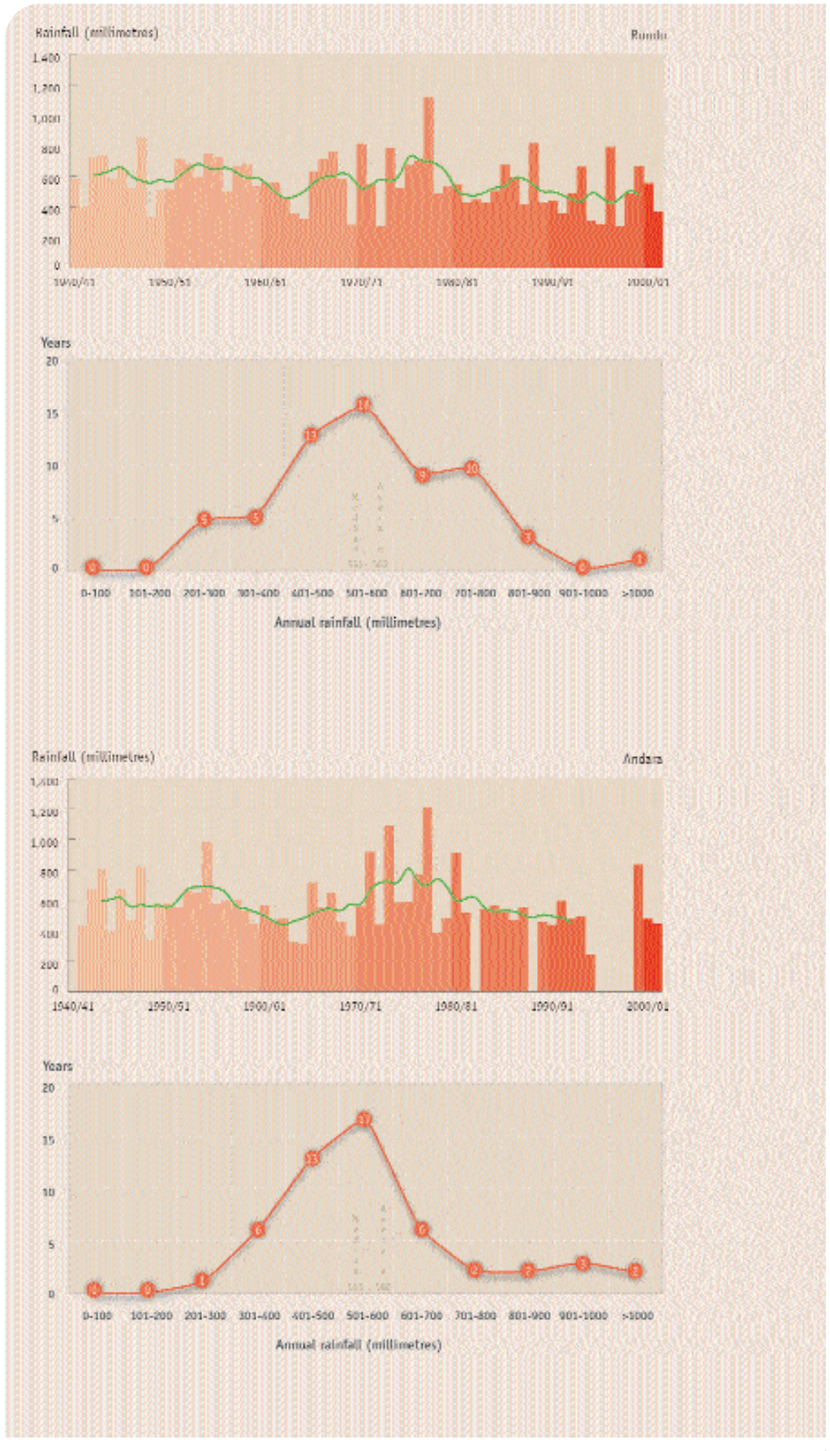


FIGURE 14-
Annual totals of rainfall vary substantially from year to year, as shown by these records from the past 60 years at Rundu and Andara. The second graph shows the number of years during which different amounts of rain fell. (The green line shows the five year moving average.)

during the 1970s, and then a long recent dry spell since the early 1980s. These cycles are similar to those seen in rainfall records at places in the Caprivi, north-western Botswana and to the south-west in the Grootfontein area.

FIGURE 14 also shows the numbers of years during which different total amounts of rain fell at Andara and at Rundu. Total falls of more than 500 millimetres can be expected in most years (85% of years at both Andara and Rundu), while totals of more than 600 millimetres can be expected in about 65% of all years at both places. By contrast, drier years with less than 400 millimetres were recorded in nine out of 60 years at Rundu and seven of 52 years at Andara.

It is clear that rainfall is often inadequate for crop growth as a result of low rainfall, irregular falls, or long periods of hot and dry weather. Young crops, particularly, then wither and die. The growth of natural pastures is likewise limited as a result of poor rainfall in some years (see page 66). While no clear measures of what might be called drought are available, graphs showing the numbers of days on which different amounts of rain fell provide an indication of how frequently rains of value for crop and pasture growth may fall (FIGURE 15). The graphs are for daily totals of more than five and 10 millimetres respectively.

Based on these graphs, better falls of rain can only be expected from November onwards, and few good falls can be expected after March. January is clearly the month when rain falls both most frequently and in the largest amounts each day. There are slight differences in the onset of higher falls of rain, such that good falls occur earlier in the season in the east (Andara) compared with the west (Rupara/Nkurenkuru).

These, however, are only trends and one of the most obvious features is the great variation in the timing and amount of rain from season to season (FIGURE 16). Some seasons see little rain overall (such as in 1997/1998 and 2001/2002), others have good falls spread throughout the summer (1999/2000), while others look promising but then have periodic dry spells (such as in February 1999 and January 2001 and 2002 (see also page 93). Each season sees a quite different pattern of rainfall, and these unpredictable differences make it difficult for anything and anybody (farmers, plants and animals) that relies on rain.

TEMPERATURES, EVAPORATION, AND WIND

The region's generally warm climate is reflected in FIGURE 17, which shows that temperatures increase very rapidly from the coldest months of June and July to the warmest month of October. This is because there is relatively little cloud cover to shield incoming radiation from the sun in October, whereas increasing cloud cover and rains make the remaining summer months cooler. Average maximum temperatures are above 30° Celsius in all months except for May, June and July. Temperatures during the winter months seldom approach freezing point, and only in June, July and August are average minimum temperatures below 10° Celsius. Frost is therefore exceptionally rare, and only ever occurs in the low-lying valleys.

Total evaporation rates amount to about 1,950 millimetres per year. About four times more water is therefore potentially lost through evaporation than falls as rain. The greatest rates of evaporation are in September and October (FIGURE 18) when temperatures are high, there is little moisture in the air and it is often more windy than at other times of the year (see below). Lower rates of water loss in the mid-summer are due to the higher humidity and the cooler conditions brought about by cloud cover.

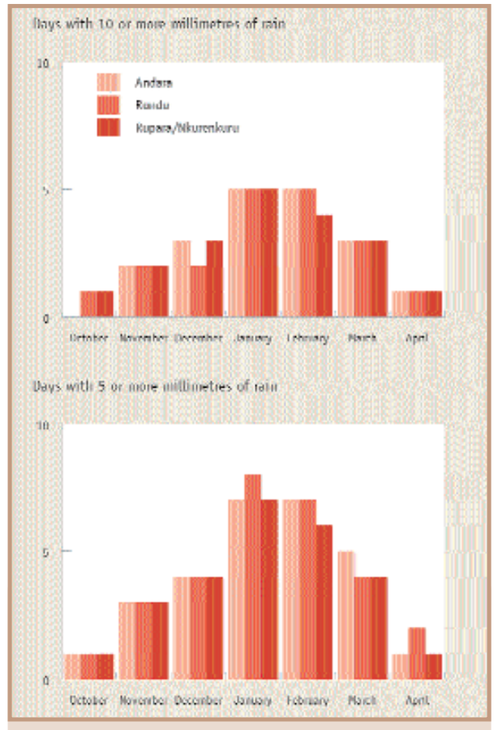


FIGURE 15-
The numbers of days on which five and 10 or more millimetres of rain were recorded at Andara, Rundu and at Rupara/Nkurenkuru.[2]

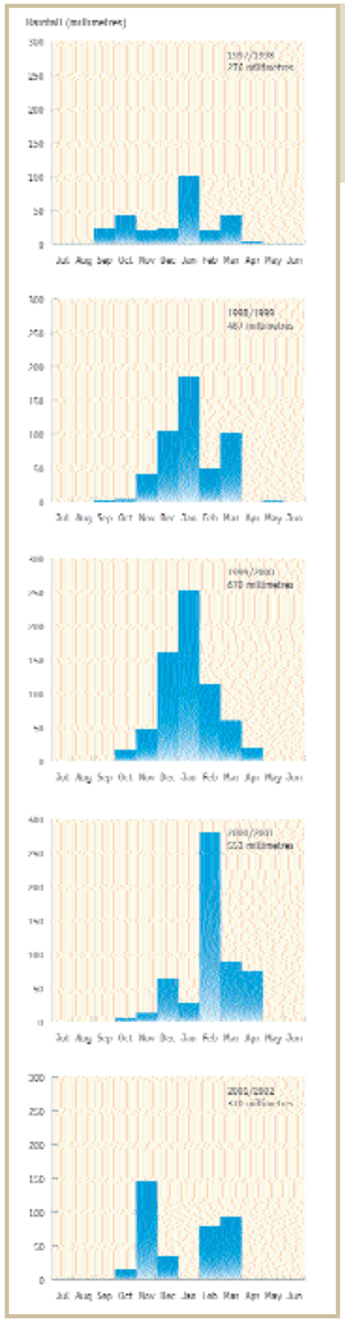


FIGURE 16-
(Left) Patterns of rainfall vary from season to season, as shown by rainfall recorded each month at Rundu over five summer seasons from 1997/1998 onwards. The total amounts recorded in each season are given in the top right corner of each graph.

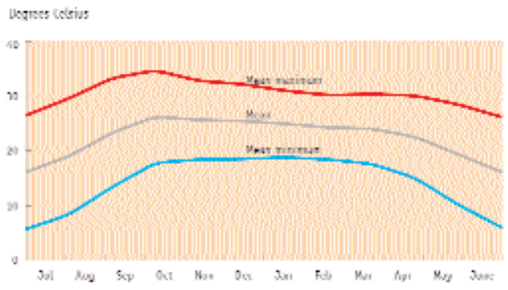


FIGURE 17-
Temperatures rise most rapidly in September and then gradually decline after October. The greatest differences between the lowest and highest temperatures each day are in July and August when maximums are often 20° higher than minimum temperatures.

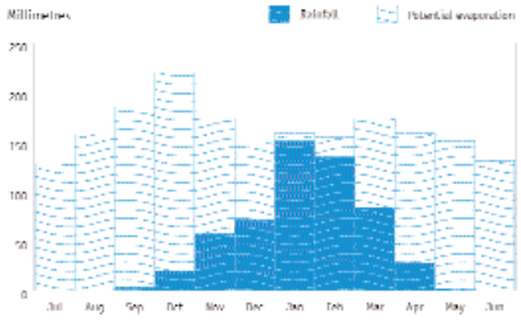


FIGURE 18-
Almost two metres of water potentially evaporates each year, about four times more than the total rainfall. Rates of evaporation are highest in October as shown in this graph, which also provides comparative figures for monthly rainfall at Rundu.

Wind speeds are generally low, rising from averages of about three kilometres per hour in the mornings to about 12 kilometres per hour in the early afternoon, before dropping again to about three kilometres per hour in the evenings (FIGURE 19). Morning and evening winds are strongest in October and November, whereas winds in the afternoon are lightest in December and January. In most months, however, it is completely calm for over half the time. Most winds are from the east, between north-east and south, and only in January is there appreciable wind from the west.

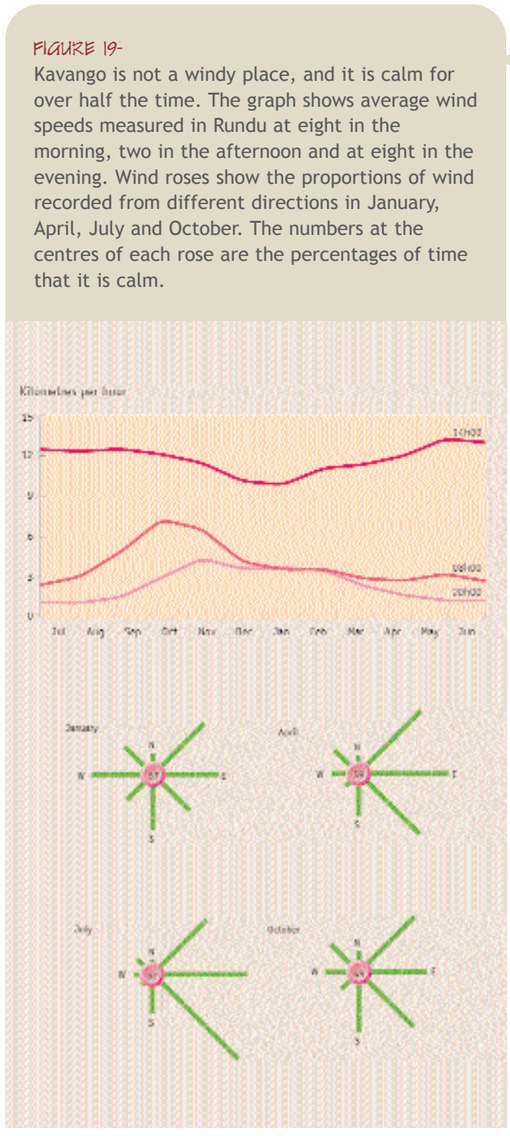


FIGURE 19-
Kavango is not a windy place, and it is calm for over half the time. The graph shows average wind speeds measured in Rundu at eight in the morning, two in the afternoon and at eight in the evening. Wind roses show the proportions of wind recorded from different directions in January, April, July and October. The numbers at the centres of each rose are the percentages of time that it is calm.

Some records

- The wettest season was in 1977/1978 when 1,204 millimetres was measured at Andara.
- The driest season was in 1972/1973 when only 221 millimetres was measured at Rupara.
- The day with the highest recorded rainfall was on 26 December 1977 when 190 millimetres was recorded at Rupara.
- The lowest temperature recorded at Rundu was -0,8° Celsius on 30 May 1994.
- The highest temperature recorded at Rundu was 41° Celsius on 20 November 1987.

Key notes

- About 80% of all rain falls during four months from December to March.
- The timing and amount of rainfall varies greatly from year to year, month to month and day to day. Dry periods and heavy falls of rain thus occur regularly.
- Rainfall was generally low during the 1980s and 1990s.
- Temperatures increase rapidly from the coldest months of June and July to the warmest month of October. Temperatures seldom reach freezing point and frost is extremely rare.
- Almost two metres of water is potentially lost each year as a result of high evaporation rates. This is about four times more than the total average rainfall each year.
- Winds are generally light, and it is completely calm for over half the time during most months.

CHAPTER
FIVE

OKAVANGO

The flow of a lifeline

Popa Falls

Much of what happens in Kavango is linked to the Okavango River, and the very fact that so many people live here is due to the presence of the river. However, any discussion on the importance of the river should take care to distinguish between the values of the river itself and that of the surrounding riverine valley and habitat. Statements are often made, for example, that the large numbers of people living along the river are dependent on the Okavango. This seems logical, but it clearly implies that people derive most of their resources from the river. However, it is certain that the immediate livelihoods of most people are almost entirely independent of the river (see Chapter 8). Even the presence and use of alluvial soils has nothing to do with the existing river, for instance. These soils were deposited hundreds of thousands or millions of years ago, and the river now contributes nothing to the quality of the soils in the valley.

This is not to deny the importance of the Okavango, but rather to emphasize that its true value should be recognized for the lifeline that it really is: a relatively pristine place in which plants, fish, birds and other wildlife can live in abundance; a source of limited quantities of water for irrigation and other purposes (see Chapter 6, page 58); and an attraction for tourists that can bring substantial economic gains to the Kavango Region and Namibia, amongst other values. And so the river should be put to appropriate uses – not abuses – that recognize these resources. Making good use of the river also requires an understanding of the Okavango's catchment, the nature of water flow, the quality of water and the fish that live in it. The pages that follow summarize information on these aspects.

THE CATCHMENT

The total area of the catchment in Angola is 148,860 square kilometres, of which 60,860 square kilometres belongs to the Cuito River (FIGURE 20). The Okavango is called the Cubango River in Angola, and the distance from its source on the Bié Plateau to the Cuito confluence is 930 kilometres.[1] Rocks on the Bié Plateau are granites and layered gneisses but the plateau makes up a small part of the Cubango's catchment area. Kalahari sands cover the remaining much greater area of its catchment, and the same sediments cover the entire Cuito catchment. It is these sediments that are most important in giving the river its clear and clean water (see below). There are few nutrients in the sands that can leach into the water and tiny particles are trapped as the water percolates through the sand.

The Cubango River rises as one of several main tributaries that run parallel with each other from north to south. From west to east the main tributaries are the Cubango, Cutato, Cuchi, Cucuchi, Cuelei, Cuebe, Cueio and Cuatir Rivers.

The Cuito River is 730 kilometres in length[2] from its source to the confluence, and this is the Okavango's only significant tributary. Indeed, for seven months of the year the Cuito contributes more water than the Okavango (see below). Five main tributaries feed the Cuito, from west to east: the Luassinga, Longa, Quiriri, Cuito and Cuanavale Rivers.

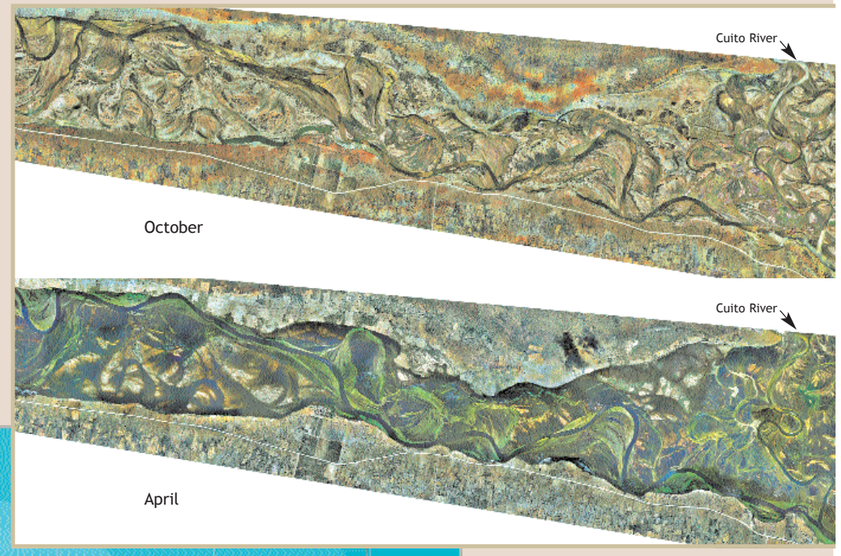
Several dry rivers are shown in FIGURE 20. By far the longest of these is the Omatako Omuramba covering a substantial potential drainage area of about 55,700 km². It has never been seen to flow into the Okavango, but it was a significant tributary in much wetter periods long ago (see page 29). The length of the Omatako is 635 kilometres from its source near the Omatako hills to its confluence at Ndonga. A number of other river courses (for example, Ekuli, Mpuku, Ndonga, and Rukange) also meet the Okavango but they, too, are always dry.

Higher areas in Angola where the Cubango and Cuito have their sources have average annual rainfalls of over 900 millimetres per year (FIGURE 20). From those wetter areas, the river progressively flows through drier and drier areas until it reaches the Okavango Delta in Botswana, where the average annual rainfall is less than 450 millimetres. Rainfall across the whole catchment thus decreases from north to south and from west to east. Throughout the catchment there are distinct wet and dry seasons, with almost all rain falling between October and April (see FIGURE 13, page 41).

In the upper reaches of the Cubango the river drops rather steeply, at least in comparison to the extremely shallow gradient along the rest of its course to its confluence with the Cuito and, indeed, all the way to Maun (FIGURE 21). The Cuito also has a very shallow gradient throughout much of its catchment area, partly reflecting the fact that much of the area is swampy.

The river valley in the Namibian section varies between two and six kilometres in width. For much of its length, it is relatively narrow and confined by higher ground (FIGURE 22). Most areas of floodplains are small compared with the extensive floodplains along certain stretches: between Tondoro and Bunya, between Mupini and Shambyu, around the Cuito confluence where very large areas are flooded on the

Some of the largest floodplains are around and to the west of the confluence of the Cuito River, shown here as it meanders south on the right hand side of these two aerial photographs. The two photographs were taken in October 1998 when the floodplains were dry because the rivers were very low and in April 1999 when large volumes of water covered the floodplains. The old main gravel road runs along the southern banks of the river and passes Nyangana Mission (the area of large square fields in the centre of the photographs), while the sports field and buildings of Linus Shashipapo Secondary School are clearly visible just below the actual confluence of the Cuito.



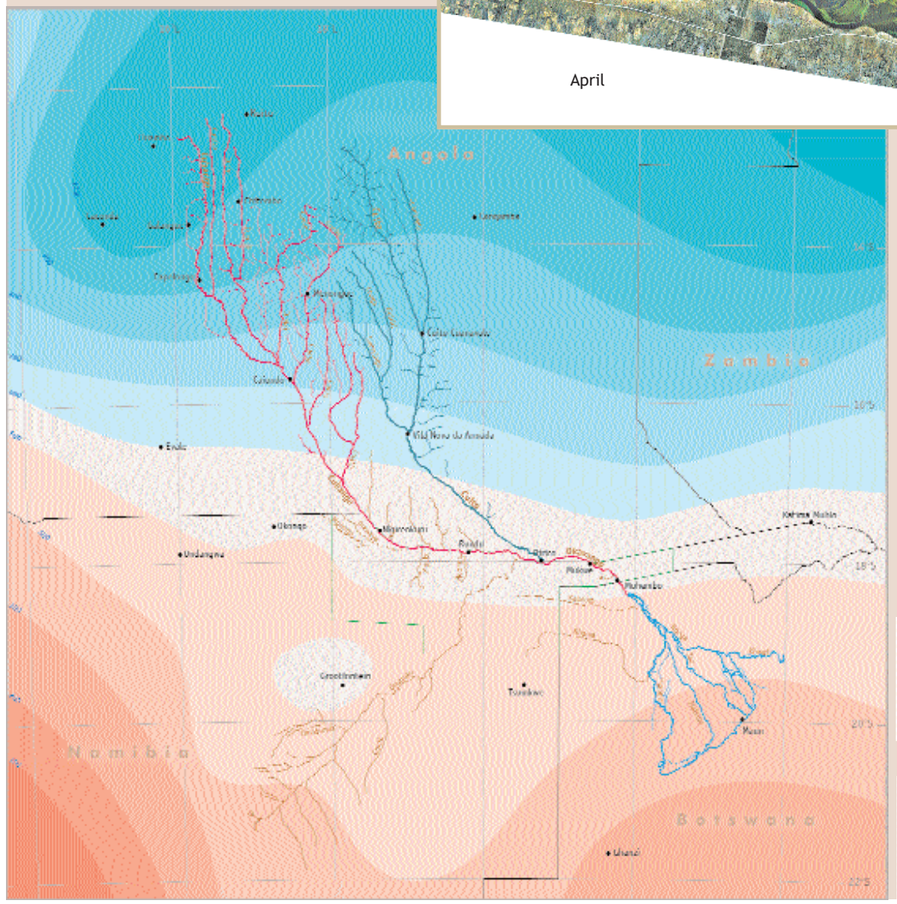


FIGURE 20
The Okavango Basin stretches across Angola, Namibia and Botswana, as shown by the positions of the various rivers that make up the Basin. The map also shows average annual rainfall across the area.

Angolan side (see photographs on page 49), and then from Bagani south to the Botswana border. Some of the floodplain in Mahangu Game Reserve is flooded permanently and is similar to the extensive areas of marshes downstream in the Okavango Delta.

THE FLOW OF WATER[3]

Water leaving Kavango and entering the Okavango Delta is provided both by the Okavango and Cuito Rivers. The actual contributions made by the two rivers can be measured by comparing the flow of the Okavango at Rundu (before they join) with that at Mukwe (below the Cuito confluence). These are the two places where water flow is gauged, and subtracting the Mukwe runoff from that measured at Rundu gives a measure of input from the Cuito. The figures show that the Cuito contributes about 45% and the Okavango 55% of the total water flow per year. However, the volumes contributed by the two rivers vary greatly during the year (FIGURE 23). The Okavango's peak flow measured at Rundu is usually in April, while that of the Cuito is normally in April or May. The peak flows later reach the lower reaches of the Okavango Delta in Botswana about three or four months after passing Rundu.

The highest flows at Rundu are much higher (the average in April is 405 cubic metres/second (m^3/s)) than peaks for the Cuito (average of only 175 m^3/s in April), and so the Okavango brings in much more water during floods. The Okavango also has a much more variable flow than the Cuito: the highest rate of flow ever recorded for the Okavango (962 m^3/s) is about 90 times greater than the lowest rate ever recorded (11.1 m^3/s). The same figures for the Cuito only vary by a factor of less than 10: from a highest of between 550 and 600 m^3/s to the lowest of 64 m^3/s. The higher discharge rates of the Okavango mean that it carries more water than the Cuito between January and May, but it

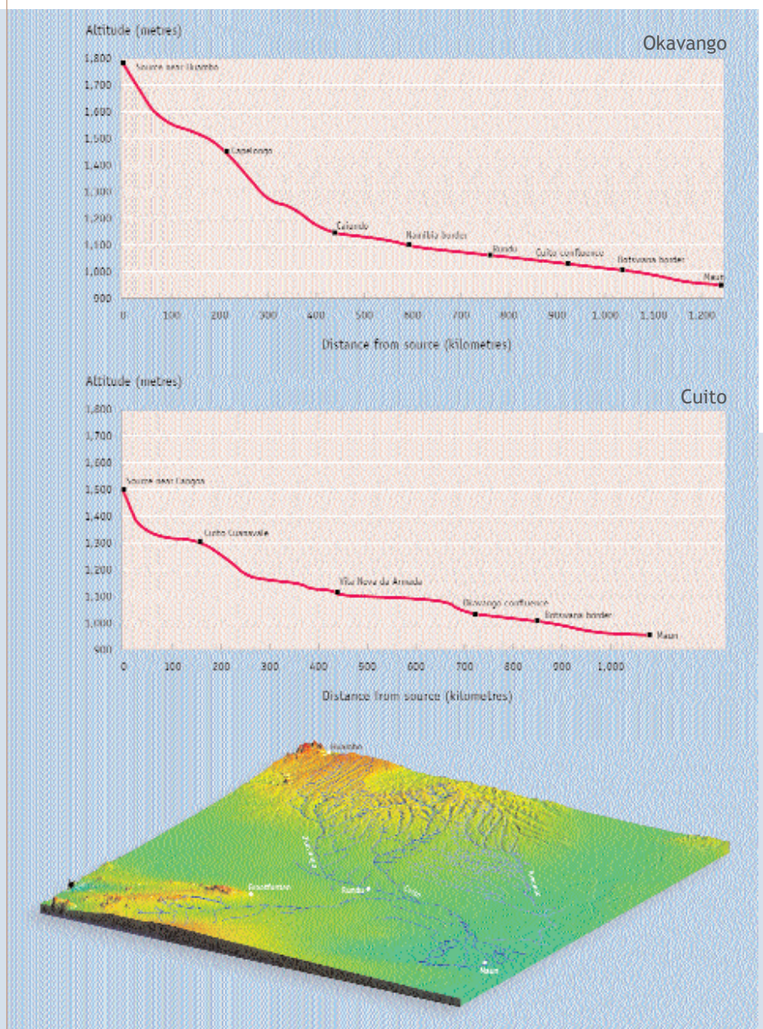


FIGURE 21-
The Okavango (left above), and Cuito (left below), have extremely shallow gradients along much of their courses. The steepest flows are in the upper catchment of the Cubango after it leaves the Bié Plateau. The graph shows the altitude of the rivers at different places, while the three-dimensional model gives a pictorial view looking from the south-east over the Delta and then towards the Bié highlands in the far north-west.
Part of the drainage of the Kwando River in the east is also shown.

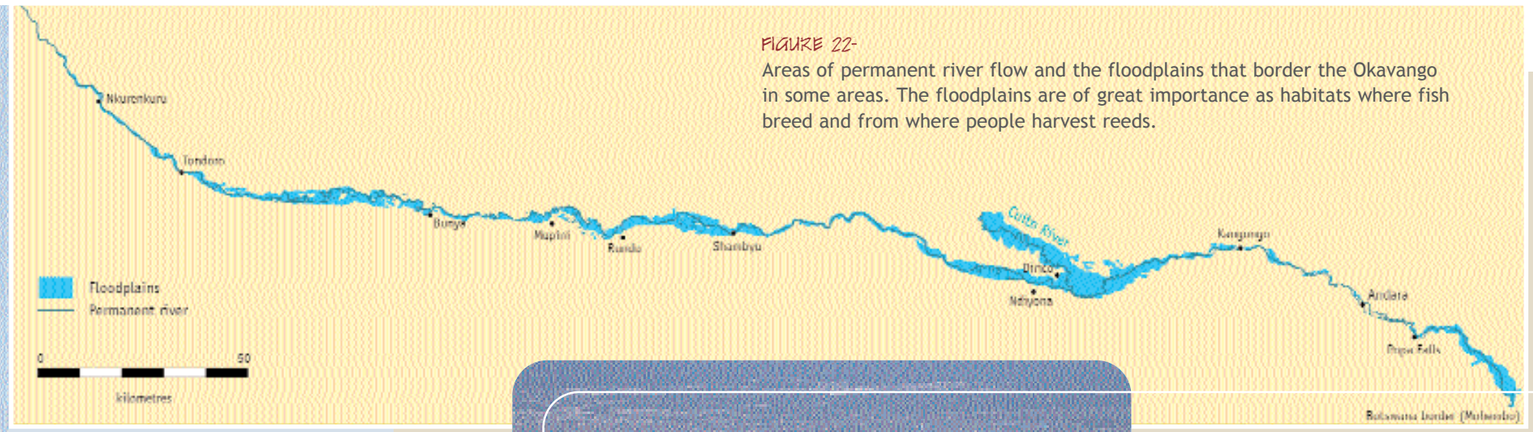
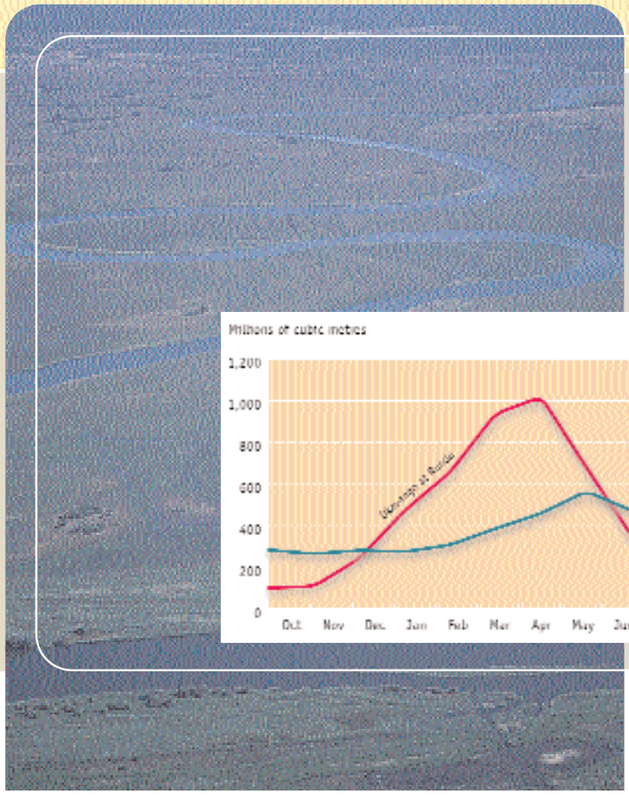


FIGURE 22-
Areas of permanent river flow and the floodplains that border the Okavango in some areas. The floodplains are of great importance as habitats where fish breed and from where people harvest reeds.



The broad meanders of the Cuito River just before its junction with the Okavango River at the bottom of the photograph.

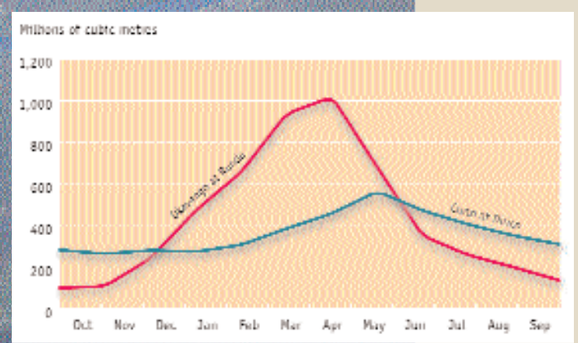


FIGURE 23-
The volume of water carried each month by the Okavango is greater than that of the Cuito between January and May, but the Cuito provides more water during the rest of the year.

then drops so much that the Cuito contributes more water for the remaining seven months of the year (FIGURE 23).

The following table provides measures of annual runoffs above the Cuito's confluence (at Rundu) and below the Cuito at Mukwe. The differences between maximum and minimum volumes are substantial: about four times at Rundu and about three times at Mukwe.

Total average, minimum and maximum annual runoffs at Rundu and Mukwe in million cubic metres (Mm^3).

Place and years of data	Average	Minimum (year)	Maximum (year)
Rundu (1945-2001)	5,207	2,260 (1971/72)	9,810 (1962/63)
Mukwe (1948-1998)	9,594	5,607 (1995/96)	15,354 (1967/68)

It is also clear that river flows differ widely between high and low years, as shown by the year-to-year changes in FIGURE 24. There are thus many years when the flow is high and many other years with little runoff. This graph also reflects some longer-term changes, especially the lower flows during the 1980s and 1990s, much of which are attributable to lower rainfall in those two decades.

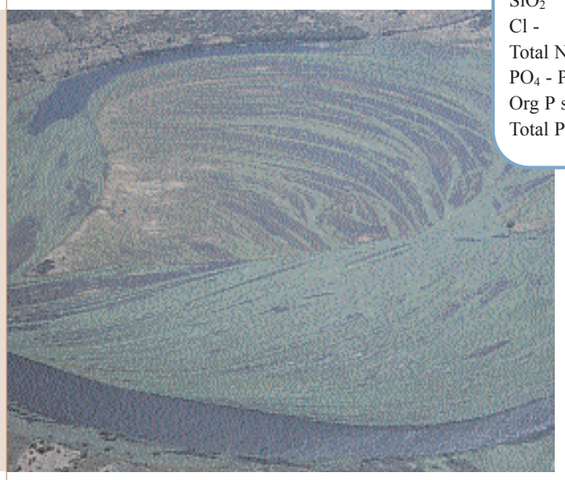
Annual variations in runoff in the months of October and April are compared in FIGURE 25. The April flows fluctuate greatly from year to year, reflecting great year-to-year differences in rainfall and runoff. By contrast, there is relatively little variation from year to year in October volumes, showing that the river subsides each year to a fairly stable rate of discharge. The only significant change is the lower flows in recent years.

THE QUALITY OF THE WATER

Information on the quality of water in the Cubango and Cuito in Angola is not available, but the Okavango's water is generally clean and clear along its entire course. There are few nutrients or sediments, and its turbidity (or muddiness) is low. The chemical composition of river water measured during a survey in 1994 is given in the following table.

Chemical features of Okavango River water in Namibia.[4]

	Unit of Measurement	Mainstream Sites	Backwater Sites
Conductivity	Siemens/cm	30-45	45-205
PH		6.8-7.2	6.7-7.5
Total dissolved solids	mg/l	25-42	30-172
Alkalinity	as $CaCO_3$ m/l	10-20	20-95
Na ++	mg/l	1-3	3-10
K +	mg/l	1-2	1-3
Ca ++	mg/l	6-16	7-46
Mg ++	mg/l	3-8	6-22
SiO_2	mg/l	8-15	9-36
Cl -	mg/l	0.5-1.0	1.0-5.6
Total N	mg/l	0.1-1.5	0.1-6.2
PO_4 - P	mg/l	0.01-0.07	0.02-0.15
Org P sol	mg/l	0.01-0.10	0.02-0.32
Total P	mg/l	0.01-0.15	0.04-0.37



The table shows that the concentrations of chemicals are generally higher in the river's backwaters than in the main stream. It is likely that concentrations of phosphates have increased in recent years, especially close to Rundu as a result of effluent from the town.[5] Such chemicals from sewage and fertilizers could have severe effects on aquatic life in the river, and there is concern that increasing chemical concentrations may rise as the number of people and farming activities along the river increase.

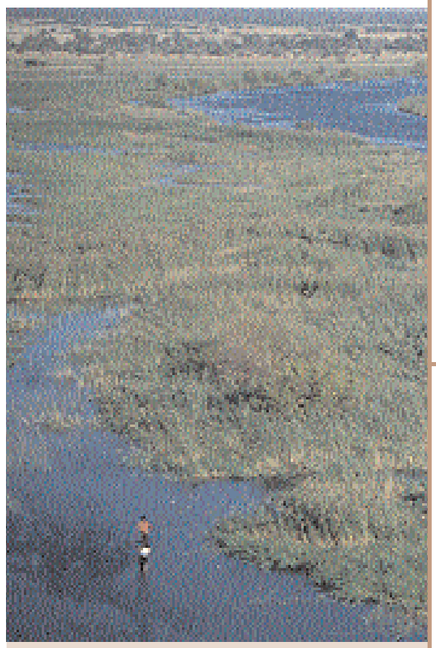
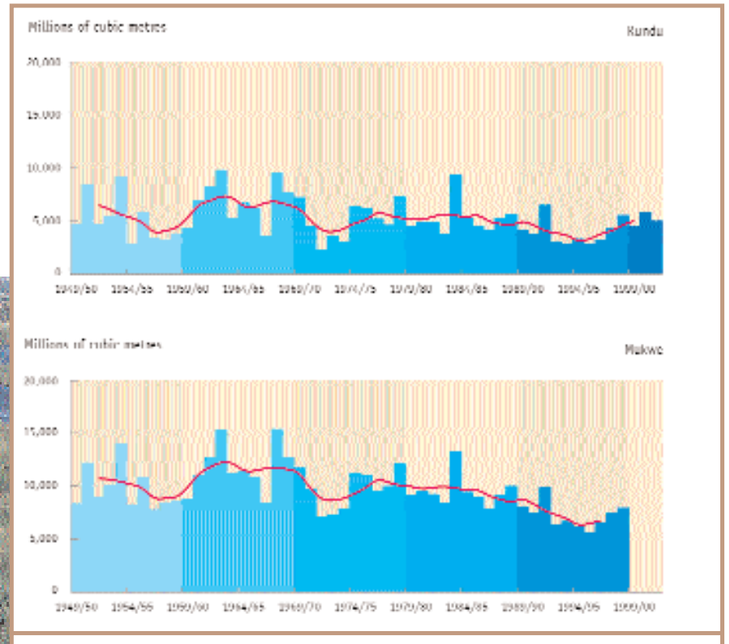


FIGURE 24-
Total volumes of water passing Rundu and Mukwe vary greatly from year to year. The columns show the actual values while the red lines are moving averages over five years.



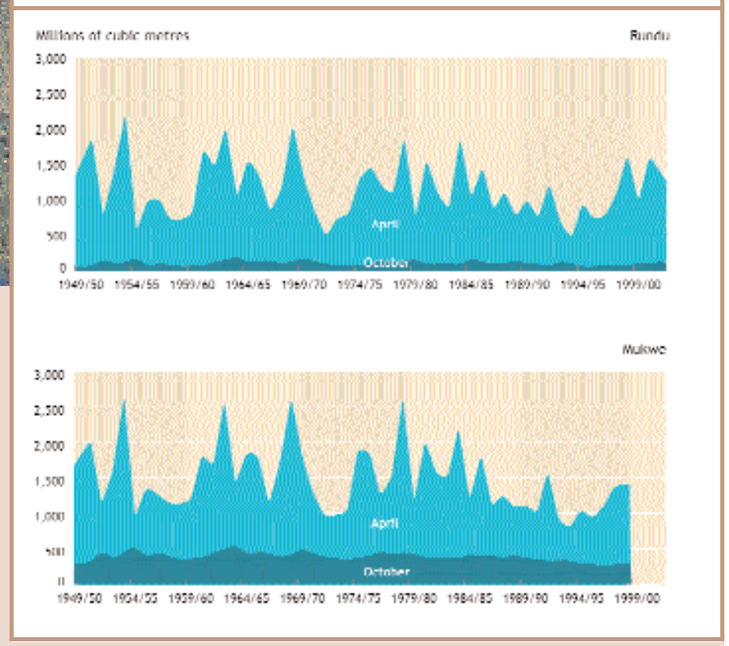


FIGURE 25-
Compared to April, the volume of water carried in October is much lower but also much more stable than in April when flows fluctuate widely from year to year. The river also carries much more water at Mukwe during October than at Rundu because of the greater input of water from the Cuito during the drier months.

FISH AND FISHING

An abundance of fish was one of the resources that attracted people to live along the Okavango River long ago, and today fish remain a significant feature in the lives of many people. Fish also form an important part of the river's natural ecology. A total of 76 species have been recorded in the stretch of river in Namibia, and this relatively high diversity is due to the fact that the fish community is divided along two dimensions. Firstly, species are separated in terms of their different kinds of food into so-called detritivores that eat tiny particles of food that float in the water, herbivores that feed on plant material, and predatory carnivores that eat other fish. A second, and more important level divides species into the different habitats they prefer and to which they are adapted. Thus, different species occupy the river's five main habitats: the mainstream, rocky areas and rapids, backwaters, permanent swamps, and the floodplains.[6]

The different species also vary in abundance. Fish that are caught most frequently are the red-breasted tilapia, barbs, catfish, tigerfish and squeakers. By contrast, the ocellated spiny eel and the broad-head catfish are extremely rare and are regarded as species requiring special conservation attention.

While separate areas in the river provide different fish species with their preferred habitats, the floodplains are of greatest value as places in which most fish breed. The floodplains start to become inundated in the later summer months once the rising waters push out over flat surrounding ground. Very large areas become floodplains in the best years when the river's level rises up to 4.5 metres above its lowest levels (see photographs on page 49). The most important feature of the flooded areas is that they are very rich in nutrients. Whole communities of plants and animals flourish as a result of the abundant nutrients, all of which provides young fish with a rich supply of food. The floodplains also provide the young fish with a refuge where they are comparatively safe from larger, predatory fish. The best survival of young fish and overall increase in fish populations occurs in years when water levels are highest and the flooding lasts longest. Indeed, the annual flooding is the main driving force for the breeding of fish. The greatest danger to the fish resource occurs when patterns of flooding are changed and every effort should be made to protect the limited floodplain areas (FIGURE 22).

Aquatic plants start to die off as the floodwaters recede during autumn and winter. Nutrients from the decaying plants are then returned to the soil, and young fish leave the floodplains to live the remainder of their lives in the main stream or in permanent backwaters of the river. However, large numbers of fish are sometimes trapped when the water drops, and great numbers of birds, people and other predators then enjoy a feast of helpless fish.

Many people catch fish on a regular basis, either as a source of food for their homes or as a commodity to sell. Three surveys have estimated that between 32 and 47% of households along the river have family members catching fish.[7] The surveys were done between 1987 and 1994, and in today's figures of something like 20,000 rural homes along the river, these percentages would translate into roughly 6,000–9,000 households. However, this does not mean that people from all these homes fish every day. The proportions of fishing households may also have declined since these surveys because of the recent drop in fish numbers (see below). Fish are also traded. In one study, about 42% of rural households along the river reported that they sold fish and 29% stated that they bought fish rather than catching them themselves.[8]

The peak period for fishing is between September and December, when the river is at its lowest, the fishing grounds are most accessible and the fish are most concentrated. This is also the period of the year when mahangu from the previous season's harvest may be in short supply and fish can then form an important supplement to the diet of the poorest people. Compared to other incomes, however, fish contribute little to the overall cash or material, in-kind incomes of the majority of rural homes (see page 107). Two of the surveys mentioned above estimated the total weight of fish caught per year as 840 and 1,045 metric tons, respectively. Taking these figures and the number of households that catch fish into account, each person along the river consumes an average of only 10-20 kilograms of fish per year.[9]

The kinds of traps or gear used to catch fish are usually divided into traditional and modern methods. The most widely used traditional gear are fish funnels and kraal or corral traps, while other methods include using fish fences with valved traps and corrals, scoop baskets, push baskets, bows and arrows, set fish hooks, and spears. Modern gear consists of gill and seine nets, line and hooks, wire mesh fykes and mosquito nets.

The use of mosquito nets is often seen as problematical because fish eggs and the tiniest young fish are caught in the fine mesh. Indeed, the use of nets and overall pressure placed on fish populations by the growing number of people fishing in the river is widely believed to have caused a major decline in the fish resource. There are, however, several aspects to this issue. The first is that it is both the numbers of fish and especially their sizes that have decreased, and so the overall weight of fish caught has been reduced a great deal. A second feature is that the populations of some species have remained fairly stable, while others may have declined. The third aspect is that the succession of years with relatively low flows of water has probably also contributed to a reduction of fish. With smaller floods and the floodplains remaining inundated for shorter periods, fewer fish would have produced eggs and the survival rates of young fish would have been reduced. However, more research is needed to understand the nature and severity of human fishing pressures and patterns of flooding on fish populations in the Okavango.

Key notes

- Assessments of the importance of the Okavango River need to distinguish between the value of the river itself and that of the surrounding riverine valley and habitat.
- The river's clean and clear water is mainly due to the fact that most of the water filters through and out of Kalahari sands over much of the catchment area.
- Rainfall across the whole catchment decreases from north to south and from west to east, and the river increasingly becomes a linear oasis the further downstream it flows.
- The Cuito contributes about 45% and the Okavango 55% of the total water flow per year, but the contributions vary: more water comes from the Okavango between January and May and the Cuito then contributes a greater flow from June to December.
- Flows in the Okavango are very much more variable from year to year and month to month than in the Cuito.
- The volume of water leaving Kavango in the year of highest recorded flow (15,354 million cubic metres in 1967/68) was almost three times greater than that in the lowest year (5,607 million cubic metres in 1995/96).
- There are extensive floodplains along certain stretches: between Tondoro and Bunya, between Mupini and Shambyu, and around the Cuito confluence. Most fish breed in the floodplains and changes to flooding patterns pose a great danger to the fish resource.
- The use of nets and overall pressure placed on fish populations by the growing number of people fishing in the river are believed to have caused a major decline in the fish resource.

SAND AND WATER

CHAPTER
SIX

RESOURCES

Natural wealth

Kavango looks the way it does because it was moulded by various geological and historical events, many of which were described in Chapters 2 and 3. The region's plants and animals were likewise shaped by evolutionary processes of long ago, but the way in which these organisms live today is also a more direct consequence of three fundamental inputs: energy from the sun, water provided by rain, the river or from underground, and the soils in supplying a medium in which plants can grow and draw nutrients and water. These three ingredients – alone and in combination – determine the nature and abundance of living organisms in the region.

Solar energy is obviously abundantly available in providing energy for plant growth and heat to warm the air and ground. By contrast, water is a severe problem, especially for anything that lives any distance from the river. Rainfall is highly seasonal and unpredictable (see Chapter 4), and the growth of crops and natural vegetation is often limited by a shortage of rainwater. Underground water is beyond the reach of most roots, and it is only through the recent use of boreholes and pumps that groundwater can be used for people and livestock, as described below in this chapter. Soils, too, are a severe problem because they are so infertile and hold little water in most areas.

This chapter begins with accounts of underground water and soils as two of the fundamental inputs on which life in Kavango depends. Then follows information on the region's natural vegetation and the major impact that repeated bush fires have on the structure and composition of woodlands. A variety of aspects concerning animal life in Kavango are described with a special focus on the abundance and distribution of larger mammals. A final section considers the region's conservation areas and the use that tourism makes of these natural parks.

THE SUPPLY OF WATER

People and livestock in Kavango get their water from two sources: the river and from boreholes that pump water from under the ground. Various aspects concerning the flow of water in the Okavango River are described in Chapter 5, but what is important here in the context of water supply is that only a small fraction of the water is used. The total amount of river water now used in Kavango each year is about 22 million cubic metres (Mm^3), of which approximately 74% supplies agricultural irrigation schemes, 15% is used by rural people for their livestock and domestic needs, and 11% is for urban use in Rundu.[1] The 22 Mm^3 amounts to about less than $^1/_4$ of a percent of the total average volume of water that enters Botswana at Mohembo, and even during years and months with low flows, the amounts removed from the river in Kavango are relatively small. However, several new and large irrigation schemes are being developed and planned (see page 99) and, once implemented, these would raise the total amount of water extracted from the river to about 136 Mm^3 per year, or about 1.4% of all water that leaves Namibia at Mohembo. This proportion still appears small but the effects of removing these amounts of water on the health of the river, especially the Okavango Delta in Botswana, have not been assessed. A good deal of irrigation water would be pumped at the start of the growing season in early summer when the volume of water in the river is at its lowest. Moreover, the proportion of water extracted during the driest months in years when flows are unusually low could be substantial. No regulations or quotas control the use of river water in Angola, Namibia or Botswana.

The supply of water is one thing, but having access to uncontaminated water is also important for reasons of avoiding diseases caused by bacteria and other parasites in dirty water (see page 85). Water sources are commonly divided into those that are unsafe (potentially contaminated water from the river or hand-dug wells) and those that are safe (underground or borehole and treated river water). In 2000, approximately 52% of all households used so-called 'safe' sources, a slight improvement from 46% in 1991. The great majority of homes that use unsafe water are in rural areas. Thus in 2000, only 40% of the rural population had access to safe water compared to 82% of people in Rundu.[2]

Most underground water is provided through boreholes drilled and supplied with pumps by the Department of Water Affairs, although a few wealthier farmers have also installed their own boreholes and pumps. Borehole pumps generally draw water using diesel, wind or electrical (often solar powered) energy, whereas water in hand-dug wells is usually winched to the surface by hand. The main effect of having access to groundwater has been to enable people to settle in inland areas where they would otherwise have been unable to live (see page 114). However, underground water has also been of value in places close to the river, especially where it is used to provide safe water to bulk water supply schemes for schools, hospitals and the public at such places as Nkurenkuru, Kahenge, Tondoro, Rupara, Bunya, Mupini, Kayengona, Shambyu and Nyangana.

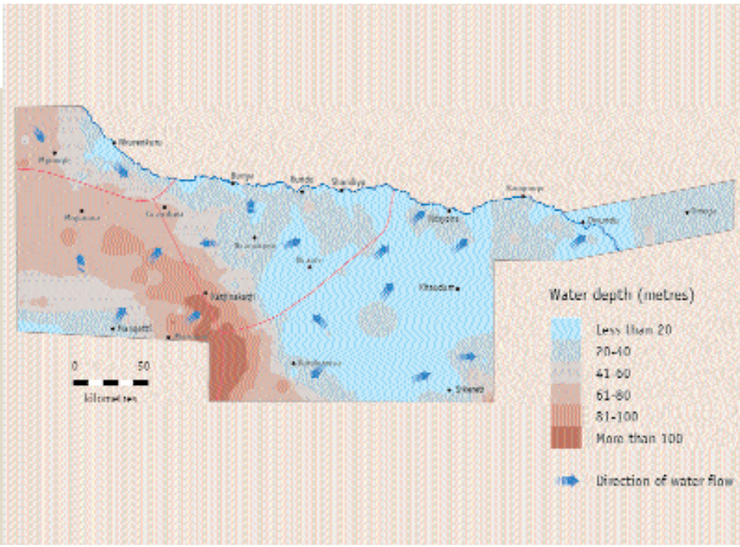


FIGURE 26-
Underground water is usually found at much shallower depths in eastern than western Kavango. The scale to the map shows the average depth at which borehole water is pumped from below the surface. The red lines indicate the approximate boundaries of four zones in which underground water flows in different directions, as shown by the arrows.[3]

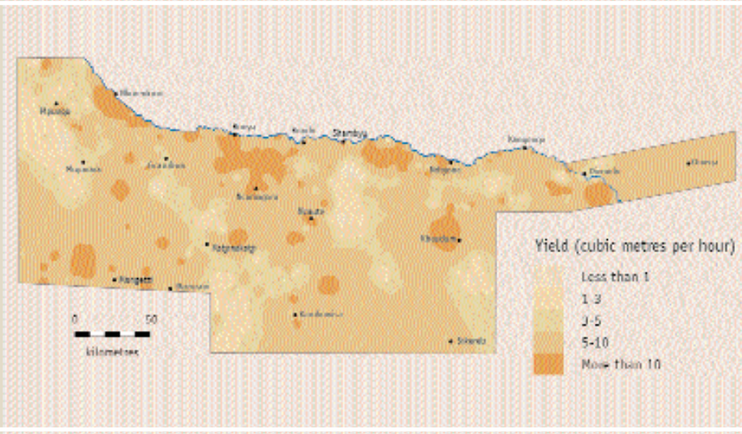


FIGURE 27-
Most boreholes provide moderate supplies of water sufficient for the small villages. The map shows average yields from boreholes measured in cubic metres of water pumped to the surface per hour.[4]

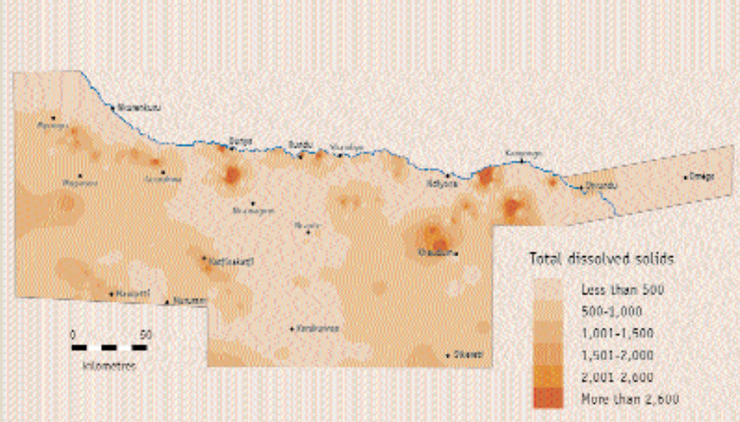


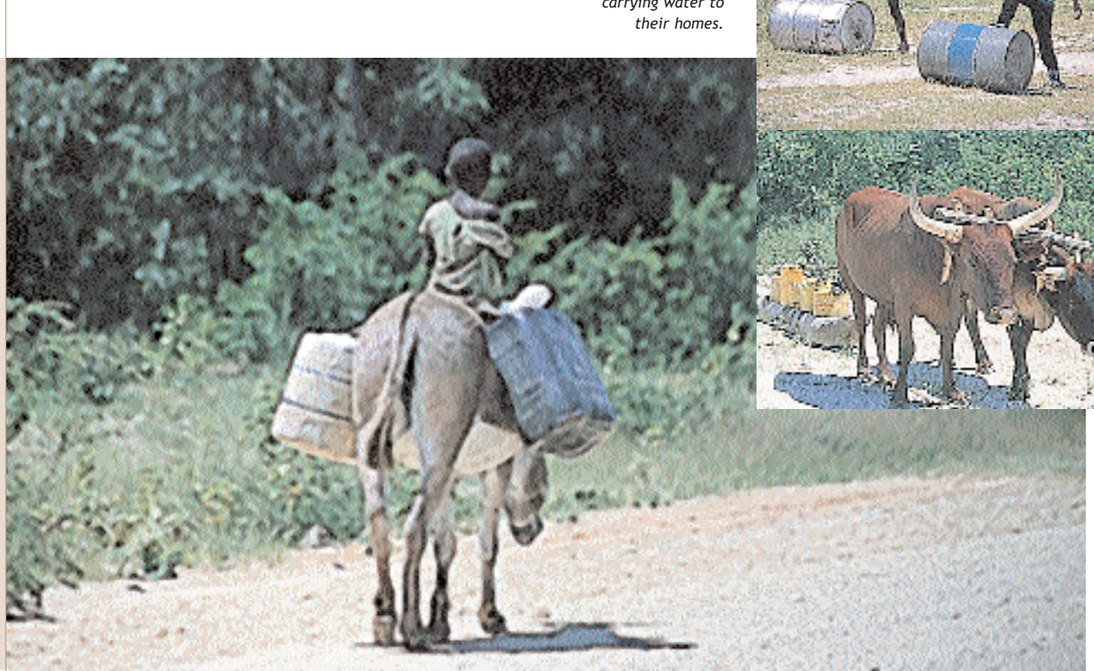
FIGURE 28-
Underground water in the region is usually of good quality, as shown by the values of total dissolved solids (TDS) in milligrams per litre. The purest water has low TDS values, and humans can drink water with values of less than 2,000. Water with values above 2,600 should be avoided, while even live-stock should not drink water having TDS values above 5,000.[5]

Most underground water lies in bodies of water – known as aquifers – in the Kalahari sediments (see page 24). The water is trapped under pressure in tiny spaces between the grains of sand and other sediments. The aquifers lie at various depths (FIGURE 26), those in the eastern half of the region being at the shallowest levels of 10 to 30 metres below the surface. Water in western Kavango is usually found below 60 metres, and water in some places has only been found at depths of as much as 350 metres. The main effect of these different depths is that deeper water is much more expensive to find and pump. Other than aquifers in the Kalahari sediments, the only other underground water bodies are in Damara Sequence rocks of the Nosib Group in the area of Andara and Popa Falls (see page 24).

The shallow aquifers along the river often consist of shallow bodies of water trapped in old channels of the Okavango River. Most of the water seeping into those ancient deep channels probably flows in from the south. Indeed, these movements of underground water from the south mean that the Okavango River gains water from shallow aquifers, rather than the river water recharging aquifers. Flows of underground water into the river valley occur in three of four separate zones of movement of underground water (FIGURE 26). The first is in the north-west where water permeates south-eastwards from Angola. A second zone is in the centre of Kavango, and here water flows radiate out from the vicinity of Ncamagoro. Flows also spread out in a third zone in the south-east, while water flows north into Kavango from the Grootfontein area in the fourth zone.

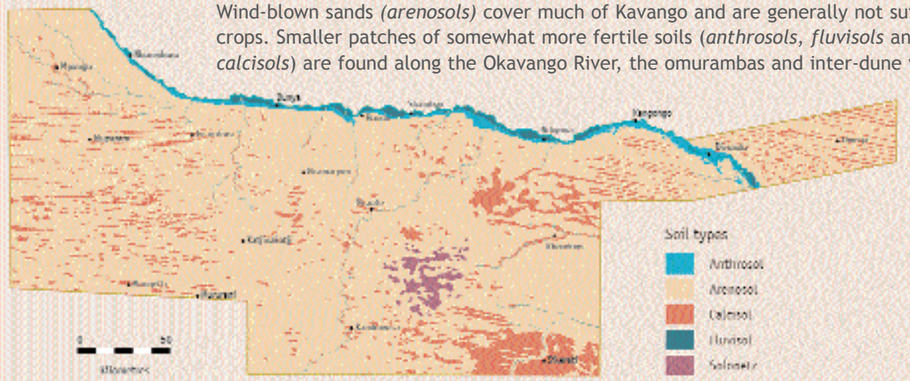
Shallow aquifers in the east are recharged much more rapidly by good falls of local rain than the deeper aquifers into which water seeps over much longer periods. Water is also relatively easy to find in the eastern shallower aquifers, and yields of 5–10 cubic metres per hour can generally be obtained (FIGURE 27). These are adequate to supply the household and livestock needs of small villages. There is, however, a good deal of variation in yields, even between boreholes close to each other. Most differences are due to three factors: (a) differences in the permeability of the sediments in which the water is trapped, (b) the thickness of the aquifer (and the depth to which the borehole penetrates the aquifer), and (c) the diameter of the borehole well.

The majority of boreholes in Kavango provide pure, good quality water with values of total dissolved solids (TDS) of less than 1,000 milligrams per litre (FIGURE 28). Water unsuited for use has been found in only a few areas, in many of which the water was probably contaminated by animal waste, especially where cattle troughs or kraals were close to wells drawing water from shallow aquifers. Precautions should be taken to guard against additional contamination of the region's underground water resources as the number of people and livestock grow.



Water is often transported over substantial distances, and people in Kavango use many methods of carrying water to their homes.

FIGURE 29
Wind-blown sands *(arenosols)* cover much of Kavango and are generally not suited to crops. Smaller patches of somewhat more fertile soils (*anthrosols, fluvisols* and *calcisols*) are found along the Okavango River, the omurambas and inter-dune valleys.[6]



Soils in the bottoms of omuramba valleys are more clayey (and thus dark) than the pale coloured sands higher up and away from the valley. This is the Ndonga Omuramba.

SOILS

Soil is often taken for granted as the substance that soaks up rainwater and in which grasses, trees and crops grow. Other than farmers, many people also fail to recognize how soils vary and how their qualities affect how much water is retained, the depth to which a plant's roots may extend, and what nutrients the soil contains for plant growth. The combination of these qualities dictates such important features as what plant species can grow and the structure of plant communities.

Different kinds of soil are generally characterized by the way in which water, air and mineral and organic components are arranged within the soil body. Soils in Kavango are completely dominated by sand (FIGURE 29), especially fine wind-blown sands deposited as a mantle across the region during much drier times long ago. The fine sands, loosely called Kalahari sands, are more correctly termed *arenosols*, and they usually extend to a depth of at least one metre. Other than sand, which generally makes up more than 70% of the body of the soil, less than 10% of the soil consists of clay and silt. The sandy texture allows water to drain away rapidly, leaving very little moisture at depths to which most plant roots can reach. The porous sand also holds very few nutrients, and the loose structure of sand means that there is little run-off and water erosion.

There are two types of soils along the river. The first and closest to the river are *fluvisols*, which are sediments deposited during floods. Most of these soils are therefore on the floodplains (see Figure 22, page 51) where periodic flooding means that most areas of *fluvisols* cannot be used for crops. The sediments usually consist of a mix of silt, clay and fine sands. The soils are not infertile but also not very productive. On higher ground within the river valley are so-called *anthrosols*, which are soils that have been modified by repeated ploughing and crop growth. The body of soil originally consisted mainly of two layers: a top layer of *arenosols* overlying deeper deposits of *fluvisol* sediments. The *fluvisols* were probably deposited during a much wetter period while the wind-blown *arenosols* were placed there during a later arid phase. The two layers have been mixed by repeated ploughing in many areas because it is on these soils that most crops are grown in the region. The *anthrosols* are, however, generally low in nutrients.

Most other crops are grown on *calcisols* in the omuramba and inter-dune valleys. A layer of calcium carbonate lying at some depth below the surface characterizes *calcisols*, which consist mostly of fine sand and smaller proportions of clay and silt. In some areas the calcium carbonate forms blocks of calcrete. The soils are potentially quite fertile but they generally contain little organic material and iron and zinc may not be available to plants as a result of the high concentrations of calcium.

A large area of *solonetz* soils occurs to the west of Khaudum. These are not suited to crop growth because they are characterized by concentrations of sodium salts at levels that are harmful to many plants. Much of the sodium accumulates in a layer of clay below the soil surface.

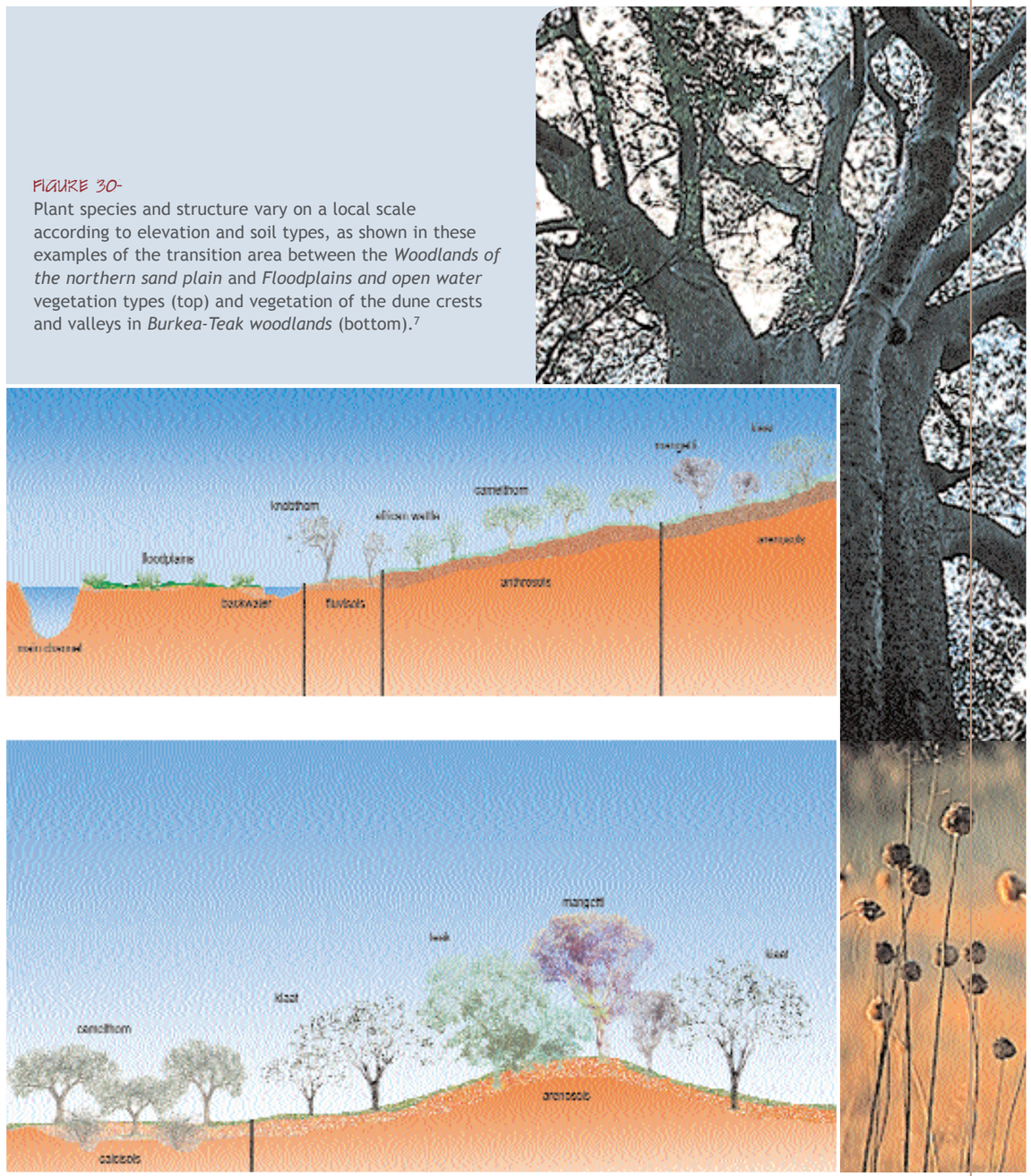
This account of the five major types of soils should make it clear that soils in Kavango are generally not fertile. Much of this is due to the predominance of sand and comparative scarcity of clays and silt. Water thus drains away rapidly and the percolating water also often carries away nutrients from within the soil. The poor fertility of the soils is also a reflection of the arid environment in which relatively little plant material is available to decompose into organic nutrients. Moreover, frequent fires burn away fresh plant material and humus that could decompose into the soil, and cause nitrogen and sulphur in the top soil layers to be released into the atmosphere. Experiments have shown that crop yields can be boosted substantially by the addition of nitrogen and phosphorous, but these need to be applied at specific times and in appropriate amounts to be effective. The fertilizers, particularly nitrogen, will only be effective in years with adequate rainfall, however, and poorer farmers will be reluctant to buy fertilizers if there is a sizeable risk of them not providing any benefit.

PLANT LIFE AND TYPES

Plants are important to Kavango for many reasons: in providing pastures for livestock, materials for building, weaving and wooden craft, fuel wood, fruits and nuts and traditional medicines. These are aspects of value to people, but plants are also the most important components of all natural habitats. There would be no animals without plants, and the greater the diversity of plants in an area, the higher the diversity of birds, mammals, insects or other groups. For example, wildlife in Mahango is abundant both for reasons of the protection that the reserve offers and for the fact that a diversity of plant life is present to offer animals food and shelter.

The topography or relief of the ground and soil types are the most important factors to determine the nature of plant communities, and the effect of these is

FIGURE 30-
Plant species and structure vary on a local scale according to elevation and soil types, as shown in these examples of the transition area between the *Woodlands of the northern sand plain* and *Floodplains and open water* vegetation types (top) and vegetation of the dune crests and valleys in *Burkea-Teak woodlands* (bottom).[7]



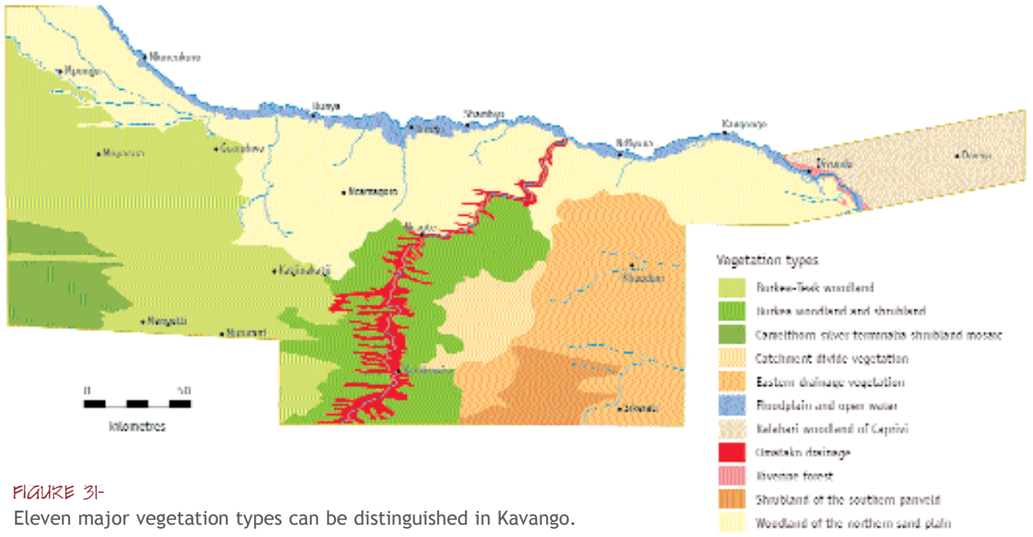


FIGURE 31-
Eleven major vegetation types can be distinguished in Kavango.

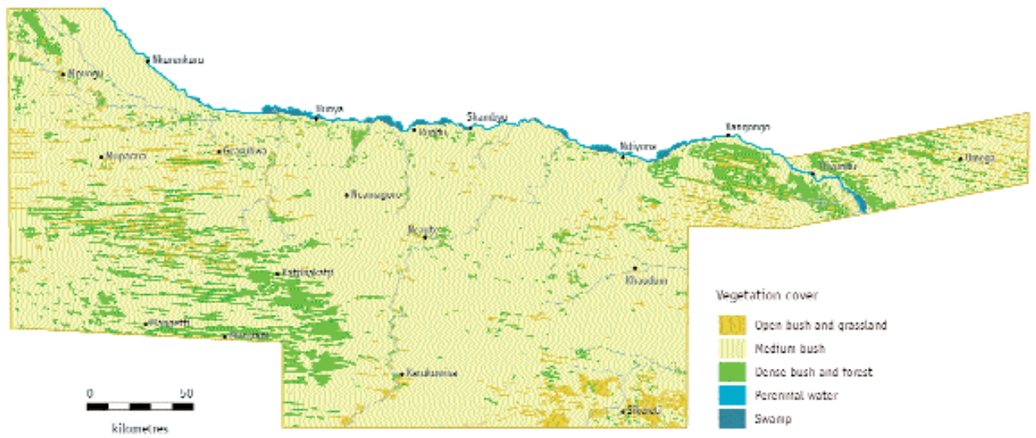


FIGURE 32-
Many parts of the region are covered in dense woodland, while other areas are more open grasslands or have been cleared of trees, as shown in this map of vegetation cover.

clear on both a broad and local scale. For example, the relative uniformity and predominance of broad-leafed, deciduous woodlands across the region is largely the result of widespread distribution of wind-blown sands (FIGURE 29). Examples of more local variation are provided by the diagrams in FIGURE 30, which show how small-scale changes in the composition and structure of plant communities relate to soil types and relief. These kinds of local and small-scale changes are found throughout the region and they are so prevalent that classifying plant communities into zones or types is often difficult. Indeed, much of the vegetation is often best characterized as mosaics of various small units.

While the vegetation types shown in FIGURE 31 are mosaics consisting of many species and communities of plants, there are three broad groupings. Firstly, much of the region consists of fairly tall woodland growing on deep Kalahari sands. This is true of the *Burkea-Teak woodlands*, *Burkea woodland* and *shrublands*, *Woodlands of the northern sand plain*, *Kalahari woodlands of Caprivi*, *Eastern drainage vegetation*, and *Catchment divide vegetation*. In many of these areas there are the remains of old dunes and the vegetation varies considerably between that on the sandy dunes and the more clayey soils in the inter-dune valleys. Thus, tall teak, false mopane *(msivi)*, burkea, kiaat *(mukwe)* and mangetti trees often dominate the deeper sands, while lower lying, more clayey soils are characterized by shrubby vegetation of silver terminalia, camelthorn, *Combretum hereroense*, *Acacia fleckii* and patches of grassland. Much of the *Catchment divide vegetation* grows on solonetz soils.

Much of inland Kavango looks like this savanna woodland dominated by Burkea africana.

Secondly, there are vegetation types associated with drainage systems: the *Floodplains and open water*, *Riverine forest*, and the *Omatako drainage*. Vegetation along many of the other dry omurambas is similar to that in the Omatako, the sides of the valleys being wooded with fairly tall burkea trees while the valley floors are often grasslands with scattered copses of shrubs. Much of the original vegetation in these drainage systems has been destroyed by the clearing of land for crops, especially along the Okavango River. The riverine forest flanking the river near Andara and Divundu is the only forest of its kind remaining along the Okavango, and every effort should be made to conserve the forest.

Thirdly, there are two vegetation types in which there are many pans: *Camelthorn-Silver terminalia shrubland mosaic and shrublands of the southern panveld*. The soils in these areas are often shallow and contain large quantities of calcrete.

In addition to changes in the types of vegetation in Kavango, there is also much variation in the amount of plant cover, especially of trees and shrubs (FIGURE 32). The fairly fine resolution provided in this map shows how old dunes are more wooded while the inter-dune valleys are more open. The same is true of plant cover along the dry drainage lines. Many of the patches of dense bush are teak woodlands, especially those in the Mururani-Katjinakatji area, west of Andara and in the Caprivi Strip.

PLANT GROWTH

FIGURE 33 provides a perspective on how plant growth and production varies from season to season. The 11 maps show an index of total plant growth each season between 1991-1992 and 2001-2002, and two features stand out very clearly in the maps. First, there is a high degree of variation in plant growth from season to season, a reflection of how annual rainfall varies so much. The season of 1994-1995 was by far the worst, and Rundu then received only 308 millimetres. Andara recorded 246 millimetres, the lowest total in 55 years of records for the station. Another bad season with low plant production occurred in 1992-1993. Most of the best seasons have been in recent years: 2001-2002 and the three between 1997-1998 and 1999-2000.

The second feature shown by the 11 maps is how much plant growth varies from place to place. Again, this reflects the patchiness of rainfall, some areas receiving good falls and others very little. But the variation in plant growth is also due to certain kinds of vegetation producing more new growth each season than other kinds. In most seasons, the swampy areas in Mahango Game Reserve show up as producing more growth for this reason. And, finally, the maps show how areas that have been cleared of natural vegetation now produce very little growth. This is best seen in the area around Rundu, where there is less plant growth each season than elsewhere.

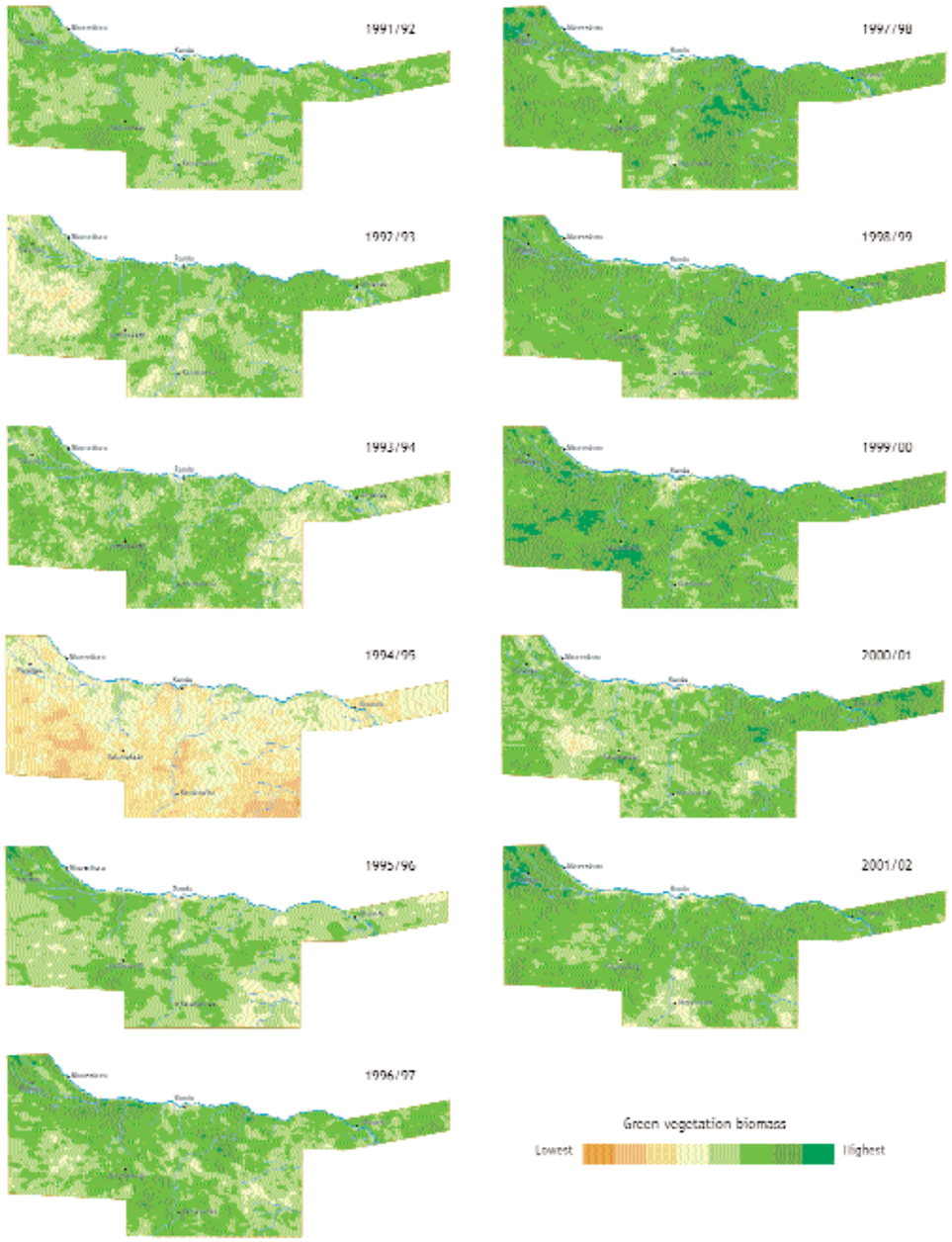
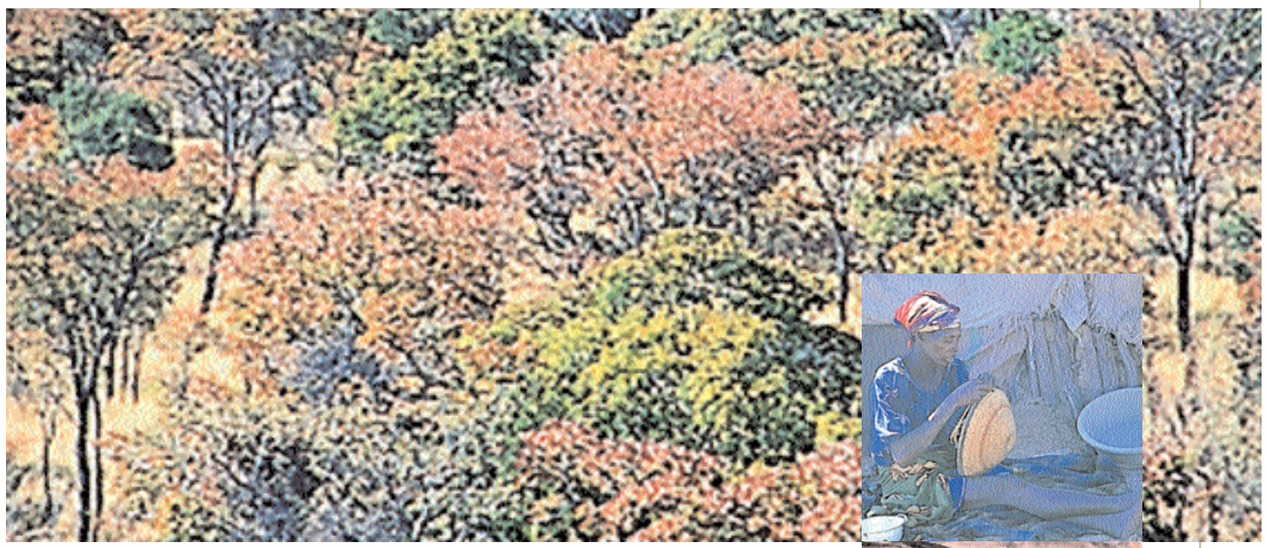


FIGURE 33-
Plant production varies from year to year and place to place, as shown over 11 seasons between 1991/1992 and 2001/2002. The colours are an index of the total volume of new plant growth during each season, which lasts from July of one year to June of the next.[8]



The coming of winter brings out splendid autumn colours as leaves begin to dry.

THE MANY USES OF PLANTS

People in Kavango use natural plant resources in a variety of ways. Many of the uses are essentially domestic in nature, the plant products being used at home and for the immediate benefit of members of the household. Other uses involve the sale of items to earn cash incomes, and many of the sold products are also exported from the region. Perhaps the most important use made of plant products is for wood. Most homes in Kavango are at least partially constructed using timber harvested from local trees such as kiaat, teak, burkea, camelthorn and silver terminalia. Wood was used as a fuel in approximately 90% of rural homes in 1991, and that proportion has probably not changed much since then. In fact, the use of wood fuel has probably increased as a result of the growing volumes of firewood now sold alongside the major roads, much of it being exported for use elsewhere. Sleds and dug-out boats are also made from pieces of wood or tree trunks. Other major uses of wood are for furniture and craft production. Large-scale commercial logging and harvesting of kiaat, false mopane and teak stopped in the early 1990s, but some furniture continues to be made from these trees. Until some 10 years ago, most wooden craft were small articles sold along the road between Rundu and Katjinakatji, but an increasing export trade both in small items and large statues has developed in recent years. Many of these items are sold in Windhoek and Okahandja. Large rough blocks of kiaat and false mopane wood are also exported for the use of carvers elsewhere. In theory, anyone cutting wood for the export of timber, craft production and sale of firewood should have a permit from the office of the Directorate of Forestry in Rundu.

Baskets and firewood are just two of the many products derived directly or indirectly from the wealth of plant life in Kavango.

Grass is used extensively, most notably for grazing Kavango's herd of about 150,000 cattle. Little information is available on the quality and availability of pastures in Kavango, but reasonable grazing is apparently widely available away from the comparatively small areas that are very heavily stocked (see page 102). *Kweek* or *Cynodon dactylon* lawns on the river's floodplains and along the omurambas are a particularly valuable grazing resource. Most rural houses are thatched with grass and many homes near the river have walls of platted reeds. A substantial export industry of thatching grass (mainly *Eragrostis pallens*) has developed in recent years, much of it going to commercial thatching companies in Windhoek, central northern Namibia and South Africa. In the few areas where palms grow in Kavango, their leaves are used to make baskets, both for domestic use and for sale in a growing export market.

People cause most of the hundreds of bush fires that ravage Kavango each year. Some fires are set deliberately while others run out of control, often when trees are burnt to clear new fields. Smaller trees can be cleared with an axe, but fires are best to kill tall camelthorns, as shown on the opposite page.

A large variety of trees and shrubs produce nuts and fruits that are consumed domestically. For example, a recent survey found that nuts and fruits from between 35 and 50 different species are eaten in any one area.[9] Most of these are taken only occasionally but others, especially mangetti, monkey oranges and *msivi* provide relatively large quantities of food. Mangetti nuts are also used on a large scale to brew an alcoholic drink, *kashipembe*, and as a source of oil. Studies are now exploring the potential for distilling *kashipembe* into a bottled liqueur and for producing oil for the cosmetics industry elsewhere in the world. The leaves of a number of wild spinach plants are regularly consumed, as are water lilies and various mushrooms. Many plants are also used for medicinal purposes, and the same recent study on plant uses found that the healing properties of between 20 and 40 different species were used in any area.

THE BURNING OF KAVANGO

Very large areas of Kavango burn year after year, especially so in eastern Kavango and the Caprivi Strip (FIGURE 34). This might be due to the higher rainfalls in the east producing more grass to burn than in the drier west. However, fires may also be better controlled in the west by the presence of more cattle farmers than in the east. The long lines of inter-dune valleys in the west (Figure 8, page 27) also restrict runaway fires to a greater extent than in the east where there are few natural barriers to stop fires from spreading.

The great majority of fires occur during the winter months and most are started by people. Some fires are set deliberately to stimulate the growth of new pastures, while others run-away accidentally when farmers burn small areas to clear land for cultivation or to remove vegetation from waterholes, for example. No quantitative studies have been done to assess the effects of fires in the region, but it is clear that frequent and widespread burning has several important impacts. First, large areas of grazing are lost, especially when fires rage over large areas. For example, between 21 and 50% of the region burnt each year from 1989 and 2001 (FIGURE 35). The average area burnt over those 13 years was 32%, and so farmers must battle to graze their animals if an average of about one-third of all pastures are lost to fire each year. Secondly, many young trees are killed and as a result very few young trees of valuable timber species are to be found in some areas. This is particularly true for teak and *msivi* trees. Thirdly, large and valuable timber trees (and other species) are either killed directly by fires or their trunks are gradually burnt away over several years until they die or fall over. Fourth, large areas become impenetrable thickets of shrubs, especially of silver terminalia and *Baphia massaiensis*. Fifth, soil fertility is reduced by the loss of nitrogen and sulphur to the atmosphere and the burning away of leaf litter and humus that would otherwise decompose into organic nutrients in the ground. Sixth, livestock, wildlife, homes and people may be burnt or killed by fierce fires. Finally, the extent and frequency of burning means that Kavango fires must add significant volumes of ash and carbon dioxide to the atmosphere. How significant those amounts are is unknown, but the contribution made by fires in Kavango to global pollution has to be acknowledged.

FIGURE 34-
Many areas of Kavango burn every year as shown by the number of times that different places burnt during the past 13 years (bottom). The three small maps show the extent of bush fires in three years: 1997, 2000 and 2001.[10]

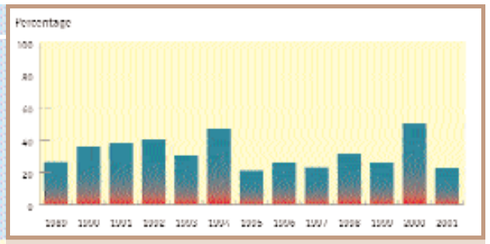


FIGURE 35-
Between one fifth and half of Kavango is burnt each year, as shown by these percentages of the region's total area that were burnt between 1989 and 2002.

With such large ears, kudus are well suited to life in woodlands where sound signals are often more valuable than visual ones.

WILDLIFE IN KAVANGO

Although large areas of uninhabited woodland cover Kavango, there are few large animals in many of those areas. Indeed, most large mammals occur in the region's game reserves, particularly in the Mahango Game Reserve and Khaudum Game Park, as shown in the table below and FIGURE 36.

Estimates of the numbers of large mammals in Kavango.[11]

Species	Mangetti Game Reserve	Khaudum Game Park	Mahango Game Reserve	Caprivi Game Park	Elsewhere in Kavango	Total population in Kavango
Lechwe			100			100
Reedbuck			150			150
Roan		100	50	20		170
Sable	25		130	20		175
Hippo			200			200
Oryx	20	150			50	220
Blue wildebeest	50	150	40	20	50	310
Giraffe	20	300	20	20	20	380
Eland	500					500
Buffalo			500	100		600
Kudu		200	150	100	500	950
Elephant	20	1,500	300	200	50	2,070

The species listed in the table to the left are of course not the only large mammals: there are reasonable numbers of tsessebe, impala and zebra in Mahango Game Park, and then also smaller animals such as duiker, situtunga, steenbuck and warthog in Mahango and elsewhere. Kavango is also home to six species of large predators (FIGURE 37), although they are so secretive that few people are lucky enough to see them. There are also very few of them, as estimates of their total populations in the region indicate: 20 brown hyaena, 30 cheetah, 40 spotted hyaena, 50 lion, 100 wild dog and 300 leopard.

Although there are many more elephants than any other large mammals, these giants come and go. For example, estimates at different times show that the population in Khaudum Game Park may vary between 800 and 2,200 elephants. Some of them move south into north-eastern Otjozondjupa while others travel east into Botswana. In fact, all the elephants in eastern Kavango form part of a much larger population of 120,000 or more animals that cover an area extending east to Caprivi and the Chobe and Hwange National Parks in Botswana and Zimbabwe, respectively. On the other hand, the small number of elephants in the Mangetti area may move west to link up with the large population of Etosha elephants.

Several conclusions or inferences can be drawn from the large numbers listed in the table to the left. First, the

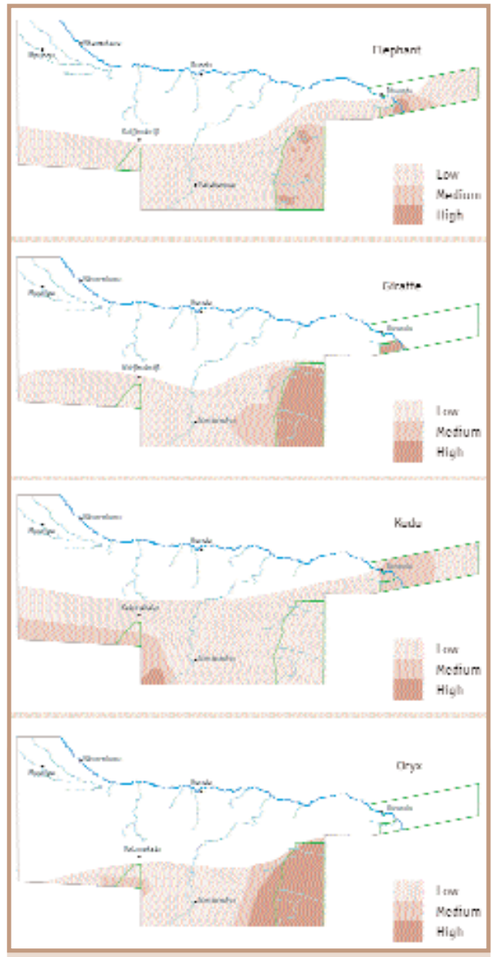


FIGURE 36-
Most large animals occur in Mahango Game Reserve and Khaudum Game Park, as shown by the relative densities of elephant, giraffe, kudu and oryx.

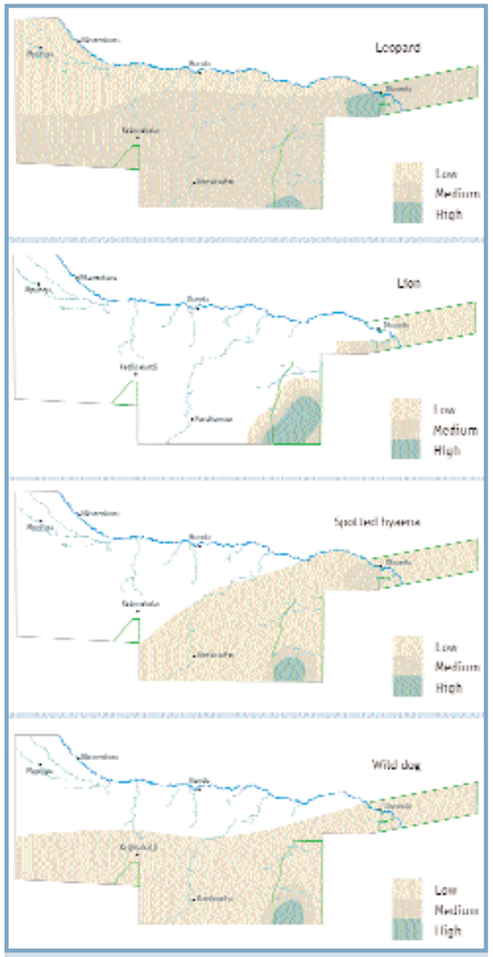


FIGURE 37-
Like other large mammals, most carnivores occur in the eastern parts of Kavango. The maps show the relative densities of leopard, lion, spotted hyaena and wild dog.[12]

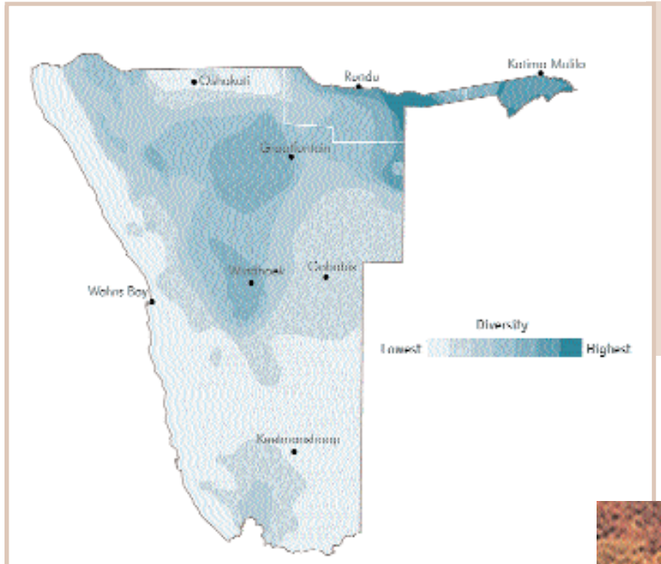


FIGURE 38-
Kavango is home to a more diverse community of plants and animals than most other areas in Namibia. Much of the diversity in Kavango is linked to the variety of habitats along and near the Okavango River. This overall measure of diversity is based on the numbers of species of plants, birds, reptiles, mammals, frogs, termites and scorpions found in different areas of the country.[13]

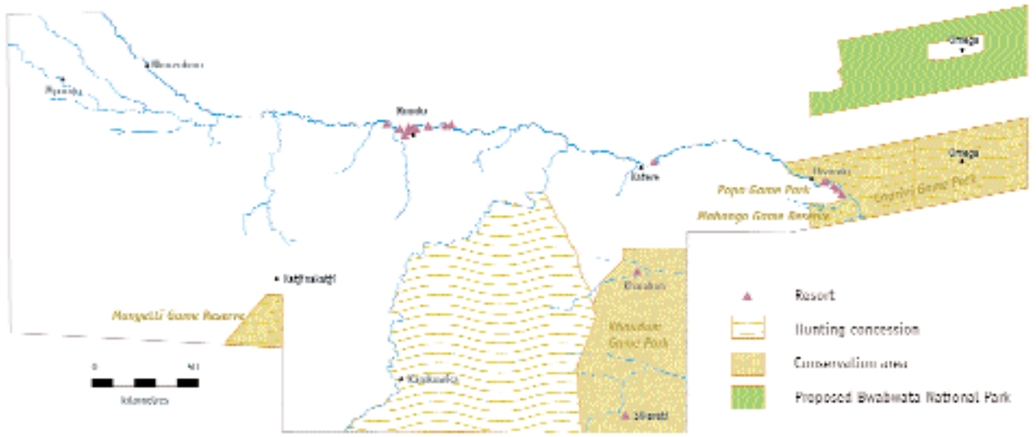


FIGURE 39-
Conservation areas cover about 15% of Kavango, but facilities for tourists are not available in most of these areas. Five areas are allocated as hunting concessions. The proposed Bwabwata National Park will consist of Mahango Game Reserve and much of the existing Caprivi Game Park.

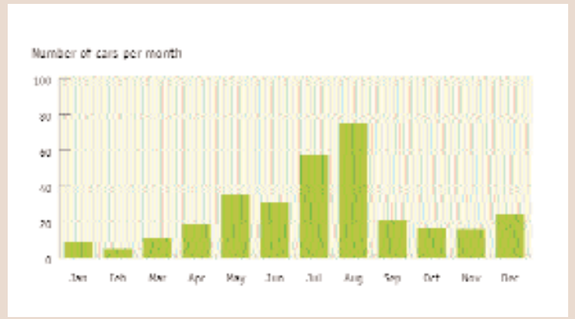
One of Kavango's comparative advantages is its ability to offer tourists camping sites in a spectacular environment.

numbers tell us that the reserves offer protection to significant populations of these species. Secondly, habitats in these areas are likely to be of reasonable quality if so many animals are present (although riverine forests in Mahango Game Reserve have been badly damaged by the large herds of elephants there). Thirdly, it is these kinds of animals that are attractive to tourists, and their relative abundance provides good cause for the reserves to draw visitors. Finally, an abundance of large mammals serves as an indicator that many other smaller species are likely to be present in the same areas. In this respect, Kavango has a much higher diversity of animals and plants than other areas in Namibia (FIGURE 38). Along with an area near Ngoma in Caprivi, more birds (419 species) have been recorded in Mahango Game Reserve than anywhere else in Namibia.

CONSERVATION AND TOURISM

Approximately 15% or 7,508 square kilometres of Kavango's surface area is allocated to conservation in five reserves: Khaudum Game Park (3,841 square kilometres), Caprivi Game Park (3,002), Mangetti Game Reserve (420), Mahango Game Reserve (245) and the minute Popa Game Park (0,25 square kilometres). Proposals are now being made to adjust the boundaries of the Caprivi Game Park so as to cut

FIGURE 40-
Very few visitors go to Khaudum, as shown here by the average number of visitors' cars recorded at Khaudum camp over the past four years. The graph also shows that the majority of visits are between May and August.



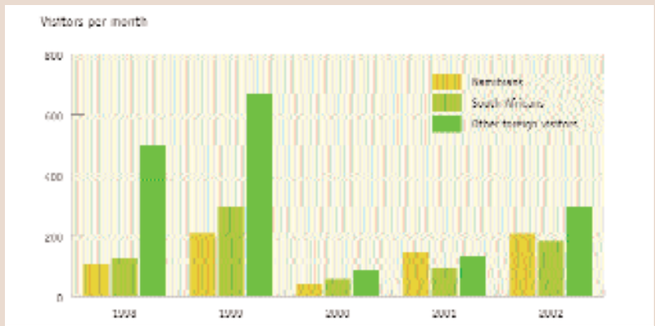


FIGURE 41-
Numbers of tourists crashed following the unrest that broke out at the end of 1999 and early in 2000. The graph shows the average number of visitors to Popa Game Park each month between 1998 and 2002.

out several areas used for farming and the settlement of Omega. These proposals would also provide for the establishment of the new Bwabwata National Park that would incorporate the Mahango Game Reserve (FIGURE 39).

Each park is managed by resident staff of the Ministry of Environment and Tourism while accommodation at Popa Game Park and Khaudum and Sikereti camps is run by a parastatal, Namibia Wildlife Resorts. However, both organizations have suffered from the loss of experienced staff and difficulties in recruiting competent new people. This has led to a variety of problems in the parks. In the unlikely event that there will be a drastic improvement, there is a strong argument for handing the management of the parks and resorts to private enterprise. Contracts to manage the parks could make it a condition that each area be run according to existing management plans stipulating, for example, aspects of maintenance, law and order, and the provision of water holes. The involvement of private enterprise could also do much to expand the provision of tourism facilities in the region and especially in the parks (see below).

There are five hunting concessions in Kavango, although one to the east of Omega extends further eastwards into part of Caprivi. The concessions are defined areas in which specific numbers of large mammals can be hunted under the supervision of a professional hunter. People who hunt the animals pay the hunter an agreed price. Each concession is awarded for a different price. The total value of the five concessions in 2002 amounted to N$2,840,000, which was paid into a trust fund to support the development of parks and community-based natural resource management projects. The concessions are normally awarded for a three-year period. During the most recent period, the concessions in Kavango allowed for the hunting each year of the following: 41 elephants, 10 leopards, six lions, hyaena, steenbok and duiker, four buffalo and roan antelope, five sable

Elephants, crested francolins (opposite), lilacbreasted rollers (above) and bullfrogs (right top) are just four of the thousands of species that give Kavango such a rich diversity of animal life.

antelope and eland, and two each of kudu, crocodile, lechwe, reedbuck, impala, wildebeest and oryx.

For such a large region there are remarkably few facilities to accommodate tourists (FIGURE 39). Most hotels, lodges and camp grounds are clustered in and around Rundu, where the majority of visitors are business people, government officials and people in transit through the region. There is also a group of five resorts south of Divundu. The small number of resorts for tourists is even more remarkable given that such large areas are allocated for conservation. There are, indeed, only three resorts in these conservation areas. Curiously, the most popular and biggest resort is actually in an area (Popa Game Park) that is much too small to serve any real purpose for conservation. The only other two resorts are the rudimentary facilities at Khaudum and Sikereti. Numbers of visitors to these two resorts are amazingly low, ranging between an average of five and 75 cars per month at the Khaudum camp (FIGURE 40).

The spate of unrest that broke out in Kavango at the end of 1999 and early in 2000 had a devastating effect on tourism to the region. Tourists simply abandoned the whole of north-eastern Namibia, and many resorts and hotels had to close for a year and longer. The effect of this is most clearly shown by the number of visitors to Popa Game Park (FIGURE 41). In keeping with the growing tourism business to Namibia, the number of visitors had increased year by year, with the number of foreign visitors (from South Africa and elsewhere) to Popa increasing by 4,000 from 1998 to 1999. Then came the great slump in 2000, when numbers of foreign visitors dropped by almost 10,000 from the 1999 total. Although the number of visitors increased in 2001 and again in 2002, it seems certain that it will take several more years before the confidence and numbers of visitors return to what they were.

Key notes

- Less than 0.25% of the total volume of Okavango River water is extracted in Namibia.
- Access to underground water has enabled people to settle in many inland areas where they could not otherwise live.
- Most boreholes provide moderate supplies of water that is of good quality; water in western Kavango is usually much deeper than that in the east.
- The wind-blown sands that cover much of Kavango are generally not suited to crop cultivation.
- Natural vegetation is used for many important purposes: grazing, building materials, fuel wood, food such as fruits and nuts, building, craft production, and as medicines.
- Plant growth varies greatly from season to season, and from place to place as a result of variation in rainfall, changing types of vegetation and human influences.
- Between 21 and 50% of Kavango burnt each year between 1989 and 2001. The extensive and frequent burning causes many environmental problems.
- Most large species of wildlife occur in north-eastern Kavango, particularly in the Mahango Game Reserve and Khaudum Game Park.
- Kavango has a greater diversity of plants and animals than most other areas in Namibia.
- Approximately 15% of Kavango is allocated to conservation areas, but there is a need to improve management of these areas. In most areas there are no facilities to accommodate tourists.
- Hostilities in Kavango at the end of 1999 and early in 2000 had a devastating effect on tourism to the region.

SAND AND WATER

CHAPTER
SEVEN

PEOPLE

On the move

The lives of people in Kavango have changed very rapidly in recent decades. The population has grown substantially to about 201,000 in 2001, and health and education services are now well established and widely distributed in the region. All of this is quite different from conditions a hundred years ago when the population was very small and there were no formal schools. There were also no clinics or hospitals, and the prevalence of a variety of diseases was one reason why the number of people was so small. Population growth rates and life expectancies were kept low by the high death rates.

Nowadays, young people dominate the population because rates of child mortality are much lower. Movements by large numbers of Angolans into the region have also added to the population, but other people have left to seek work elsewhere in Namibia. The majority of people live near the river or along a number of omurambas and the main road to Rundu from the south. But many people have also moved from rural areas into Rundu, which has the only urban population in Kavango. Most rural people live in homes built of wood and grass harvested locally, and wood is the main cooking fuel. The most densely populated areas are best served with schools and health facilities. School classes are dominated by pupils in the lower primary grades and relatively few people have completed higher levels of education. HIV/AIDS, malaria, acute respiratory infections, diarrhoea, tuberculosis, bilharzia and malnutrition are the most significant health problems that beset the people of Kavango these days.

POPULATIONS

The distribution of people speaking different languages broadly follows the tribal areas shown in FIGURE 73 (page 113). Almost half of all people speak Rukwangali, which is the language of Kwangali and Mbunza people, while people belonging to the Gciriku and Shambyu tribes speak Rumanyo (FIGURE 4-2). Most people reported as speaking 'Other Namibian' languages are Oshiwambo speakers, many of whom reside in Rundu where a great variety of languages are commonly heard as a result of the many origins of people who live there. There were approximately 4,800 San people in Kavango in 1998.[1]

About one-third of Rundu residents and 15% of rural people speak a language of Angolan origin as their mother tongue, reflecting the high rate of immigration from Angola over the last 30 years. Very large numbers of people moved to Kavango during the mid-1970s during hostilities associated with Angola's independence war, while other waves of immigrants and refugees followed other bouts of insecurity. For example, many refugees arrived following the failure of the Angolan ceasefire in 2000, and the great majority of about 10,000 people who registered at the refugee centre in Rundu between 1999 and 2002 were from Angola. While many troubles have indeed made people flee Angola, it is also true that many Angolans moved to Kavango because of its comparatively better economic opportunities, services and infrastructure.

The distribution and density of people can be grouped into three zones (FIGURE 4-3). The first is the most densely populated ribbon along the river, where densities are generally higher than 40 people per square kilometre (km²) and exceed 100 people per km² in some places. There are similar densities along certain sections of the Mururani-Rundu road, indicating that the distribution of people, at least in that part of the region, has been strongly influenced by the presence of good road access (see page 115). Secondly, there is a large area consisting of many small, scattered settlements south of the river and west of the Mururani-Rundu road. Many of these small settlements are also along dry drainage lines or omurambas. Densities around the settlements generally range between 1 and 10 people per km².

The third zone consists of the very sparsely populated remainder of the region where there are very few or no people. This zone, with population densities of less than 1 person per km², makes up about 78% of the total area. Most large, open areas are in the south-east, south-west and in the Caprivi strip.

The first estimate of the region's population was made about 90 years ago, when some 4,500 people were reported to be people living along the south bank of the river (another 5,500 were estimated to be on the north bank in Angola (see page 36)). Thereafter, estimates were made in 1925 (12,000 people), 1926 (14,000), 1936 (19,150) and in 1946 (24,100 people). None of these figures were based on systematic population censuses, however, and it was only in 1951 that the first full census was conducted. A total population of 21,873 people was counted. Since then, the population has increased by about nine times to the 201,093 people reported during the 2001 census (FIGURE 4-4). Of those counted in 2001, 3,589 people were in institutions (e.g. school hostels) leaving 197,504 other people living in normal homes. The total number of households in the region amounted to 30,359, giving an average of 6.5 people per household.

The overall rate of population growth between 1951 and 2001 was just over 4.5% per year. Indeed, growth has been much higher than elsewhere in the country: for example, the

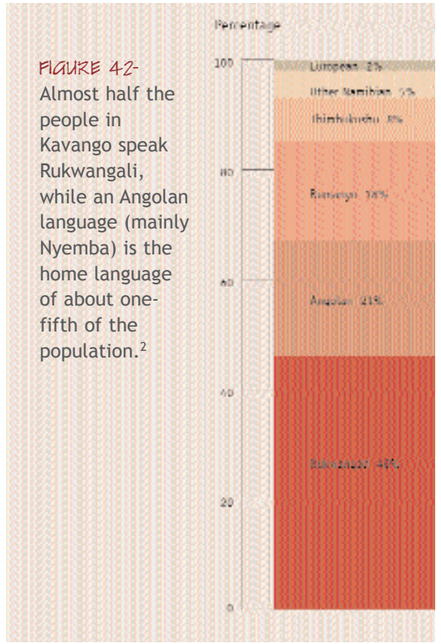
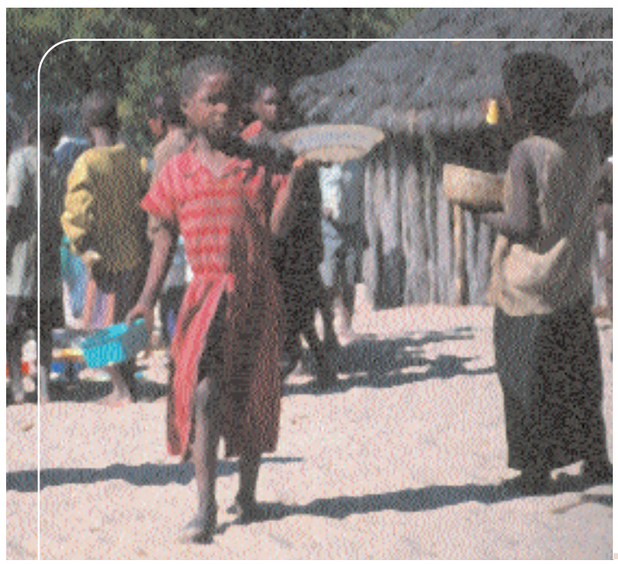


FIGURE 4-2
Almost half the people in Kavango speak Rukwangali, while an Angolan language (mainly Nyemba) is the home language of about one-fifth of the population.[2]

Children make up about half the people in Kavango, and the greatest challenge of today is to set conditions that will allow such children to carry their potential into the future.



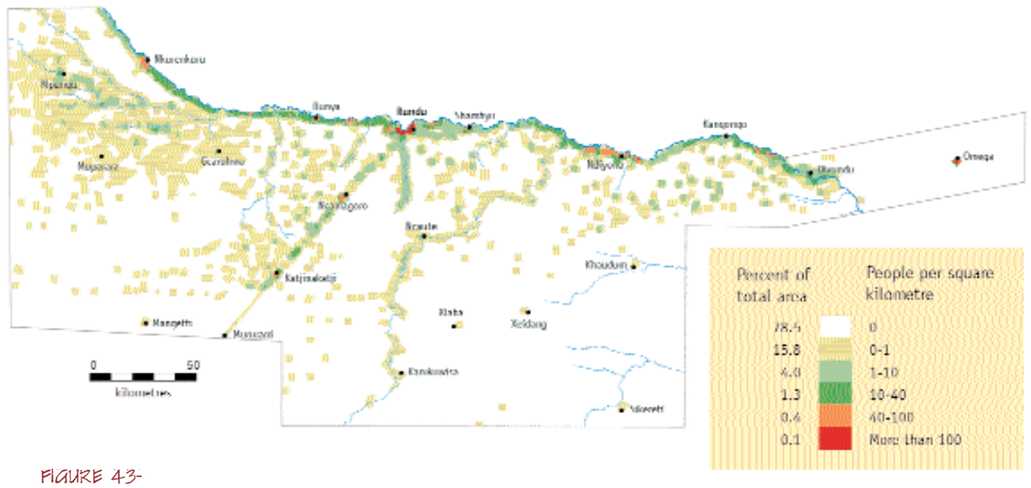


FIGURE 4-3
Most people live in densely populated ribbons along the Okavango River, the main road from the south and along certain omurambas. The map shows the density of people in 2000, while the legend shows the proportions of the region populated with different densities.[3] The approximate number of people (including residents of Rundu) living within 5 km of the river is 145,000 while about another 10,000 people live between 5 and 10 km of the river. This leaves about another 46,000 people living further than 10 km from the river.

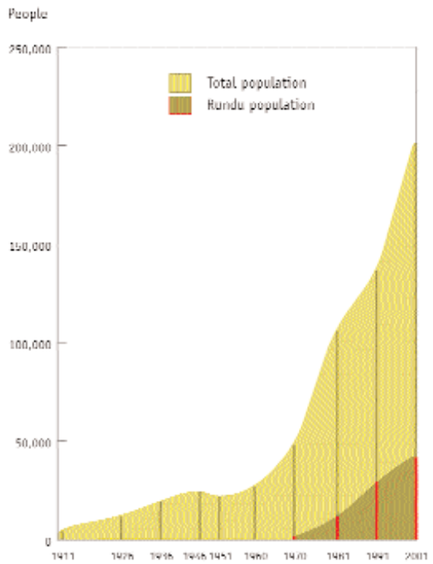


FIGURE 44-
The number of people in Kavango has grown very rapidly, both as a result of declining death rates and immigration from Angola. The graph shows changes in the whole population between 1911 and 2001, and in Rundu between 1970 and 2001.[4]

total growth rate between 1991 and 2001 in Namibia was 2,62% compared to 3,97% over the same period in Kavango. Between 1970 and 1981 the growth rate in Kavango was a staggering 7,45%, and 5,96% between 1981 and 1991.

Much of this rapid growth was due to the high numbers of Angolans who settled in the region, and growth rates were thus affected as much by immigration as they were by births and deaths. Leaving aside the unpredictable rate of immigrations, two factors suggest that rates of increase will slow. The first is the significant decline in fertility that has occurred over the past 10 years. In 1991, each woman would produce an average of 7,1 children over the course of her life, but this had dropped by a third to 4,2 children in 2000. Some of the decline was perhaps due to family planning programmes, but the increasing number of women who moved from rural, subsistence livelihoods to town and formal employment probably

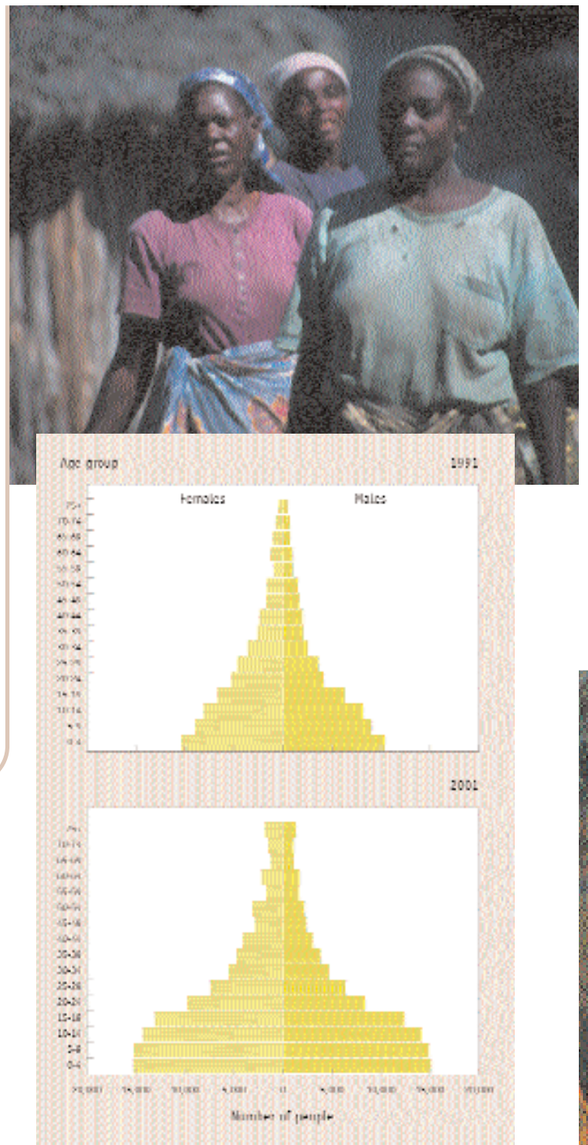
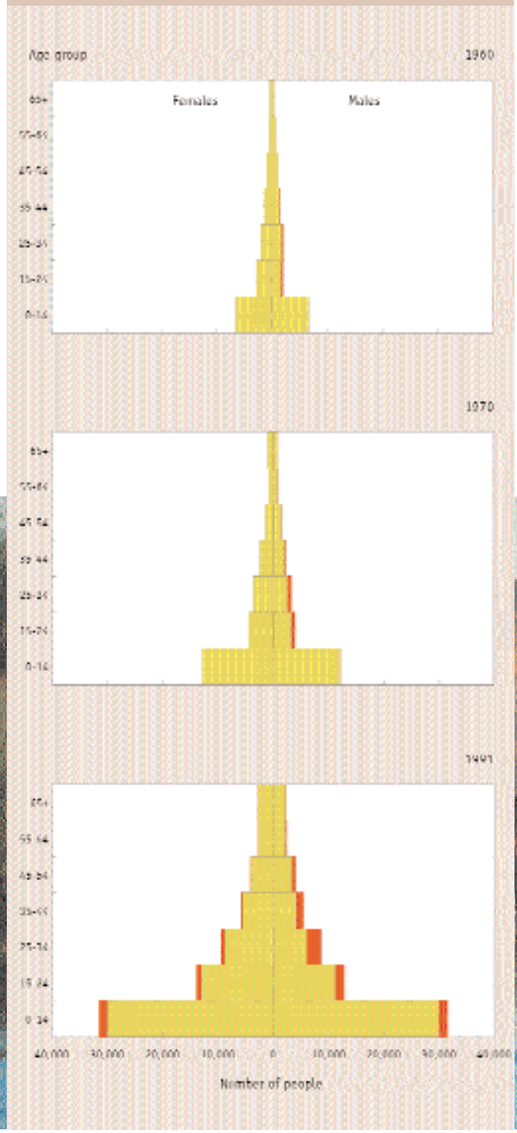


FIGURE 45-
The population is dominated by young people, as shown by these age pyramids of the population in 1991 and 2001.[5]

FIGURE 46-
The age and sex structure of the population in 1960, 1970 and 1991, and the number of people speaking Kavango-languages resident in Kavango *(yellow bars)* and elsewhere in Namibia *(red bars)*.[6]

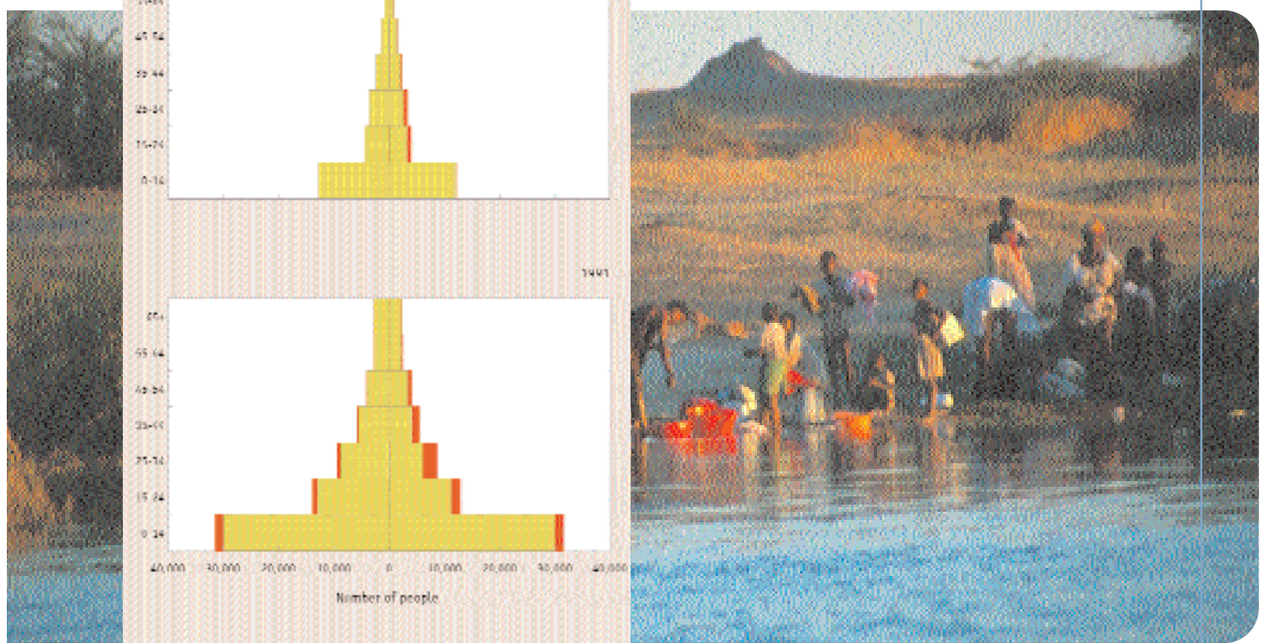


had a greater effect on childbearing patterns. The second factor to slow population growth is the increasing numbers of deaths and decline in life expectancy due to AIDS (see page 84). Someone born in 1991 could expect to live for 57 years on average, but this figure had dropped by almost a third to 40 years in 2000 as a result of this disease.

The age and sex structure of the population in 2002 (FIGURE 45) reveals several noteworthy features. Firstly, young people make up a huge proportion of the population: 72% of all people are less than 30 years old and 44% are below the age of 15. Secondly, the number of 0–4 year-olds are about the same as the number of 5–9 year-olds, a reflection of reduced birth rates in recent years and perhaps increased mortality of young children caused by the transmission of HIV from their infected mothers. Thirdly, there are more females than males, especially so amongst adults.

There were also about 22% more women than men aged 20–54 in Kavango in 2001, a difference caused by the fact that more men have left the region to work elsewhere (FIGURE 46). Moreover, these graphs indicate that men started to leave as migrants before women, and that the proportions of men and women now living elsewhere has increased over the past few decades.

More adult women than men live here because many men have left to work elsewhere in Namibia.



In addition to migration in and out of Kavango, there have been large-scale movements of people within the region. One significant movement is of people from rural areas to the urban area of Rundu, thus contributing to the substantial growth of the town from about 1,500 people in 1971 to 41,400 in 2001 (FIGURE 44). Those changes mean that the overall character of the region's population has changed from one completely dominated by rural people to one with a significant urban group. About 97% of the population was rural and 3% urban in 1971, while in 2001 about 80% was rural and 20% of the population was urban. In 1998, 24% of residents in Rundu had moved there within the past 10 years. Two-thirds of people had moved to Rundu from elsewhere in Kavango, while 12% had come from Ohangwena, Oshikoto, Oshana or Omusati, 5% from Caprivi and the remainder from elsewhere.[7]

Another significant movement is of people between settlements, and 2.8% of people were reported in 1999 as having arrived to live in new villages within the previous three years. Many such movements are from homes along the river to small villages in the inland. The movements occur for a variety of reasons, perhaps the most important being that natural resources (such as grazing, fertile soils and wood for timber and fuel) along the densely populated river are depleted. Many fields in the river valley are infested with a grass (*Cynodon dactylon* or *kweek gras*) and are now difficult to plough. It is also harder to manage cattle and other livestock along the river to ensure that they do not damage crops belonging to neighbours.

Some movements away from the river are apparently initiated by wealthier people, who establish cattle posts in unsettled areas and then recruit family members and other people to live at the posts. The new settlements become more permanent and developed as the new settlers clear land for crops, and boreholes are drilled nearby. However, it is also evident that many such small settlements do not last long, their residents either moving back to the river or to other new villages in the interior.

The majority of people live in rural households consisting of about 6–7 people, while urban homes in Rundu are smaller on average, consisting of 5–6 people (FIGURE 47). However, there are also substantial numbers of bigger homes of 10 and more people both in rural areas and in Rundu. About 70% of households are headed by men, both in rural areas and Rundu. Most households have about one active person for each dependant in the home. A dependant is someone under the age of 15 or older than 64, and dependency ratios are calculated as the total number of dependants as a percentage of the total population. In 1991 the dependency ratio was 51%, while an estimate in 1999 gives the ratio as 46%.

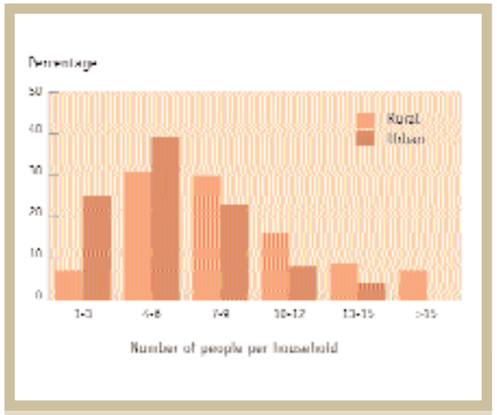


FIGURE 47-
Most homes consist of between four and eight family members, but there are also many smaller and larger households, as shown by the percentages of rural and urban households of different sizes.[8]

As might be expected, the great majority of homes rely on locally available natural resources for fuel and building materials. Thus, 97% of homes use wood for cooking, and 92% have the walls of their houses made of wood or mud. Eighty four percent of houses have grass roofs, most others being of iron (9%) or wood or sticks.[9] A slight improvement in the use of safe (piped and borehole) compared to unsafe (well and river) domestic water is shown in the following table.

Percentages of homes using different sources of domestic water in 1991 and 1999.[10]

Year	Piped water	Wells	Boreholes	River water
1991	14%	12%	24%	48%
1999	18%	7%	24%	41%

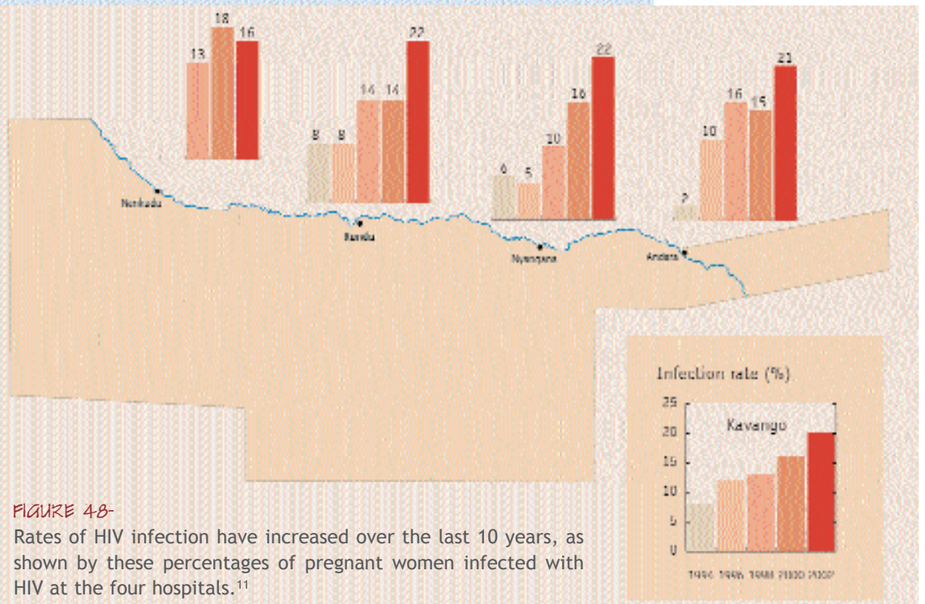


FIGURE 48-
Rates of HIV infection have increased over the last 10 years, as shown by these percentages of pregnant women infected with HIV at the four hospitals.[11]

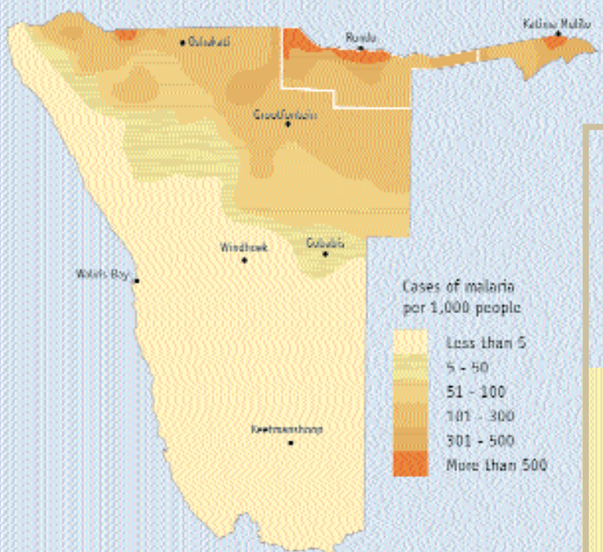
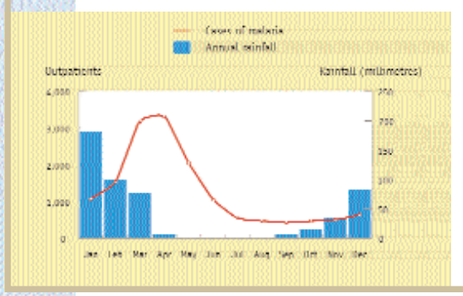


FIGURE 49-
Kavango suffers from very high rates of malaria, with more than half the population being treated for the disease each year.

FIGURE 50-
Most cases of malaria occur between two and three months after the peak rainy period, as shown by this comparison of the number of malaria outpatients treated at Rundu with average rainfall.



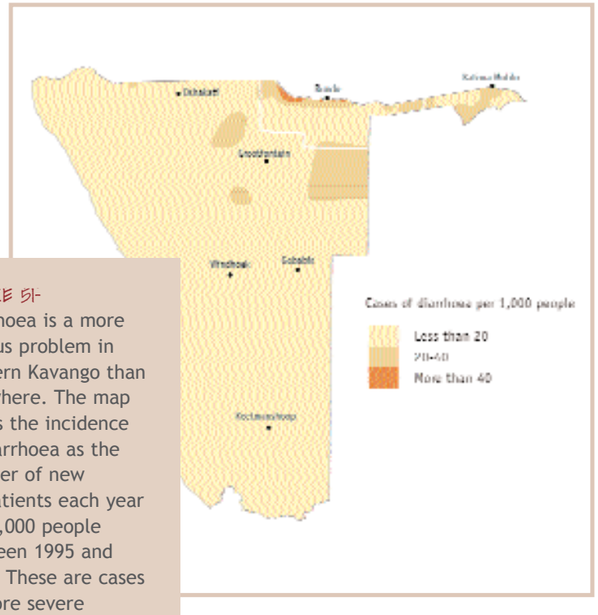


FIGURE 51-
Diarrhoea is a more serious problem in western Kavango than elsewhere. The map shows the incidence of diarrhoea as the number of new outpatients each year per 1,000 people between 1995 and 1999. These are cases of more severe diarrhoea which are accompanied by bleeding.

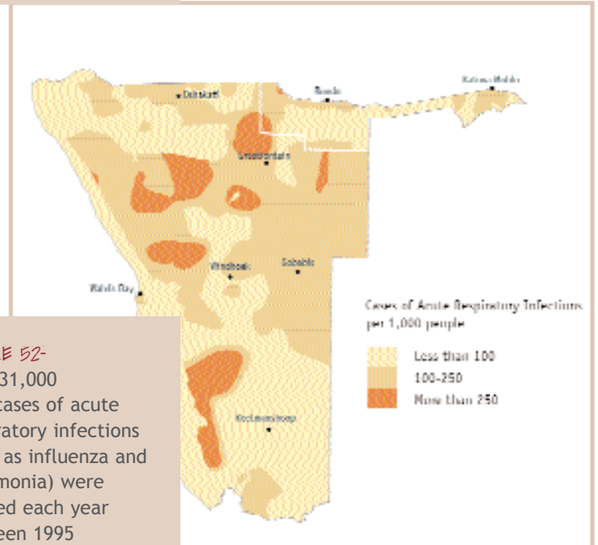


FIGURE 52-
Over 31,000 new cases of acute respiratory infections (such as influenza and pneumonia) were treated each year between 1995 and 1999.

HEALTH

People in Kavango suffer from a variety of diseases and health conditions, many of which are associated with rural and subtropical environments. The most important of these challenges are HIV/AIDS, malaria, acute respiratory infections, diarrhoea, tuberculosis, malnutrition and bilharzia. For some interesting – but unknown – reason, health problems are generally more severe in western than eastern Kavango, and the incidence of malaria, acute respiratory infections, urinary bilharzia and diarrhoea are all highest in the west.[12]

HIV infection rates have risen dramatically in recent years, as reflected by rates of infection among pregnant women tested at four hospitals (FIGURE 48). These figures are reliable indicators of infection rates among all sexually active people, and they show that about 20% of these people have HIV. People between the ages of 15 and 49 are normally taken as the sexually active part of the population, and that group makes up about 48.5% of the total number of people in the region. Given a population of about 201,000 people in 2001 means that there are over 20,000 people in Kavango carrying HIV, and all of those people may die of AIDS within the next 5–10 years. Another concern is that most deaths occur among people aged 25 to 40 who are often the most economically active people in the region. Household economies will therefore be badly affected by the disease. Demands on the region's health services will also increase, not only as a result of the number of AIDS patients but also because the ability of people with HIV to withstand other diseases – such as tuberculosis and gastroenteritis – is reduced.

Although tuberculosis (TB) is not a particularly common disease, it is often prevalent among San people and often has fatal consequences. Kavango is only second (behind Karas) in having the highest rate of infection in Namibia. Rates of infection have also increased in recent years, mainly because many TB sufferers also have HIV.

While most cases of malaria are over within a few days, some infections lead to death and malaria affects more people than any other serious disease. Between 1995 and 1999 an average of about 118,700 new[13] cases of malaria were treated each year in Kavango, and more than half the population can be expected to get

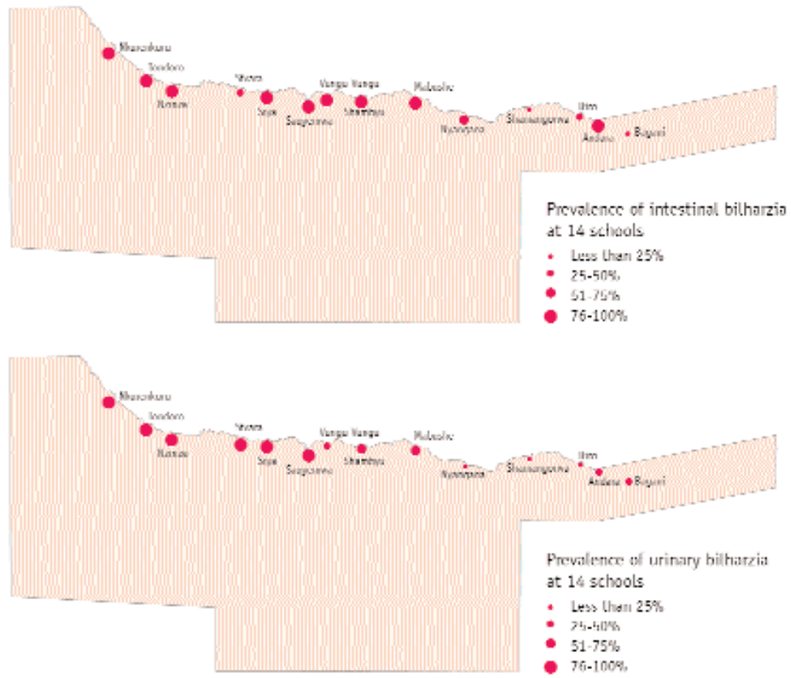


FIGURE 53-
Very large numbers of people have intestinal (top) and urinary (bottom) bilharzia as reflected by these percentages of infected pupils at 14 schools across the region.[14]

the disease each year. This is particularly true along the western areas of river (FIGURE 49). Most cases follow the onset of the rains and the accumulation of standing water in the omurambas, marshes and ditches in which mosquitoes breed. The highest numbers of malaria patients are thus treated in March and April each year (FIGURE 50).

Many parasites cause acute respiratory infections (influenza and pneumonia, for example) and diarrhoea (FIGURES 51 AND 52). Both are important and often serious health conditions and, other than malaria, more people were treated as outpatients for acute respiratory infections between 1995 and 1999 than any other condition. Diarrhoea was the third most important condition leading to hospitalization. As a leading cause of death, gastroenteritis (a form of diarrhoea) was third only to AIDS and malaria during those five years.

There are two kinds of bilharzia in the region: urinary and intestinal bilharzia, and both types are extremely prevalent along the river (FIGURE 53). Most infections occur when people swim or bathe in river water, and the main effect of both diseases is a debilitating weakness that lasts for long periods. A survey in 2000 found that the majority of school pupils to the west of Rundu were infected with both kinds of parasite, whereas to the east of the town there were much lower rates of infection by urinary bilharzia. The high infection rates found in 2000 were also many times higher than infection rates of less than 10% found during a survey in 1967. Why infection rates have increased so much is not known.

Many of the diseases described above affect children more than adults, and large numbers of children also suffer from malnutrition. An estimated 28% of children under the age of five were severely underweight in 2000; of the 13 regions in Namibia, only two others had higher proportions of underweight children than Kavango. However, mortality rates have decreased markedly in recent years: from 83 infant deaths per 1,000 live-births in 1992 to 23 in 2000, and from 56 child deaths per 1,000 one-year-olds in 1992 to 31 deaths in 2000.[15] Moving to a slightly older group, Kavango also suffers from high rates of teenage pregnancy. For example, more than a third of all women receiving antenatal care at many clinics were aged 15 to 19 and many were under 15 (FIGURE 54). One of the several undesirable consequences of these teenage pregnancies is that many girls drop out of school and fail to obtain a reasonable education.

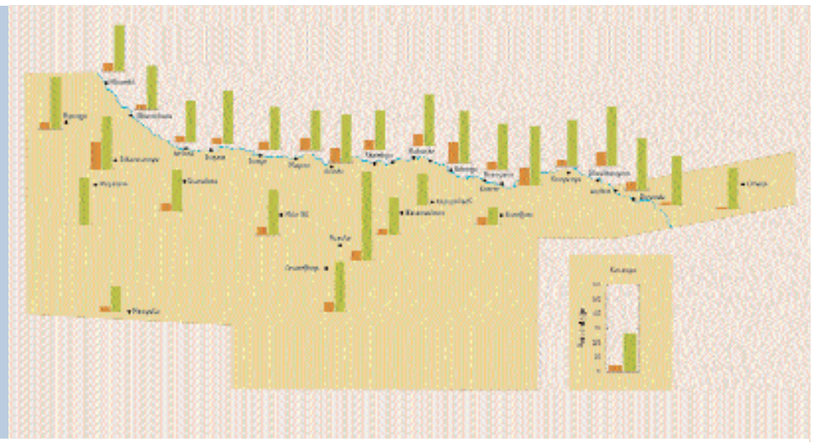


FIGURE 54-
There are high rates of teenage pregnancy, a fact reflected in this map showing the proportions of all mothers having antenatal care who were under the age of 15 (brown columns) or between 15 and 19 years (green columns).

FIGURE 55-
There were 42 clinics, nine health centres and four hospitals in Kavango in 2001.

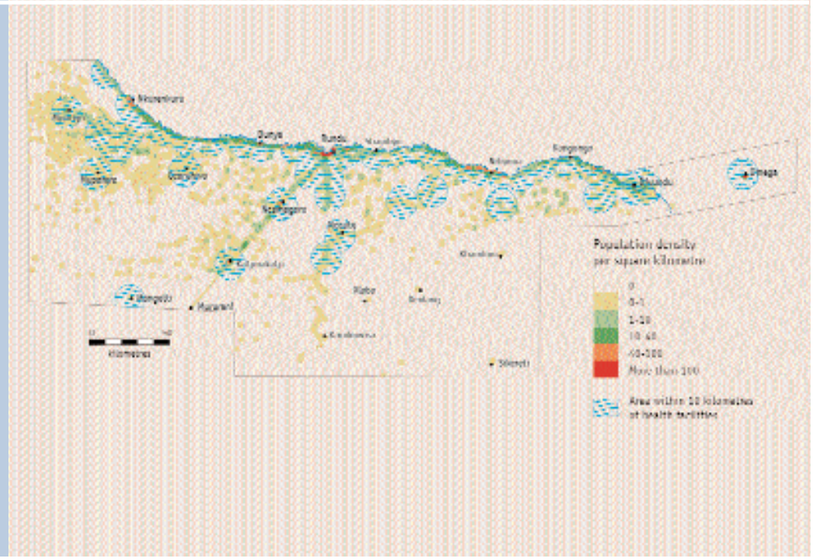


FIGURE 56-
About 85% of people live within 10 kilometres of health facilities. The map shows the density of people in areas further than the ten-kilometre range to provide indications of where new facilities could be provided.

The first level of service of primary health care is provided by the 42 clinics in the region (FIGURE 55), although nurses from some clinics visit outreach centres from time to time. There were also nine health centres in 2001, which are larger clinics equipped with some beds for the overnight treatment of patients. At a higher level for the treatment of the most serious cases are the region's four hospitals at Andara, Nyangana, Rundu and Nankudu. Only 21 doctors, 121 registered nurses and 885 hospital beds served the whole region of about 201,000 people in 2000.

FIGURE 56 provides an indication of the breadth of coverage of health facilities. This is based on the assumption that people within 10 kilometres of these facilities have adequate access to health services. Using the underlying density of people (FIGURE 43), estimates suggest that about 85% of people live within 10 kilometres of a health facility, leaving 15% of the population beyond reasonable reach of health services.

EDUCATION

Compared with other regions in Namibia, the education system in Kavango is extremely poor in many respects. Teachers are less qualified than elsewhere, there are few secondary schools, buildings at many schools are in bad shape, most adults have received little formal education, and relatively few children complete their schooling. At the beginning of 2002, there were some 68,000 children taught by 2,179 teachers at 331 schools (FIGURE 57). Of these, 271 were primary schools, 47 were combined schools (offering some primary and secondary grades), and 12 were secondary schools. In addition, there is a vocational school and a teacher training college in Rundu. The many schools along the river and the road between Mururani and Rundu are comparatively large, while those elsewhere in the inland areas are much smaller. Almost all the small, inland schools offer only lower primary grades, so most children in those areas either drop out of school after completing the first few grades or leave home and move to a school along the river.

In addition to the lack of schools offering upper primary grades in the inland areas, there is also a lack of schools providing secondary grades along the river. This is one reason why there are so many more pupils in primary than in secondary grades (FIGURE 58). There are also more boys than girls in secondary grades, largely because many girls drop out of school as a result of teenage pregnancies.

Levels of education amongst adults are extremely low, especially for women and older people (FIGURE 58). In 1996, only 4% of men and 1,5% of women aged 15 and older had completed Grade 11 or any higher level of education. Taking the completion of Grade 4 as an indicator of literacy, most men older than about 50 years and most women older than about 40 cannot read or write.

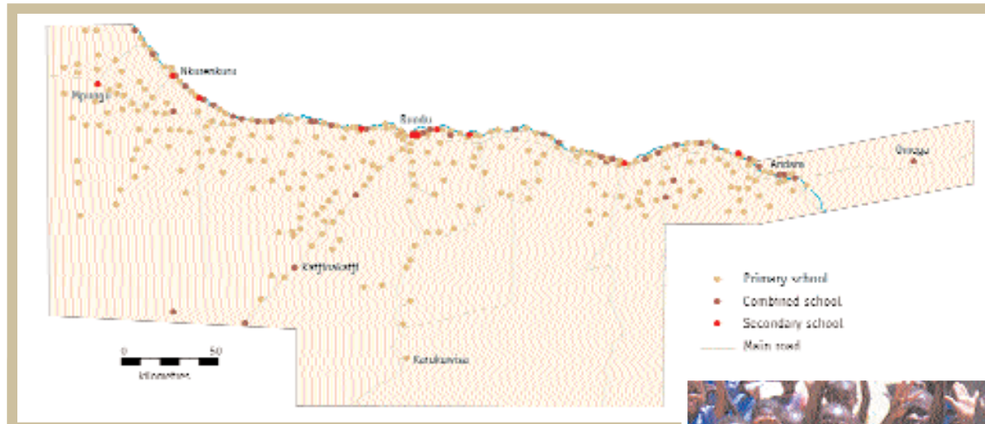


FIGURE 57-
The distribution of schools offering primary grades and secondary grades, and combined schools. Note that many schools offer only a number of the primary or secondary grades, for example Grades 1–5 or Grades 8–10.[16]

FIGURE 58-
There are many more pupils in the lower than in the higher grades, and more boys than girls in the higher grades. These are enrolments in 2001.

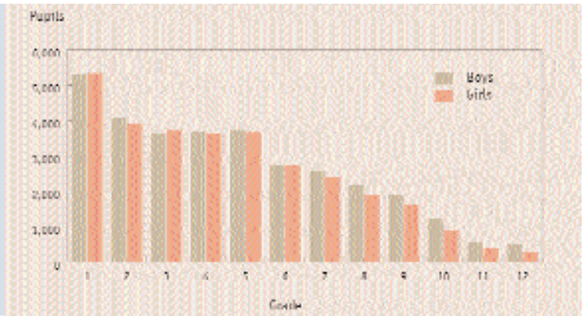
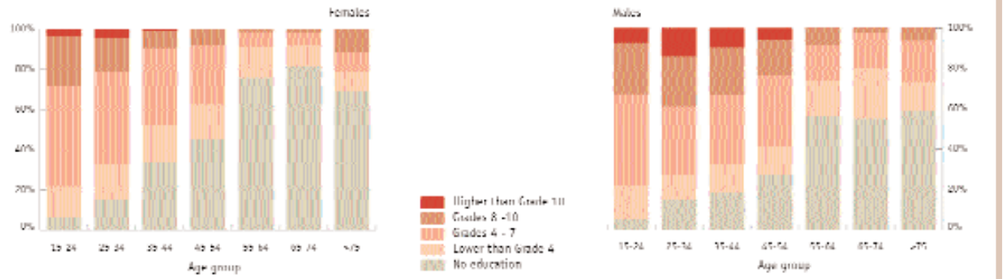
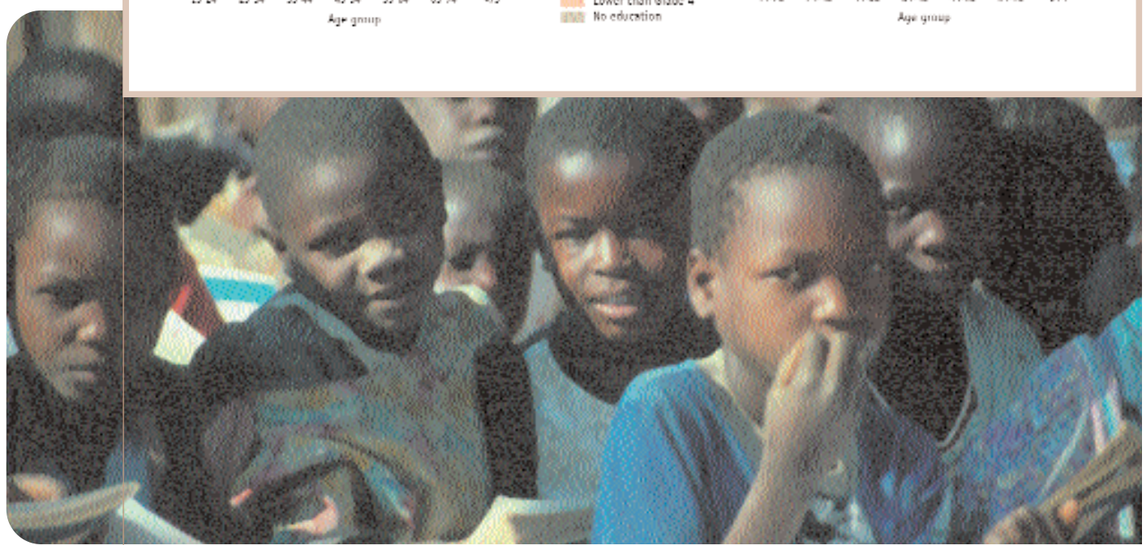


FIGURE 59-
Very few adults have completed higher levels of education, as shown by these percentages of people aged 15 and older who have completed various levels of education.[17]





Total enrolments in the 12 grades have increased from about 41,100 pupils in 1992 to 68,000 in 2002. Part of that increase has been due to population growth, but enrolments also increased because more children now remain at school for longer to complete higher grades. For example, numbers of Grade 6 pupils doubled from 2,700 in 1992 to 5,400 in 2001, and there were only 212 Grade 12s in 1992 compared with 755 in 2001. By contrast, numbers of Grade 1s dropped because of policy changes introduced to prevent pupils from failing and repeating the same grades; the lower grades were previously over-enrolled with many repeaters before these changes.

FIGURE 60 provides an indication of the breadth of coverage of schools. This is based on the assumption that people within five kilometres of schools have access to education. Using the underlying density of people, estimates suggest about 96% of people live within five kilometres of a school, and 4% live beyond a distance of five kilometres of schools.

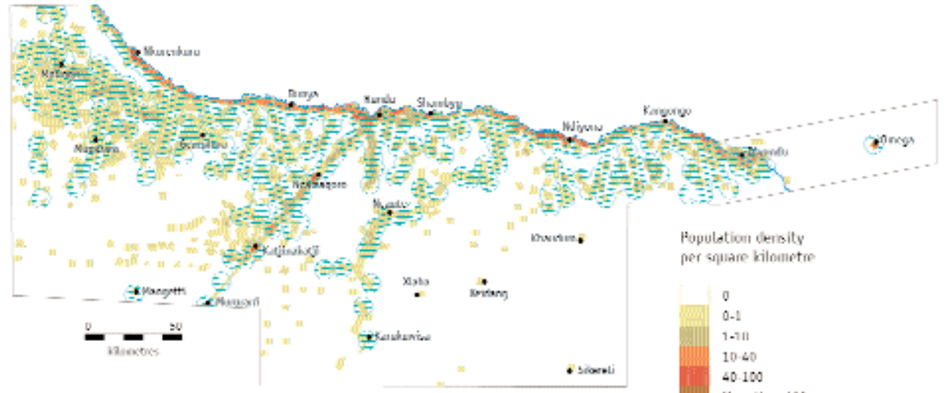


FIGURE 60-
The great majority of children live close to schools. The map shows areas within five kilometres of schools compared with the density of people.

Key notes

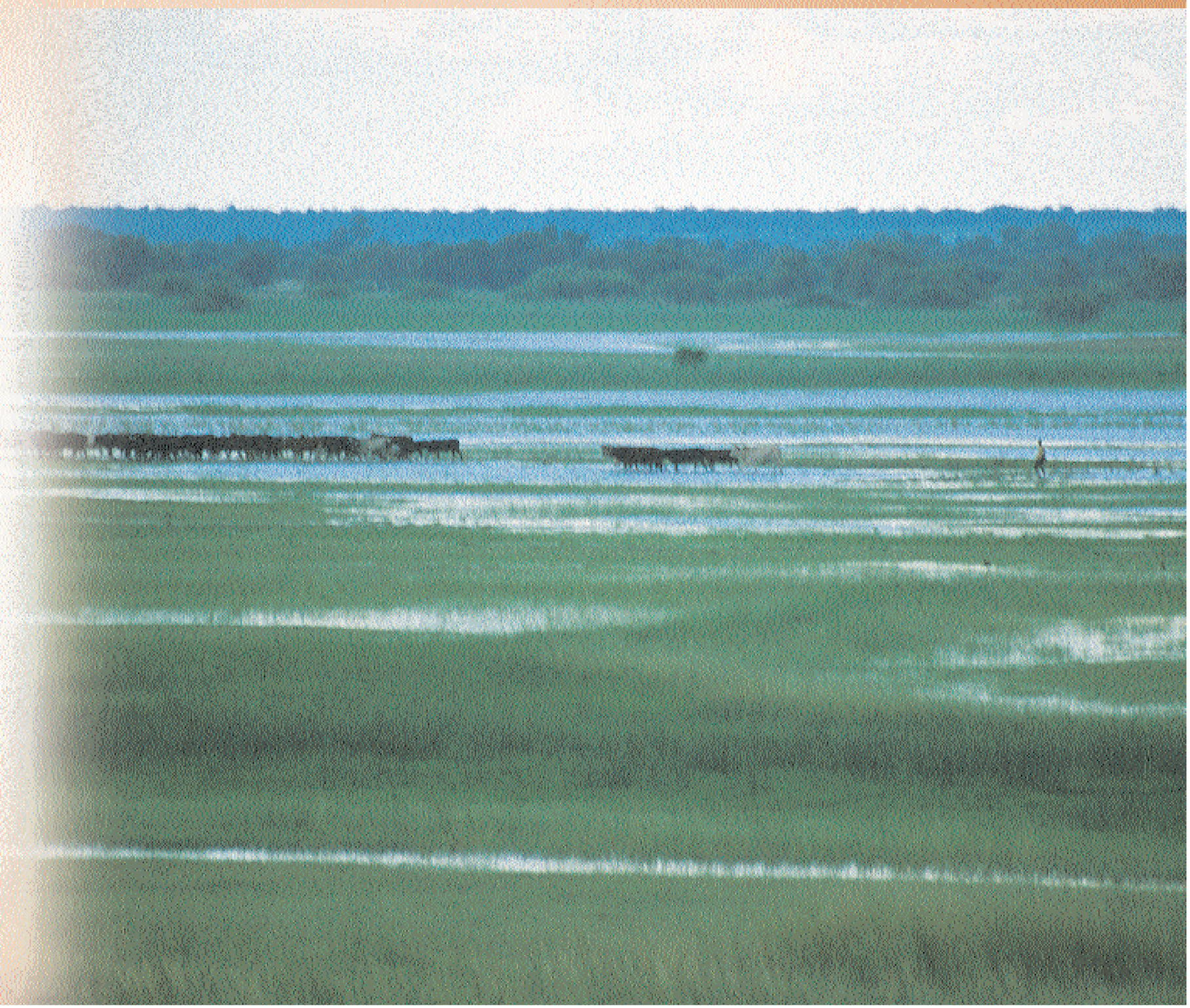
- The first schooling was offered at Nkurenkuru in 1909.
- About 155,000 people live within 10 kilometres of the river. This includes about 41,400 people in Rundu.
- The population increased by 4,5% per year between 1951 and 2001. Much of this rapid growth was due to the many Angolans who settled in Kavango.
- Young people dominate the population, with 72% of all people being under 30.
- Fertility rates and life expectancies have declined by a third over the past 10 years.
- The most significant health problems are HIV/AIDS, malaria, acute respiratory infections, diarrhoea, tuberculosis, malnutrition and bilharzia. Several diseases are more prevalent in western than eastern Kavango.
- About 20% of all sexually active people have HIV, and about one-third of all expectant mothers receiving antenatal care are teenagers.
- Most people have access to health and education services: about 85% of people live within 10 kilometres of a health facility and 96% live within five kilometres of a school.
- The education system is deficient in many respects: teachers are often not qualified, there are few secondary schools, many school buildings are in bad shape, most adults have received little formal education, and relatively few children complete their schooling.

SAND AND WATER

CHAPTER
EIGHT

WELFARE

Making a living



This lengthy chapter is about rural people in Kavango. They are the people who live in about 23,800 households and make up roughly four-fifths of the region's population. More than anyone else, these are the people who make much greater and more direct use of natural resources: soil, water, grazing pastures and wood for building and cooking, for example. These and other resources are also used in diverse ways. Life in the countryside may be seen to be simple, but rural livelihoods are actually complex associations, household economies being comprised of a variety of incomes contributed in varying ways by different people. Some incomes are in the form of cash (such as wages, pensions and profits from the sale of wood) while others come from material or in-kind goods (for example crop harvests, wood, labour or fish).

Rural lives are also changing very rapidly, and the changes are happening in a variety of ways. In fact, we often forget just how quickly livelihoods in Kavango have changed in recent years. Just 75 years ago, few people had any schooling and most had never benefited from modern medicine. There were very few cars or roads, no public telephones, and not many people had ever seen or heard of sources of energy such as electricity, gas or paraffin. People also had very little experience in having cash incomes or in buying food. Almost everybody was wholly and directly dependent on resources provided by the natural environment.

Surveys of income sources have only been done in recent years and so exact measures of economic changes from earlier years are not available. The broad patterns are fairly clear, though. The biggest and most obvious change is the increasing contributions of cash incomes. Migrant labour to mines and farms to the south of Kavango provided the first such incomes during the earliest years of the 1900s. Then came a steady increase in the number of paid jobs as teachers, nurses and other civil servants, labourers on agricultural projects, and much more recently in small-scale informal businesses in Rundu and small centres such as Divundu and Nkurenkuru. New cash incomes have also come from the sales of farm produce and crafts. These may amount to significant sums for certain households, but their overall contribution to the flow of cash in the region is small.[1] Indeed, the total amount of cash in the region remains very low, at least compared to other communal areas such as those in the north-central regions and Otjozondjupa.

A second major change involved a reduction in material incomes from hunting, fishing and the gathering of resources from wild plants, such as fruit. With a small population of people scattered along the length of the river in the early 1900s (see page 35), there was abundant wildlife, perhaps similar to the numbers of hippos, lechwe, giraffe and oryx now seen only in the Mahango Game Reserve. Many traditional poems and songs pay tribute to hunting forays, serving as reminders of successful hunts in the past. Just how badly fish populations have declined is hard to say (see page 54), but most people agree that fish were much more abundant in the past. Fishing was also serious business. Charles John Andersson, the Swedish explorer and so-called discoverer of the Okavango River, wrote in 1861 'many of the natives devote a considerable portion of their time to fishing, and employ various simple, ingenious and highly effective contrivances for capturing the finny tribe'.[2]

Incomes from crop production may also have dropped, especially along the river where soil fertility has declined as fields are used year after year with little use of fertilizers, manure or compost to replenish soil nutrients. The growing number of people has limited the area in which new fields can be cleared. There has also been a decline in incomes from livestock because there are now far fewer cattle in relation to the number of people than before (see page 104).

Much of the chapter focuses on farming because most rural households are involved in some kind of crop and livestock production. Many people depend on farm produce for at least some of their food intake, and they may derive incomes from the sale of farm products. Through clearing and grazing of vegetation, farming has a greater impact on the natural environment than any other activity. Wealthier people often invest their savings in farming, for example by acquiring additional cattle and larger fields. Finally, people have been farming over many generations and an understanding of agricultural practices provides a useful view of how people have adapted to conditions that surround them. Likewise, an appreciation of established values attached to farming provides perspectives on how people may face changing circumstances in the future.

CROP FARMING

Crop farming in Kavango is a peculiar enterprise! On the one hand it is a major activity of almost all rural households, and crops provide a good deal of the food that people eat. But on the other hand, crops are cultivated ineffectively, the whole system being characterized by low inputs and low outputs.

FIGURE 61-
Hot and dry or cool and wet! This graph shows rainfall (blue bars) and maximum temperatures (red bars) each day during December 2000 and January and February 2001 at Rundu. A total of 53 millimetres of rain fell over several days in the third week of December 2000 when many mahangu fields would have been planted. Most days over the next six weeks were then dry, with a total of only 33 millimetres falling during a few scattered showers. It was also very hot, and maximum temperatures rose above 30°C on 39 of the 42 days. A spell of cool and wet weather then followed during the last three weeks in February. By then, most crops planted earlier in December would have died during the hot, dry six weeks and the fields would have had to be planted again.

Relatively few resources and efforts are invested in cultivation and the harvests are correspondingly small.[3] Why, then, is crop farming so unproductive?

Other than a few small vegetable plots, all subsistence crops are grown on dryland fields that are not irrigated. The most important consequence of this is that crop production is heavily dependent upon rainfall and much less stable than other resources. Good years are those when rainfall is both sufficient in quantity and well timed, crops receiving regular falls of productive rain throughout the growing period (see page 43). But the unpredictable nature of rainfall in the region means that productive rains often only start relatively late in the season, which lasts only a maximum of about 120 days. And there is always a good chance of long gaps of hot and dry weather between rain showers, as shown in the example of a three-month period at the end of 2000 and beginning of 2001 (FIGURE 61). Many crops then wither and die, especially if the plants are young.

Such dependence on rainfall leads to one major problem: a high risk of crop failure. But there are other problems that

Rich harvests of tomatoes and other vegetables can be reaped along the river, but such enterprises require hard work and access to markets to be successful.

raise the chances of failure. Most soils are generally low in nutrients and their sandy texture means that they hold little water (see page 62). Rainwater either drains away rapidly or evaporates as a result of high evaporation rates (see page 44). Nutrients in soils that have been cultivated also take many years to be replenished. Attacks by pest insects and birds are frequent threats to a growing crop. Finally a range of socio-economic factors add further risks to crop farming, such constraints as shortages of labour, capital and markets Elements of these difficulties are discussed below.

Mahangu (pearl millet) is the dominant crop because it is the only cereal that can be produced on poor quality sandy soils where rainfall is low with frequent dry spells. Over 90% of cultivated areas are used for mahangu production, largely

using traditional varieties of seed selected from the harvest of the previous year. This is particularly true for families living at the riverside where 45% of all households use traditional seeds. About one third of all households also plant improved seeds (mainly Okashana-1) and 28% use a mixture of both traditional and improved seeds (FIGURE 62). Okashana-1 seeds are usually planted late in the season as they have a shorter growing period. The few large-scale commercial producers also prefer this variety because of its higher yield.

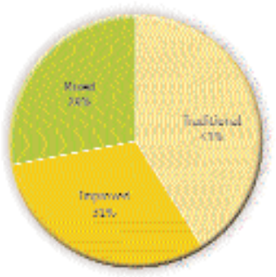


FIGURE 62.-
Traditional mahangu can grow in poor soil with low rainfall, but improved cultivars have shorter growing periods and higher yields. The pie chart shows the percentages of households planting different types of mahangu seed.[4]

Although most farmers also grow maize, sorghum and vegetables, only about 5% of all field areas are planted with these crops. Sorghum and maize are generally planted on more clayey soils, often in the valley bottoms of omurambas. Much of the maize is consumed as green cobs, while most sorghum is used to brew beer. Vegetables, such as melons, beans and pumpkins, mutete, bambra nuts, cowpeas and groundnuts, are generally planted in amongst the mahangu. A few women cultivate small vegetable gardens along the river, watering their tomatoes, cabbages and carrots by hand. Proportions of households growing different crops vary slightly between the river zones and the three inland zones of the region (FIGURE 63).

The area cultivated by each household varies a good deal, most fields being between two and four hectares along the river and three and six hectares in the inland areas. But several other factors also have an impact on field sizes. First, the size of cultivated area is related to rainfall: a survey in 1992/1993 (a bad rainy season) showed that while 70% of households intended to cultivate more than one field, only 44% ended up doing so.[5] Second, male-headed households cultivate 25% more land than female-headed households. Third, cultivated areas vary in relation to a household's size, assets and wealth. Thus, homes with cash incomes cultivate areas 25% bigger than those lacking any cash income, and families having their own oxen or plough cultivate double the area of those having no draft power or equipment. Similarly, cultivated areas vary in relation to the number of livestock, as shown in the table below.

Average areas cultivated per household compared to the number of cattle owned by the same households.[6]

Area cultivated (hectares)	Average number of cattle
Less than 1	5
1-3	10
3-5	16
5-7	22
7-9	25
More than 9	25

Fields are often cleared before the first rains, and all other events during the crop calender (FIGURE 64) follow the onset of the rains, generally in November and December. Most fields are concentrated along the margins of the Okavango River valley, in inter-dune valleys and in the dry omuramba valleys (see FIGURE 74, page 114). New fields are cleared on an on-going basis, mainly as a result of shifting cultivation as the fertility of existing fields declines. However, this is now really only possible in inland areas where woodlands can be cleared to open up new fields. Along the river, by contrast, there is almost no arable land that has not been used.

Overall, about 91% of cultivated land is ploughed with oxen, 5% by hand and 3% is ploughed with tractors.[7] Households that plough with oxen or tractors cultivate double the areas of those that plough by hand. People who hoe by hand generally do so before it has rained and many of these farmers also plant their mahangu before the rains. These make up about 15% of all farmers, while the remaining 85% plough their fields after the first good rains have fallen using oxen or tractors. This is so even though only about 53% of households actually own oxen or ploughs. Ploughs and oxen are thus frequently borrowed or hired, and 30–40% of all households report hiring ploughs.

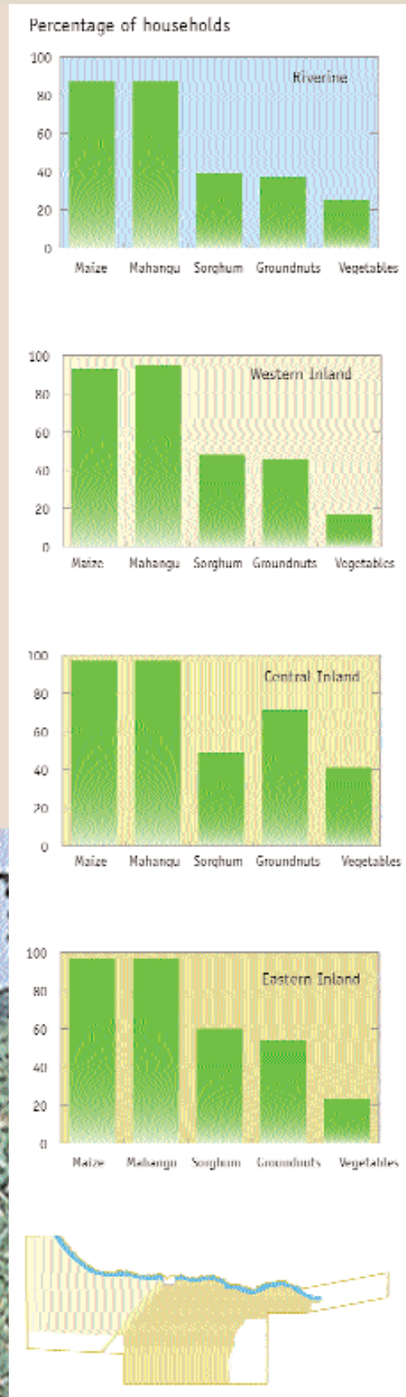
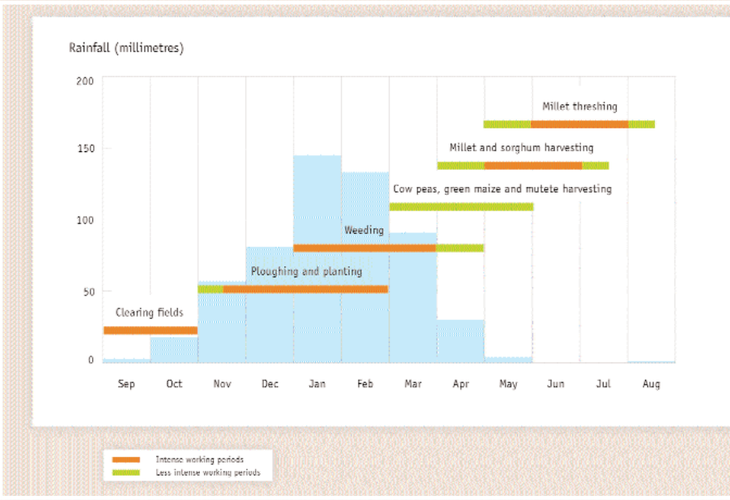
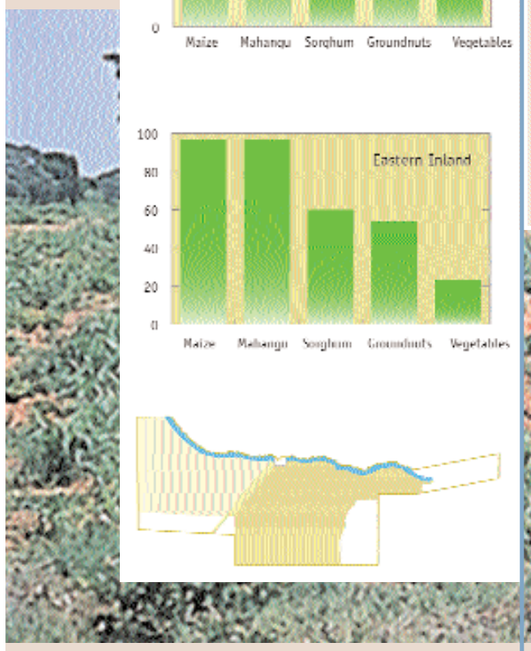


FIGURE 63-
Almost all households in inland areas grow both mahangu and maize whereas about 15% of riverine households do not grow these crops, perhaps because they have cash incomes and have stopped farming or because of the limited land available for cultivation. These are percentages of households planting different crops in four zones.[8]

FIGURE 64-
The farming calendar in Kavango shown against average rainfall per month at Rundu.





The ownership of oxen and ploughs varies in relation to a number of factors (see table below), so that more households along the river have ploughs and oxen than those in inland areas. More male-headed households have ploughs and oxen than female-headed ones. Households with wage incomes are more likely to have oxen and ploughs than those with smaller or no cash incomes.

Percentages of households having oxen and ploughs.[9]

Zone	Ploughs	Oxen
Inland	61	58
Riverine	45	40
Head of household		
Male	51	47
Female	41	38
Cash incomes		
No income	40	38
Pension	53	48
Remittances	49	43
Wage	60	56

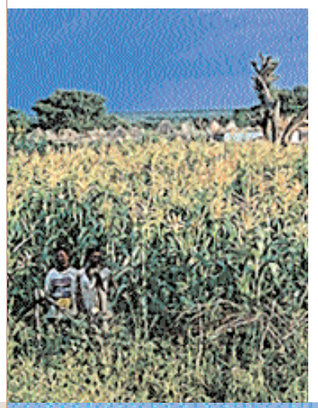
Labour is the most valuable input to crop growing. Most estimates put the average time spent by a household on cultivation per season at between 100 and 160 days.[10] More time is spent on fields that first have to be cleared or ploughed by hand. Households with larger fields also devote more labour time than those with smaller fields. Members of the family provide most labour: women work for an average of 62% of worked days, men provide 33% and the remainder is contributed by children under 15 years old and people over 60. Women are generally more engaged in cultivation while men are more involved in the clearing and preparation of land. Very few fields are fenced and one consequence of this is the need for children and other family members to tend cattle and goats during the crop season.

It is also common practice to hire labourers or to exchange labour between households, especially during busy periods of weeding. Hired labour consists either of groups of workers or individuals, and the labour is usually paid in-kind, for example with mahangu, meat or beer. Approximately one-third of all labour inputs are provided by hired people, with women supplying most such labour. The main benefit of hiring labour for wealthier people is that they can cultivate fields larger than would be possible if they relied solely on their own families. On the other hand, poorer people benefit from incomes paid for their work.

Yields and production are usually too low to provide households with significant surpluses, but some homes have huts called shiietes *in which occasional surpluses are stored.*

The Salem farming project just east of Rundu, one of the very few agricultural development projects to achieve a measure of success.

Weeding, as the most time-consuming component of crop production, is done once and sometimes twice during the season. This is in contrast to central-northern Namibia where weeds are removed at least twice each season. Less than half of farmers are reported as thinning their mahangu, a practice that would lead to greater production. The use of fertilizers and compost is also very limited. Along the river, only 2% and 8% of households apply fertilizers and compost, respectively. The use of fertilizers on inland fields is non-existent, while 8% of all households report using compost. Likewise, manure is little used, two estimates being that only 16 or 22% of all farmers apply it to their fields.



Fields are more often than not bare, largely because of inadequate soil fertility, rainfall and effort to fertilize and tend crops. However, the stubble on this field is perhaps the remnant of a good crop of maize, such as the one enjoyed by these children.

Harvesting usually starts in April. Mahangu, maize and sorghum grain are stored in a variety of different containers such as in 50-70 kilogram bags, traditional *shiietes* (small huts) or in drums. About 20% of households store mahangu without threshing and the heads are gathered in bundles of stems. Households do not mix the harvest of the previous year with the current one, and most mahangu is stored for an average of two years.

As with so many other aspects of crop farming, yields also vary a great deal: from field to field and from year to year. The greatest factors to limit yields are the low inputs made to crop growth (especially the low use of manure, infrequent thinning and weeding), the poor soils (see page 62) and frequent shortages of rain. Bumper crops may provide several hundred kilograms of mahangu per hectare, but yields of about 100 kilograms per harvested hectare are more normal.[11] These are usually insufficient for the cereal needs of most households. One analysis of yields showed that rural homes in Kavango produced an average of 115 kilograms per household member each year, enough for only 87% of the cereal needs of a household.[12] Poorer people in Kavango suffer most frequently from homegrown cereal shortages, mainly because their fields are too small to provide for their food needs or because their households are so small that there is insufficient labour to properly tend their crops.

The great bulk of crop produce is consumed at home. Some surpluses may be sold in good years, but this is rare as a result of infrequent surpluses and the low returns most small-scale farmers would get for a few bags of mahangu. The only real commercial producers are large-scale mahangu farmers, of whom there are less than 70 in the whole region. Each of them plants between 100 and 500 hectares of mahangu, and their harvests are sold to the only two commercial millers at Katjinakatji and Nkurenkuru in Kavango and to buyers elsewhere in Namibia and in South Africa. Most of these large farms are far to the south of the river and to the west of the Mururani-Rundu road. There are, in addition, the large irrigation projects on government farms at Musese, Shadikongoro, Shitemo, and Vungu Vungu, which produce mainly maize, cotton and wheat.[13]

Numerous horticultural projects have been started at various places over the past 30 years. Almost all have failed for two reasons. The first is that most projects relied on a co-operative approach, expecting groups of farmers to collaboratively operate the gardens for everyone's benefit. A second problem has been one of marketing, the farmers finding it difficult to store their perishable produce and to find regular buyers. The gardens were also unable to provide reliable and adequate supplies for large-scale buyers such as supermarkets in Rundu and hostel caterers.

An exception to this succession of failures is the Salem vegetable garden a few kilometres east of Rundu. While a management committee organizes aspects of the water supply, the 50 farmers run all other business individually and competitively. Profits are good, with one farmer making more money from his half hectare than his other job as a teacher at a local school. Produce is sold in Rundu and the presence of this large market nearby is key to the success of the enterprise. However, even this project is probably not sustainable because the costs of pumping water are still subsidized.

Returning now to the question of why crop farming is so unproductive, the low input-low output nature of cultivation is best illustrated by comparing conditions with crop farming in central-northern Namibia. Yields in this area average 300 kilograms versus the 100 kilograms per hectare in Kavango. About 60% of farmers apply manure, roughly three times more than the proportion of farmers doing the same in Kavango. The majority of fields in central-northern Namibia are protected by fences, unlike the almost complete absence of fences in Kavango. Farmers in central-northern Namibia also invest more labour in crop production and, most importantly, use much more efficient methods to store surpluses.

Why should crop farming in Kavango be so unproductive? The five possible reasons offered below are all based on assumptions that farming systems are tuned to the environment and selective processes in which they occur, that the systems evolved over long periods, and that crop farming has generally been unproductive over many years.

1. The risks of crop failure are substantial and so the chances that investments made in crop farming will be wasted are high. This describes a vicious circle: a high risk of failure leads to low inputs, and low inputs contribute to low outputs, which reconfirm that inputs remain low. It is clear that crops have often been lost over many generations as a result of shortages of rain, poor soils, crop pests (insects, queleas and elephants, for example) and tribal raids (see page 35). Several aspects of farming methods have indeed developed to help reduce such risks. Thus, batches of crops are often planted at different times, each planting session following a period of good rain to improve the chances of a portion of the crop being successful if some plants do not survive periods of hot, dry weather. Planting at different times also means that the harvest can be done gradually over a longer time so less labour is needed than if the whole crop had to be harvested in a short period. The chances of a whole crop being eaten by insect pests or birds are also reduced.
2. Potential rewards from crops have been low and farmers thus lack incentives to invest and produce more. This is closely related to the risk of failure, but rewards also come from being able to market occasional surpluses and thus increase household incomes. However, the small number of people in Kavango has meant that local markets were tiny, and the distance to other markets has limited the chances of selling produce elsewhere. Adding weight to the idea of good rewards for farming to be effective is the example of Salem. Most other horticultural projects in the region failed because farmers were unable to profit from their vegetables, whereas the Salem farmers close to the large Rundu markets now invest and reap much from their small plots.
3. The high burden placed on people by diseases has reduced their ability and willingness to work hard. Again, this is related and contributes to greater risks and lower rewards, but diseases on their own would have a severe effect on the physical strength and availability of people to labour at growing crops. For example, over half the population could have malaria during much of the crop season, and people in the region have been living with malaria, bilharzia and other debilitating diseases for many generations (see page 84). It would thus not be surprising if disease prevalence has moulded approaches to farming systems.
4. Large areas of land are available in Kavango, and so new fields can be cleared readily and cultivated for a number of years until soil fertility is reduced. Farmers then move on to clear other areas. The field areas are also quite large, the crops being planted over extensive areas and with comparatively little care. This is especially evident from the lack of thinning and small effort made to apply manure, remove weeds and store surpluses. The expectation, therefore, is that an adequate harvest can be obtained from large areas with a minimum of effort.
5. The historical availability of relatively abundant alternative foods provided other sources of food in the form of fish, wild fruits and animals to be hunted. With such alternatives there would be little need to invest heavily in crops, especially if the risk of failure was high. It could therefore be prudent to invest minimum effort in crops in the secure knowledge that alternative sources of food were available. Kavango has never experienced the succession of devastating famines that killed large proportions of the people in central-northern Namibia, and it is tempting to think that people in Kavango could turn to other food when their crops failed. Of course, the availability of most of these other foods has declined but the increased number of incomes with which to buy food might compensate this. A similar trend may in fact hold true within Kavango itself where farmers in the inland areas are often said to be more serious about crop production than those along the river. Whether this reflects the absence of fish and other natural resources in inland areas or the greater availability of alternative household incomes from wages and business activities along the river remains to be seen.

There are about 150,000 cattle and 65,000 goats in Kavango.

None of these ideas may be mutually exclusive, each perhaps offering part of an overall explanation for the farming systems of today. However, we would argue that the great famines in central-northern Namibia did as much as anything to shape crop farming there. This is why farmers there invest so much in crop production and storage. By contrast, the absence of famines and availability of other foods were probably the major factors to mould farming systems in Kavango.

LIVESTOCK FARMING

Livestock farming in Kavango is dominated by cattle and goats. There were an estimated 137,000 cattle in the region in 2000, and by 2003 the number would have risen to perhaps 150,000. This is based on an annual increase of 4%, the rate at which cattle numbers grew over the past nine years (FIGURE 65).[14]

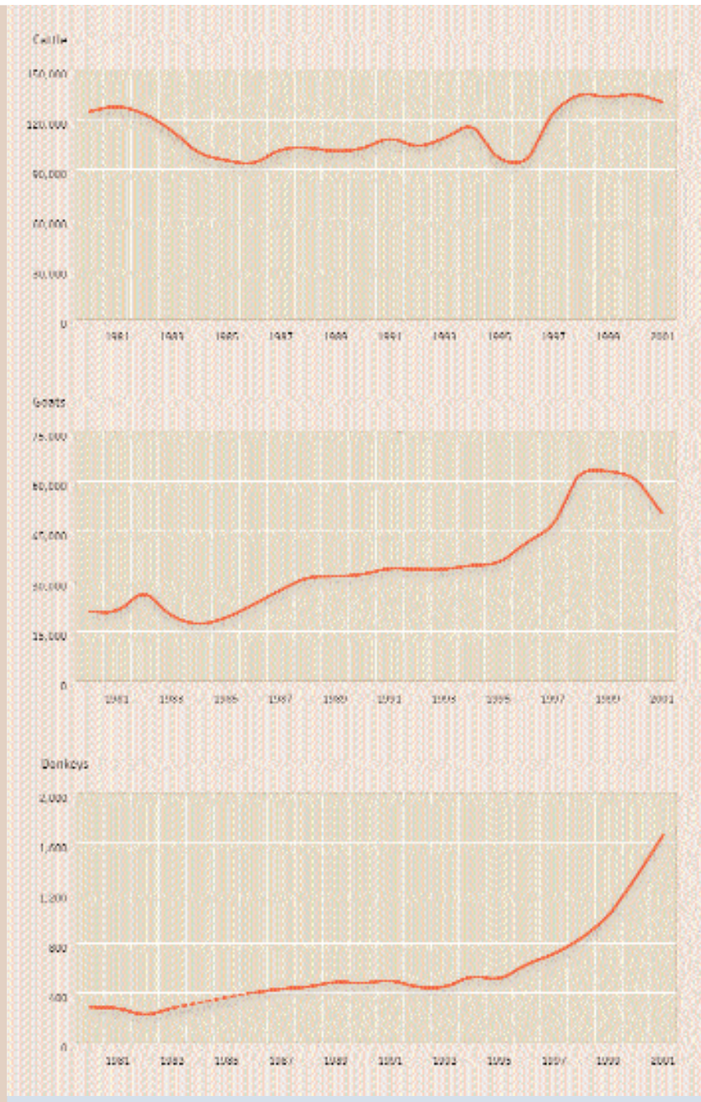
The total number of goats in the region was estimated to be about 64,000 in 1998 and 1999, having doubled and increased at an annual rate of growth of 8% over the past nine years. The lower figures in more recent years are probably due to less complete reporting. Other livestock kept in smaller numbers includes about 3,000 pigs, 1,700 donkeys, 1,200 sheep and some 500 horses in 2001. Taking cattle and donkeys as single large stock units and eight goats as equivalent to one such unit, cattle represent 92% of all large stock units in the region, goats 6% and all other animals about 2%.

FIGURES 66 and 67 provide perspectives on the density of cattle and goats, respectively. The highest densities are generally along the river where most people live, but there are also significant numbers of cattle inland, particularly in the west. Areas in which there are more than 10 cattle per square kilometre are certain to be overgrazed. Many areas in the remote south now apparently have few animals, but that will surely change once new farmers establish their large farms and water points in those areas (see page 116). A significant number of cattle in western Kavango belong to farmers from the former Owambo region from where they bring their cattle to graze in Kavango. While some reports of as many as 50,000 cattle being brought into Kavango are perhaps far-fetched, the presence of the cattle is a matter of serious concern, particularly to the Kwangali Traditional Council and resident farmers in that area.

The average number of cattle and goats per household is 29 and 23, respectively, for farmers that keep these animals. The figures are much lower if households that do not have livestock are included: 17 cattle and 12 goats, respectively. The difference in averages between those that have and don't have livestock begin to give an idea of just how variable livestock ownership is. In fact, close to half of all households do not have livestock (41% of households have no cattle and 49% have no goats, as shown in the following table).

Percentages of households having different numbers of cattle and goats.[15]

Number of animals	Cattle	Goats
None	41%	49%
1-10	22%	23%
11-20	14%	12%
21-30	10%	6%
31-40	4%	4%
41-50	2%	2%
51-100	4%	4%
More than 100	2%	1%



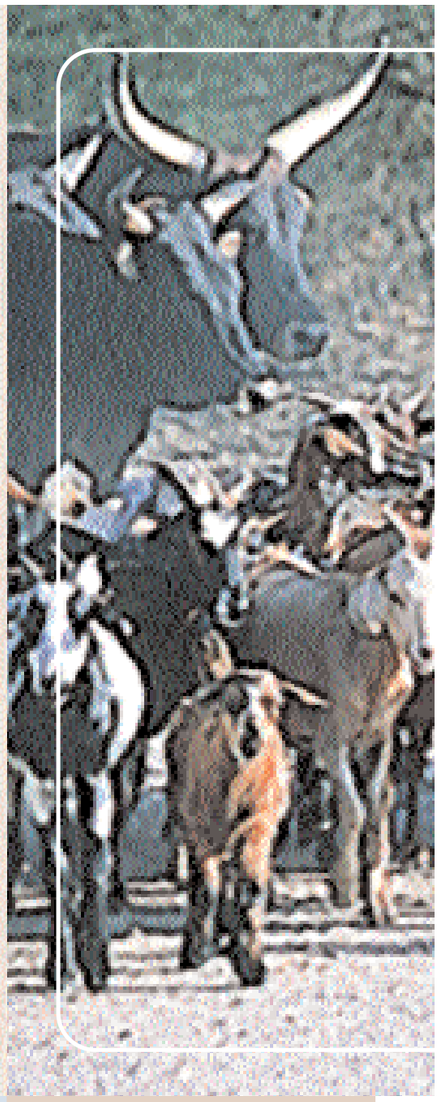


FIGURE 65-
Livestock numbers have increased a great deal in recent years. The graphs show the total numbers of cattle over the past 60 years, and numbers of goats and donkeys over the past 20 years. Earlier reports gave the number of cattle in 1912 as 12,000, in 1926 as 26,262 and in 1938 as 31,849.[16]

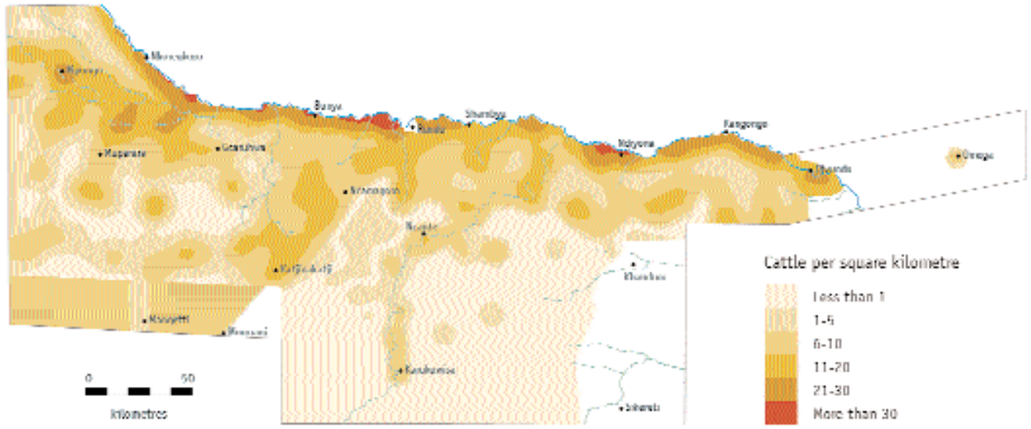


FIGURE 66
Most cattle are concentrated along the river, although there are many places inland where densities of cattle exceed six animals per square kilometre.[17]

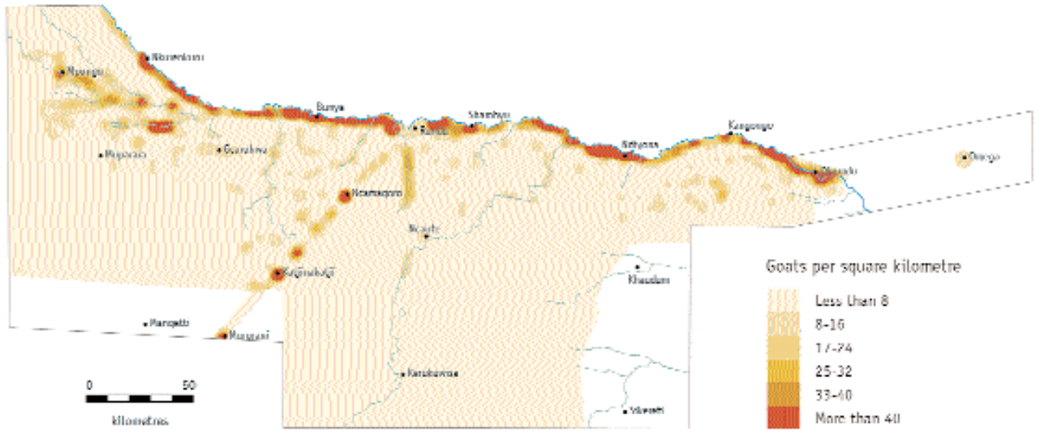


FIGURE 67
The majority of goats live along the river and larger settlements elsewhere. The figures are in groups of eight because eight goats are roughly equivalent to one large stock unit or one cow.[18]

Much of the variation in ownership relates to several factors. Firstly, patterns of ownership vary in the different zones in the region, with about 77% of households in the western interior having cattle compared with only about 50% of those along the river (FIGURE 68). Average herd sizes along the river are 9 cattle and 9 goats, compared with 26 cattle and 16 goats in the western interior (these include households that have no livestock). Many farmers in the western interior also have large herds of more than 50 cattle, and there are also quite a number of farmers with herds of 100 and more cattle. For the region as a whole, 6% of all households have 50 or more cattle and these farmers jointly own about 49% of all cattle.

Secondly, livestock ownership is related to a household's main source of income. Thus, those with wages have about double the number of livestock than those that have no income, as shown below.

The average number of cattle and goats in households having different main sources of cash incomes.[19]

Income source	Cattle	Goats
No income	7	4
Pensions	7	5
Remittances	10	6
Wages	14	8

Note that these figures come from three agricultural surveys. The averages are lower than those reported above because the samples were mainly taken along the river, but the trend in ownership pattern is clear.

Thirdly, large households are more likely to be cattle owners than those with fewer family members, and bigger households also have larger herds (FIGURE 69). Finally, ownership varies in relation to the gender of the head of the household, male-headed homes having about 30% more cattle and goats on average than those headed by women. Surprisingly, there is little difference in herd sizes between male and female-headed households that own livestock, so the 30% difference is largely due to the fact that more female-headed households do not own livestock.

Livestock ownership patterns have probably changed in recent decades with more and more animals being owned by fewer people. Early reports suggested that many people owned at least some cattle compared to the more skewed ownership that is now the case.

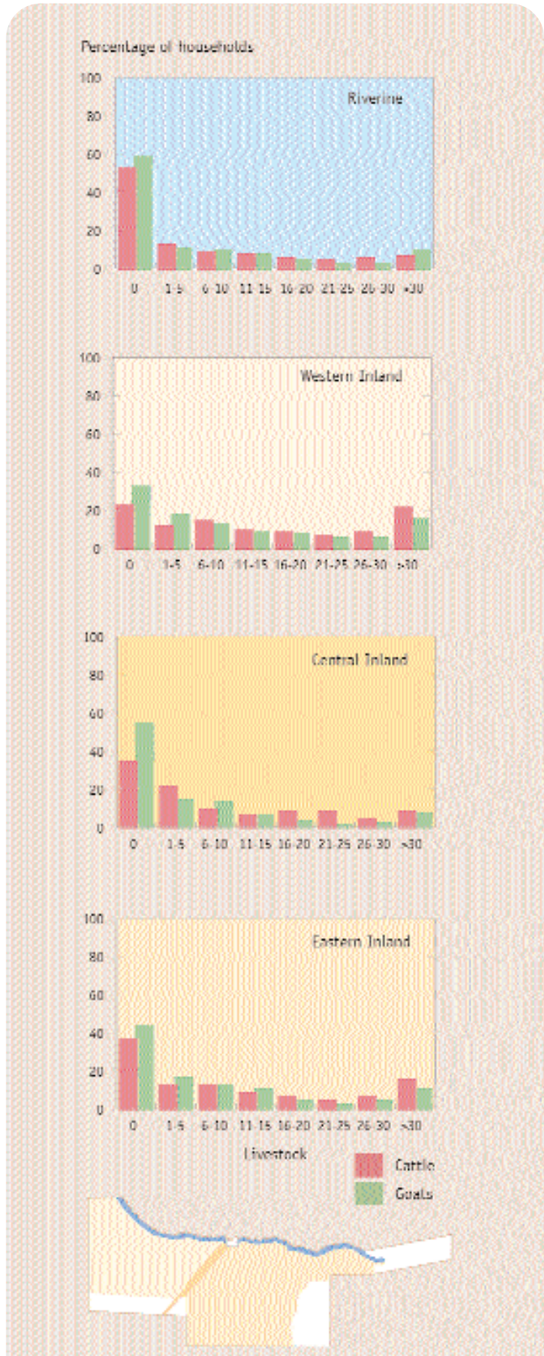


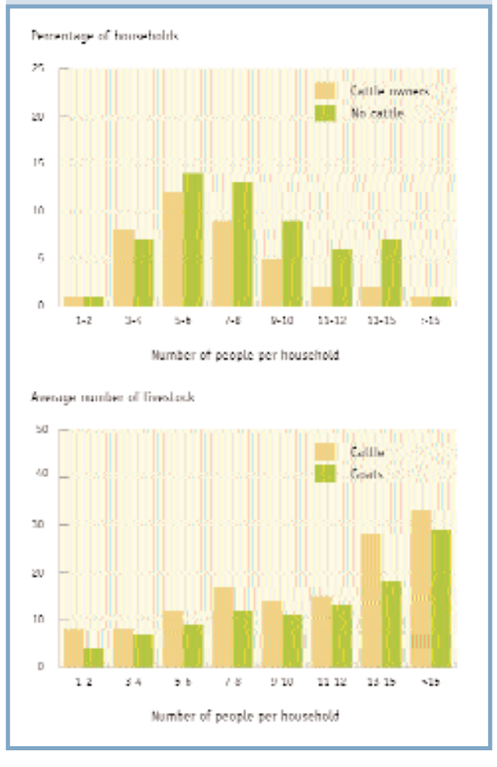
FIGURE 68
Percentages of households in four zones that own different numbers of cattle and goats. White areas are those where there are few or no households.[20]

The number of cattle in the region has also dropped significantly in relation to the number of people with the number of cattle per person now being less than half it was 50 years ago (FIGURE 70).

Livestock in Kavango have always been affected by a host of diseases, and the most important ones to have placed a burden on animals long ago were probably such diseases as January or corridor fever, black quarter disease, anaplasmosis and botulism. The great rinderpest epidemic in 1897 apparently killed most cattle in Kavango, but the most significant diseases nowadays are:

- Foot-and-mouth. The last outbreak was in 1992, but the disease remains a major threat to cattle in the region. All cattle are vaccinated against the disease annually to prevent possible infections from Angola from spreading.
- Lung sickness is also a major threat to cattle, which are vaccinated to prevent infections from spreading. This disease was introduced from Europe.
- Black quarter or black leg poses a significant threat to cattle, and was considered to be the most important cause of stock loss in the early 1900s.
- Botulism is a deadly disease among cattle, and usually occurs when animals suffer from shortages of phosphorous and then chew bones or other animal material.
- A variety of gastro-intestinal parasites lower the condition of goats and cattle.
- Sarcoptic mange is a particular problem for goats.
- Rabies can be a severe disease amongst dogs. The disease was virtually unknown at the beginning of the last century, and appears to have spread southwards from Angola between the 1920s and 1960s.
- Newcastle disease may devastate flocks of chickens because it spreads so rapidly.

FIGURE 69-
Greater percentages of bigger households have cattle, while smaller households are less likely to be cattle owners (top). Larger households also have bigger herds of cattle and goats than smaller homes (bottom).[21]



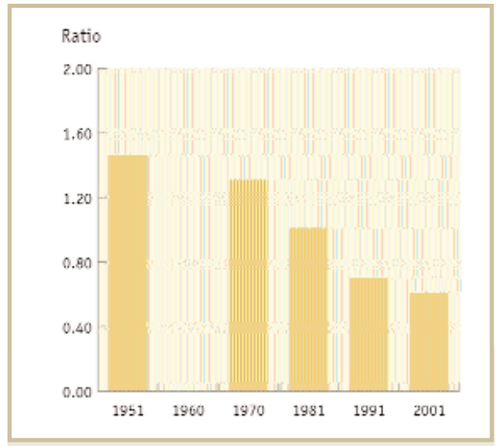


FIGURE 70-
Numbers of cattle relative to the numbers of people have dropped significantly in recent decades, as shown here by the ratio of cattle to human numbers between 1951 and 2001.[22]

Most of Kavango lies north of the veterinary cordon fence (the so-called Red Line), and livestock products from this area can only be exported south to other places in Namibia or to South Africa after going through a period of quarantine and being declared free of disease. This puts a potential limit on cattle marketing, and livestock farmers often claim that they would be more productive if they could sell their animals without veterinary controls. Such claims are debatable, however, because prices now offered by Meatco (the parastatal that buys livestock in areas under quarantine control) are comparable to those paid elsewhere. It is also clear that most cattle are not available for sale.

The low numbers of cattle now sold continues a long-established historical pattern in which most livestock are not kept for purposes of commercial and productive farming. In fact, most animals that are sold belong to farmers with small herds, whereas farmers with large herds make few of their cattle or goats available for sale. The total percentage off-take of all cattle amounts to about 7% per year, and even goats, with an estimated annual off-take of 8%, are seldom slaughtered or sold.[23] About a quarter of all cattle sold are bought by Meatco, which then slaughters and processes most of the animals at the Oshakati abattoir. The other three-quarters consist of animals sold on the informal market at so-called bush-markets along the road. Despite the low levels of sales, it is possible that the growing cash economy in Kavango will oblige farmers to sell more animals to provide them with additional cash.

Total numbers of cattle bought each year by Meatco have generally declined over the past 10 years, despite the opening of new quarantine farms in recent years (see page 113). The highest numbers bought (over 4,000) were in 1992 and 1995 following very dry years, perhaps as a result of a lack of grazing and subsidies from the government to encourage sales. The lowest number of less than 2,000 cattle was bought in 2001. The Kavango Cattle Ranch to the south of the cordon fence sells cattle directly to abattoirs in Namibia. Cattle numbers on the ranch dropped from about 22,000 in the early 1980s to less than 8,000 in 2002. The predecessor of the Namibia Development Corporation started the ranch in the mid 1970s and the NDC continues to manage this huge farm (see page 113).

Other than cash obtained from limited sales, what other values do livestock have? Oxen are of great value in providing draft power for the ploughing of fields, and farmers who use draft power cultivate bigger areas than those who plough by hand (see page 94). Draft power is also used to haul water, wood and other goods. Cows provide milk and some meat is consumed at home, but this is still much less than the value of cash purchases of meat (see page 107). There are also a variety of less tangible benefits that often have greater value than the material benefits. These are the values that livestock bring as capital investments and as hedging insurance when cash might be needed. Livestock are thus valuable savings into which surplus cash is invested. Large herds also give people access to and control over grazing pastures, thus bringing farmers status and a measure of security in the event of droughts or other disasters.

HOUSEHOLD WELFARE

It is often believed – implicitly or explicitly – that rural homes are rather homogeneous, with most people living and subsisting in similar ways. We also assume that most homes experience comparable levels of wealth. However, nothing is further from the truth. The welfare of households depends both on income and access to resources such as oxen, ploughs, livestock, grazing, fields and fish, for example. Variation in income is described below, but a few figures on ownership and access to assets also confirm the high degree of variation between households. For example, about 59% of households have cattle and some 51% have goats, leaving 41% and 49% without these livestock. Approximately 6% of all farmers own about half the cattle in the region, and about 270 people effectively own almost one quarter of all land in Kavango (see page 116). Poultry is owned by 71% of households. Only half of all farmers have their own ploughs, and less than half the households along the river catch fish (see page 54).

Another common assumption is that most people are heavily dependant on subsistence farming to provide them with the majority of their food and incomes. This is correct for a proportion of households, especially those that are very poor, but it is also true that the majority of homes buy much of their food using money earned from sources that have nothing to do with farming. These issues can be explored by looking first at sources of income and second by examining how people spend their incomes. Households obtain incomes from a variety of sources. Some are 'in-kind' or material incomes, such as mahangu harvests or milk from cattle kept at home, while others are cash incomes from wages, trading activities, pensions or remittances, for example. Most households also have several different incomes, and even individuals often have different incomes as well. A small survey of rural households in 2002 found that 67% of homes had two or three cash incomes and another 23% had between four and seven different cash incomes.[24] The following table provides estimates of the total value of income from different sources in rural homes.

Percentages of total household income from different sources in Kavango.[25]

Source	Percentage of total income
Crop production	10
Livestock	8
Non-agricultural resources	19
Non-government employment	50
Government employment	14
Total	**100**

Note: Non-agricultural resources include goods such as fish, wood etc.

The most surprising result in this table is that farming activities generate less than one fifth of all income, compared with almost two-thirds coming from different kinds of employment. Household members who work away from home earn much of the income from employment, and about 46% of homes in 1992 had at least one such income.[26] The same study in 1992 found the value of incomes from employment to be very much greater than those of any others. Thus, the annual income of a home in which one or more people were employed was seven times greater than that of households that had no one working elsewhere.

Turning now to how people spend their incomes, a survey in 1994 showed that 63% of all expenditure was on food in rural homes, leaving 37% spent on other items such as clothing, housing, fuel and transport. Among households in urban areas, expenses on food (49%) were roughly equal to those spent on other goods and services. The table below provides details on what kinds of foods were obtained and their sources as either having been produced at home or bought for cash.

Thatching grass has become an important export commodity in recent years, and now earns the region several million dollars each year. Clay pots sold along the road near Katjnakatji are another recent innovation.

Percentages of total household expenditure on food and other goods and services in urban and rural areas in Kavango in 1994.[27]

Items	Urban	Rural
Cash cereals	16.4%	13.1%
Cash meat	10.5%	4.7%
Cash fish	2.5%	1.9%
Other cash food	15.3%	11.0%
Total cash food	***44.7%***	***30.7%***
In-kind cereals	1.5%	17.2%
In-kind meat	0.6%	2.1%
In-kind fish	0.3%	1.1%
Other in-kind food	1.6%	11.9%
Total in-kind food	***4.0%***	***32.3%***
Total food consumption	**48.8%**	**63.0%**
Consumption on other goods and services	**51.2%**	**37.0%**

Note: Other food includes dairy products, fat and oil, sugar, fruits, nuts, vegetables, and beverages, for example.

While we might expect that most food in urban Rundu was purchased, the figures in this table also show that about half of all food in rural homes was produced at home and the other half obtained from cash purchases. Other interesting results are the much higher expenditures by urban homes on meat and other foods, whereas almost all food obtained by rural homes consists of cereals. Both urban and rural homes also spend significant amounts on alcohol, especially so in rural areas where alcohol makes up 4.5% of the value of all expenditures.

Another way of looking at contributions of home produce and bought items to food needs is to assess the proportions of households consuming food from different sources (FIGURE 71). This shows that a good proportion of homes rely entirely on cereals, meat and fish that have been bought or bartered. Thus, about 28% of households do not produce their cereal needs, 50% do not produce the meat they eat, and 59% do not catch the fish they consume. By contrast, about 13% of households produce all the cereals they eat, while 7 and 10%, respectively, produce all their meat and fish requirements. In between these extremes are those families that both produce and purchase some of the cereals, meat and fish that they eat.

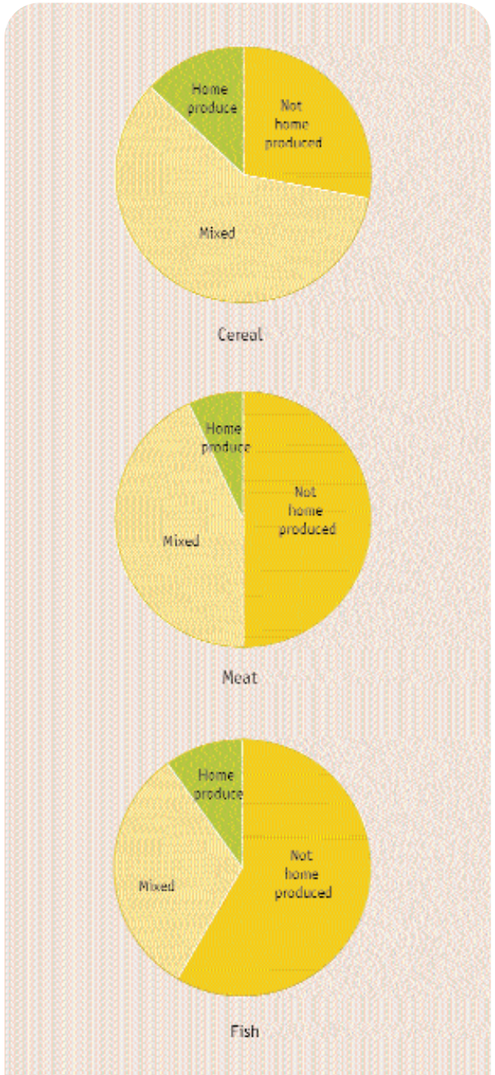


FIGURE 71
Sources of food, showing percentages of households that largely eat food that they did not produce at home, those consuming a mix of home produce and food obtained elsewhere, and those relying entirely on food they produce themselves.[28]

CHALLENGES FOR LIVELIHOODS

Many of the preceding pages have been devoted to farming because so much land is used for this purpose, and farming is apparently an important activity in which most rural households are engaged. However, its importance in contributing to incomes and food requirements is not as great as expected. This is most obvious for livestock farming, where the main value of cattle and goats rather lies in the security and investments they provide. But it is also true of crops since a surprisingly small proportion of the income of an average household comes from cultivation. This is made clear by the high proportion of income obtained from non-farming activities, and also by the large amount of food that is purchased with cash. Many households thus have significant cash incomes from non-farming enterprises, and the incomes come from a variety of sources.

And so this is what household economies look like today: a blend of cash and farming incomes. Compare this mix with the economies of a hundred years ago when an abundance of natural goods such as fish, wildlife and plant products was available to such an extent that farm products were probably used more as a supplement than as a dominant source of food. Most of the fish, wildlife and plant resources have now gone, but they are being replaced increasingly by cash incomes from jobs and informal businesses. Once again, this allows farming to be practised more on a supplementary basis than would be the case if more farm produce were needed for food.

The mix is also moving and changing extremely quickly as more and more people move into the modern cash economy, leaving behind their dependence on farming and other natural resources. Witness the rapid rate of urban growth of Rundu and the explosion of small business enterprises there (see page 121). Many new jobs have become available in Kavango, the number of teachers having risen by 800 from 1,400 in 1991 to 2,200 in 2002, for example. Add to these other government jobs and those in the escalating retail and other businesses.

And yet most plans for development in Kavango concentrate on one holy tenet: rural development. Some aspects focus on services to support people in rural areas while others attempt to improve household economies, most often by trying to raise production on small farms to provide greater food security and increase sales of farm produce. Irrespective of the particular focus, all the efforts are based on a central assumption that livelihoods on communal land can really be improved. Is this assumption valid? We think not.

A first argument against such a focus on rural development is that most people prefer alternative livelihoods, which they usually seek in towns as waged employees or running informal businesses. The rapid rate of migration to Rundu bears testimony to this. It is true that many people in towns retain links to rural households, and some even grow crops just out of town (see the photograph on page 119). However, movements to town reflect clear intentions to find better lifestyles, and so the promotion of rural, subsistence livelihoods simply runs against the aspirations of many people.

Second, rural life in this environment is hard and insecure because of the poor soils, low and unreliable rainfall, and prevalence of disease. Services are also hard to come by. In many places much of the natural vegetation has been destroyed, so much so that wood and grazing is now available only after a long walk. Water, too, is often far away and often not safe to drink. In short, this is not a place to live a comfortable life, particularly if the most attractive areas are already densely occupied by other people.

As a third and related reason, making a good living in this environment requires much more than the few hectares most people are expected to occupy on communal land. Instead, farming is only profitable if large expanses are available on which to grow hundreds of hectares of mahangu, or perhaps to irrigate maize, wheat or cotton, or the thousands of hectares on which a hundred and more cattle can be ranched. It is remarkable that there are only a few hundred large-scale farmers in all of Kavango, consisting of about 70 mahangu farmers and perhaps 500 cattle farmers who have more than 100 animals (most of these cattle owners are not commercial farmers anyway, because few of their animals are ever sold). The 50 vegetable growers at the Salem project could also be regarded as large-scale farmers. The small plots are only commercially viable because these farmers can sell their produce at Rundu (see page 99).

This raises a fourth reason: the lack of markets where farmers can sell their products to make some kind of reasonable income from their labour. Much of this problem is due to the fact that marketing infrastructure (such as storage and transport) and systems to maintain stable levels of supply and demand are largely lacking. The number of potential buyers is also relatively small, even though demands should increase as the population grows and more people have cash to buy food.

Fifthly, despite the well established practice of hiring labour and earning money from *stukwerk* (odd jobs or piece work), labour for small-scale farming is clearly limited. Many anecdotal reports indicate that people are either unavailable or unwilling to work at such activities. And since labour is such an important input, especially for crop production, it is unlikely that profitable yields will be obtained in the absence of a much greater and reliable supply of labour.

Finally, capital is required for farming activities to develop to a point that they become lucrative and beyond the level of subsistence. It is probably true that every single large-scale and/or commercially active farmer in Kavango had capital to invest in livestock, fertilizers, tractors, seed and other inputs. The capital has usually been saved from a well-paid job or business. Small-scale farmers seldom have access to such savings, and their lack of tenure and assets make it virtually impossible to get loans.

These are all reasons that make rural development difficult, especially for subsistence farmers who face high risks and low rewards, and have such better options elsewhere. Since formal jobs provide incomes many times greater than those from small-scale farming it is not surprising that most people have little interest in investing in farming and less and less attachment to rural life. For the time being, however, many rural people have little immediate hope of moving up the ladder, remaining stuck on the bottom rung where they eke out a living from farming and fishing and gathering.

Compare these rural poor with people who have entered the modern economy, mostly as wage earners working as civil servants or running small, informal businesses. These are Kavango's upwardly mobile set, people who are setting the pace by taking command of much of the economy and the land, while also being important role models for the remaining population. It is this 'elite' group who sets the pace and these are the people who will determine much of how the region's future pans out.

The transition of a society dominated by rural life to one where urban lives are the norm will take some generations. For several reasons, many people will also elect to remain in the countryside. Most of them will be poor and they should not be abandoned. But efforts to support them will be more effective if they are appropriately cast in terms of poverty alleviation rather than as rural development. Effective development can then concentrate on urban areas and those options that recognize and capitalize on real benefits to be gained from rural environments, for example large-scale farming, tourism and the economic use of wildlife.

Key notes

- The variety of risks associated with crop cultivation and low inputs to farming mean that crop farming is generally unproductive.
- Livelihoods have changed rapidly in recent decades, especially as a result of more cash incomes and the reduced availability and use of natural resources.
- Mahangu (pearl millet) is the dominant crop because it is the only cereal that can grow on poor sandy soils where rainfall is low with frequent dry spells. Over 90% of cultivated areas are planted with mahangu.
- Soil nutrients are treated as non-renewable resources since little effort is made to replace them. Thus, minimal use is made of fertilizers or compost, and about only 20% of farmers use manure.
- Average yields of about 100 kilograms of mahangu per hectare are insufficient for the cereal needs of most households.
- Most of the many horticultural projects failed because they were run on a co-operative basis and because produce was difficult to market.
- An absence of famines and availability of other foods were probably the major factors to mould farming systems.
- Livestock farming is dominated by herds of about 150,000 cattle and 65,000 goats.
- Larger and wealthier households own more livestock than homes with smaller incomes and fewer household members.
- Few livestock are available for sale, with the result that only about 7% of all cattle and 8% of all goats are sold each year.
- Rural households vary greatly in wealth and most households have a variety of incomes contributed by different family members.
- Food or cash derived from farming contributes little to an average home's needs compared to the substantial values of incomes from wages and other sources.
- Incomes of homes with one or more employed people may be seven times greater than those of households without an employed family member.
- In rural households, about half of all food is produced at home and the other half obtained from cash purchases.
- Rural development in the region is difficult to achieve, largely because subsistence farmers face high risks and low rewards, and have better options elsewhere.

SAND AND WATER

CHAPTER
NINE

LIMITS

Whose land?

A long divide: the border between Botswana and Kavango.

Kavango covers an area of 48,456 square kilometers, much of which is declared as communal land. The accepted meaning of communal implies that the government ultimately owns all land, and traditional or customary rights to the use of land are given to people living in the area. A further aim of government ownership is to ensure that land – and thus its resources – is available to people too poor to buy their own land. In short, the government holds communal land in trust as a safety net for the poor. It may seem odd, therefore, to ask 'whose land?' but, as we shall see, there are a multitude of owners and much of the land is not available to its intended users.

There are five major categories of 'owners and users' of land: the central government, the regional government, traditional authorities, small-scale farmers, and large-scale private farmers (FIGURE 72). In some areas, all land is under the clear and direct control of one of these bodies, but in many other areas different organizations exercise complex, overlapping and sometimes confusing kinds of authority.

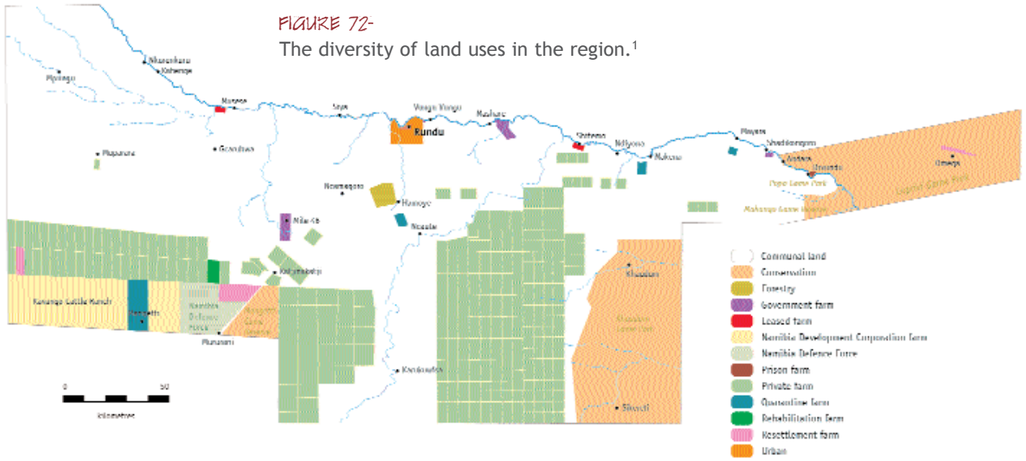


FIGURE 72-
The diversity of land uses in the region.[1]

Land use	Square kilometres	Percentage
Communal land	26,497	54.68
Conservation areas	7,508	15.50
Forestry area	100	0.21
Government farms	108	0.22
Leased farms	23	0.05
Namibia Development Corporation farm	1,683	3.47
Namibia Defence Force farms	535	1.10
Prison farm	4	0.01
Private farms	11,295	23.31
Quarantine farms	279	0.58
Rehabilitation farms	62	0.13
Resettlement farms	200	0.41
Rundu urban area	162	0.33
Total area of Kavango	48,456	100

CENTRAL, REGIONAL AND LOCAL GOVERNMENT

A total of 20% of the region is used or controlled by the government or several of its agents. By far the biggest area (7,508 square kilometres) is for conservation in the form of the Khaudum, Caprivi, Mahango, Mangetti and Popa Game Reserves or Parks. Proposals have been made to adjust some boundaries in the Caprivi to cut out areas now inhabited by large numbers of people, to amalgamate it with Mahango and to call the park the Bwabwata National Park (see FIGURE 39, page 73).

Other large areas are used by the government for farming activities at the Kavango Cattle Ranch, Mashare agricultural research farm and the Mile 46 cattle-breeding farm. The original Kavango Cattle Ranch consisted of 45 farms, 30 of which are still used for cattle ranching by the parastatal, the Namibia Development Corporation (NDC). Three others are used as the Mangetti quarantine farm, while nine farms now belong to the Namibia Defence Force, and another three are leased to war veterans. Other government farms at Shadikongoro, Shitemo, Musese and Vungu Vungu are now leased to private individuals. Apart from the Mangetti quarantine farm, three more quarantine farms were recently established near Ncaute, Makena and Mayara by Meatco, also a parastatal.

There are also resettlement farms and schemes at Divundu, Omega, on one of the Mangetti farms and at Shadikongoro. All are under government control. Rehabilitation programmes for handicapped people are run at Siya and on a new 5,000 hectare farm adjacent to the Mangetti block of farms.

Recently and importantly in the context of land uses and rights, a regional government has been formed to manage various functions on a decentralized basis. There are now nine constituencies in Kavango, each represented by an elected regional councillor. One councillor is appointed as the Regional Governor, and regional office officials are employed to administer various regional government responsibilities. However, systems have yet to be implemented for most of these intended functions. In terms of the recent Communal Land Reform Bill, one or more land boards will be established to play a direct role in controlling the use and allocation of land.

The approximately 16,000 hectares of Rundu townlands are administered by the Rundu Town Council (see below) and four villages have been declared as settlement areas: Nkurenkuru, Kahenge, Ndiyona and Divundu. These are expected to develop into towns in the future.

FIGURE 73-
Approximate boundaries of the major tribal and language groups. Note that the Shambyu and Gciriku people speak the same Rumanyo language.

TRADITIONAL AUTHORITIES AND SMALL-SCALE FARMERS

While the regional government and its councillors are expected to play an increasing role in the administration of land, certain issues of land management remain under the control of traditional authorities. The most prominent of these represent five major tribal groups, from west to east: Kwangali, Mbunza, Shambyu, Gciriku and Mbukushu (FIGURE 73). There are tribal administrative offices at Kahenge, Kapako, Kayengona, Ndiyona and Mukwe. Most of the boundaries between the five major tribes are well established, but there have been recent debates over the borders that the Shambyu people share with the Mbunza and Gciriku tribes. A relatively small number of Kxoe people live in the Caprivi Strip while there are scattered small groups of San people elsewhere. Tribal leadership amongst the Kxoe and San has, however, not been well organized or recognized in recent years.

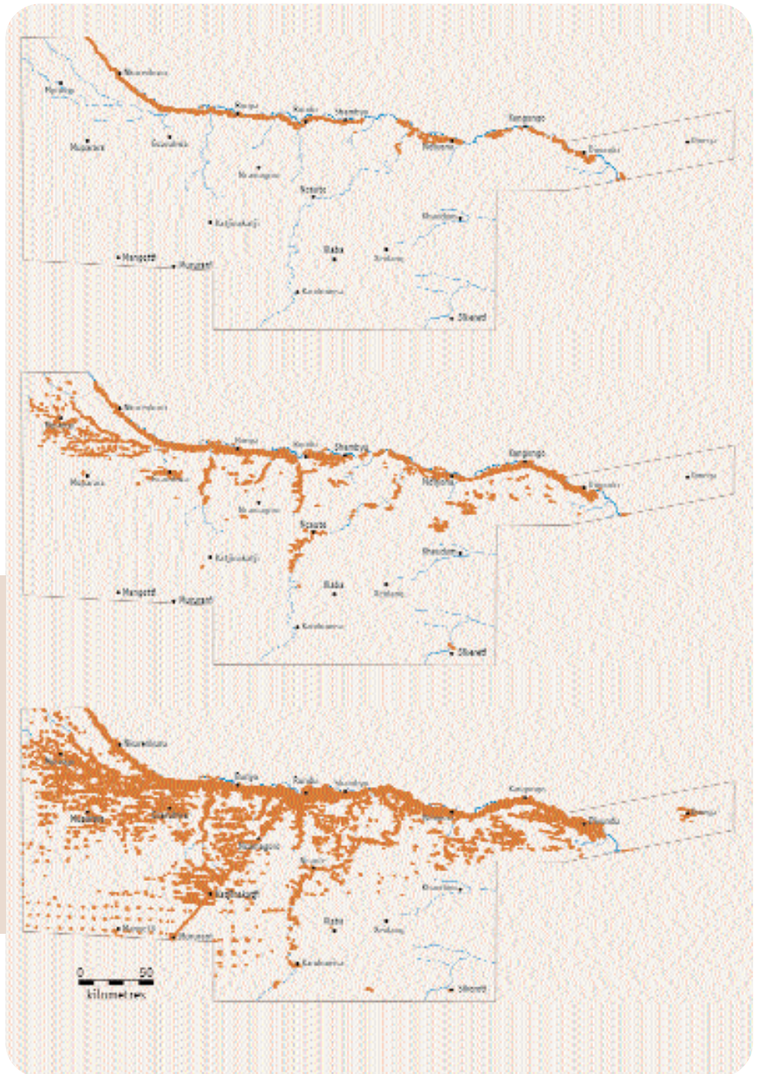


FIGURE 74–
Great increases in land cleared for crops since 1943. About 26,140 hectares had been cleared in 1943 (top), 72,100 hectares in 1972 and 194,550 hectares in 1996, an average annual rate of increase between 1943 and 1996 of 3,9%.[2]

The five major tribal groups in the region all have broadly similar levels of leadership. Each tribe has a chief (called a Hompa, except among the Mbukushu whose chief is the Fumu), a tribal council consisting of senior headmen and then local headmen at the lowest level of the hierarchy. The chief has ultimate authority over the allocation of land. In the case of large farm units, the allocations are made on the advice of the Land and Farming Committee (see below). Small-scale farmers get permission from the local headmen to settle on new ground, although the local headman first seeks the agreement of those already living in the area when newcomers from outside the area apply to live there. The local headman's recommendation is referred to the chief for final approval.

Claims are often made that traditional authorities previously exercised considerable control over the use of natural resources, such as the harvesting of fruit trees, cutting of timber and even communal pastures. However, it is debatable whether controls over natural resources and land were ever strong, given the many reports suggesting that traditional leadership was often weak or absent in some areas.[3]

Approximately 55% of the region is used for subsistence farming by about 23,800 households. Most of this area consists of fields belonging to individual households, fallow or deserted fields and communal pastures, or woodlands. Very few fields are fenced. Cattle belonging to small-scale, subsistence farmers generally graze within 10 kilometres of the households to whom the animals belong.

The distribution and extent of land used for small-scale farming has changed a great deal over the past 60 years. Almost all land cleared for cultivation in 1943 was along a narrow band near the Okavango River (FIGURE 74). By 1972, scattered fields had been cleared along many of the omurambas and interdune valleys, mostly within 50 kilometres of the river. The extent of clearing for cultivation then became more widespread, and extended further south between 1972 and 1996. Although the Mururani-Rundu road was built in the early 1960s, much of the settlement and clearing of fields along the road occurred later following the drilling of boreholes nearby. Large numbers of Angolans apparently also settled along the road during the 1990s.

Adding up the cleared areas in these three maps shows that about 3,6% of additional land was cleared each year between 1943 and 1972, and 4,2% of new land was cleared each year from 1972 up to 1996. While much of the land was cleared as the number of people increased over this period, a large part of the clearing was also due to farmers abandoning fields and clearing new ones when their old fields became less productive. By 1996, a total of about 4% of the region had been cleared for cultivation.

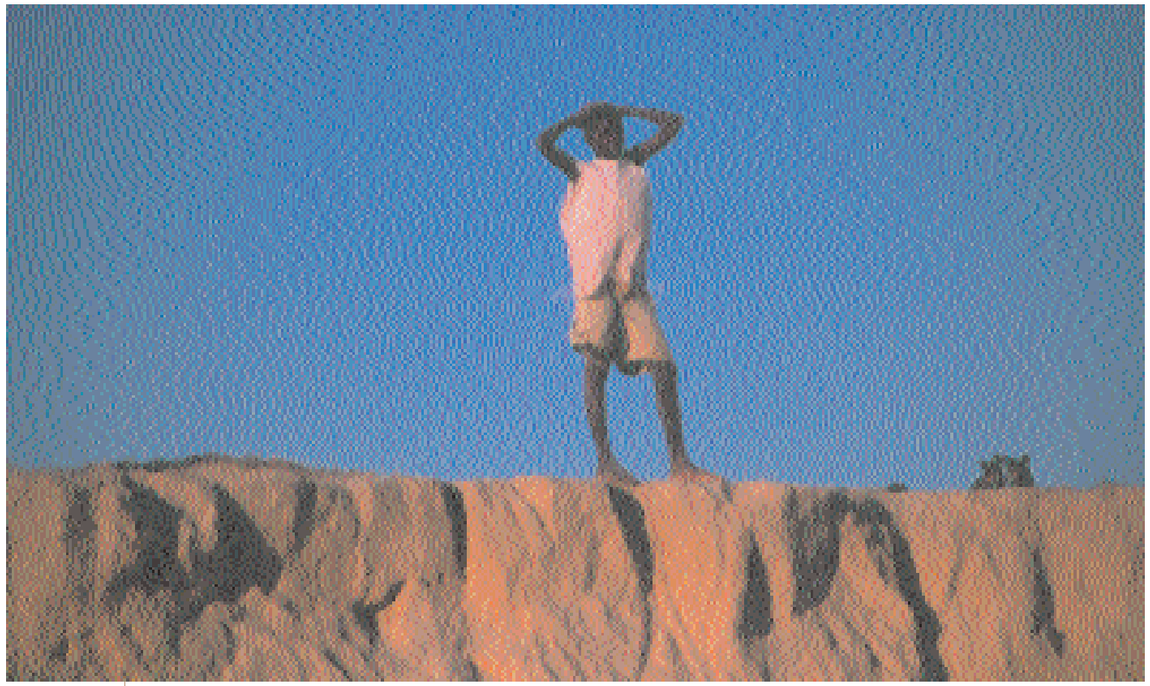
Land resources available to subsistence, small-scale farmers have declined as a result of three factors. First, the growing population has simply used more and more land for crop cultivation, livestock pastures and other natural resources. Second, as soil nutrients have been depleted farmers have cleared new fields, leaving old fields abandoned and of little use to anyone. Third, the increasing areas taken for large-scale commercial farms have further limited the amount of land available for smaller farmers.

LARGE-SCALE FARMS

Little of the region had been allocated to large-scale farmers until recently. Several large farms were allocated to individuals in each tribal area during the 1980s. The allocations were part of an effort to develop and encourage commercial farming activities, as was the much bigger development in 1989 of 44 farms – each about 5,000 hectares in size – in the Mangetti Block. A similar development took place at the same time in what was Owambo. The Mangetti farms are just north of the quarantine fence (FIGURE 72) and the intention when they were established was to later move the fence to a line along the northern border of the Mangetti farms.

Over the past few years, however, there has been a great increase and interest in large-scale farming. The 44 Mangetti farms are in the area traditionally controlled by the Kwangali people, and this led people in the other tribal areas to consider the establishment of new farms in the Mbunza, Shambyu and Gciricku tribal areas (similar plans in the Mbukushu area were never implemented). In the late 1980s and early 1990s, Land

Most of the 23,800 rural households tend small fields of mahangu, such as this one being weeded by family members and a group of hired labourers.



and Farming Committees were formed under the auspices of each tribal council with the function of demarcating areas that could be set aside and fenced as large farms.

A total of some 270 large-scale farms had been designated for individual farmers by the end of 2002. Most of the owners are middle or senior managers in the civil service or private business. In total, the large farms cover an area of over 1,1 million hectares, about 23% or just less than one-quarter of the whole region. Most farms are between 2,500 and 8,100 hectares in size. The following is an account of large-scale farms in each tribal area.

There are now 49 large farms in the Kwangali area, of which 44 (each about 5,000 hectares in size) are in the Mangetti Block. One is used as a resettlement farm for San people, while another is a rehabilitation farm. The remaining 42 Mangetti farms have been allocated to individuals but not all function as productive farms, mainly because some farms lack water or the owners have done little to develop the farms. However, the Kwangali Tribal Council exerts some pressure on the Mangetti farmers to be productive, and farms may be allocated to other people if they are not developed over several years. No lease payments are made for the farms. Plans are being considered by the Kwangali Tribal Council to create a new zone of large farms along the Oshikoto border to stop farmers from what was Owambo bringing their cattle to graze in Kavango (see page 100).

Three farms were allocated in the 1980s in the Mbunza tribal area, and all remain occupied and productive. The Land and Farming Committee has recently allocated 30 new farms to the south-east of the Mangetti Game Reserve. Twenty of these had boreholes, pumps and storage tanks installed in 1992 to provide water for livestock in the case of a drought and a need for emergency grazing. Each of the 20 farms is about 8,100 hectares in size. The other 10 farms are being established to the east and south of the 20 'drought-relief' farms.

Eight large farms were established during the 1980s in the Shambyu area. Each is about 5,000 hectares, and the farms remain as functioning private and commercial enterprises. Another 88 new farms have now been allocated to individuals. Most of these farms were intended to be 5,000 hectares but that size has been halved in line with an apparent policy that private farms in communal areas should each carry no more than 150 cattle.

There are also eight occupied and functioning 'old' farms in the Gciriku tribal area, and these too are each about 5,000 hectares. A total of 80 new farms (each 2,500 hectares) are being established. Those in the north of the blocks of Gciriku and Shambyu farms tend to be more developed with fences and water points than those in the southern, more remote areas.

The only large farms in the Mbukushu area are three occupied and operational farms near Shashasho. The tribal council has not had a Land and Farm Committee in recent years, although plans are being made to activate such a group.

The whole issue of large-scale farms on communal land is obviously a difficult and controversial one. The massive development of new farms contravenes government policy on the use of communal land, especially in protecting land (and its resources) for the use of people who are unable to buy their own farmland or live by other means. This is the first of several negative aspects to the farms. A second problem is that the formation of large-scale farms leads to greater social and economic disparities between wealthy landowners and those who remain as subsistence farmers on small pieces of unproductive land. Thirdly, the enclosure of large farms restricts access to communal pastures and other natural resources, a problem that has become severe in Oshikoto as a result of fencing of communal land. Fourthly, while it is hoped that large farms should be run as productive and commercial units, there are farmers who only see and use their farms and cattle herds as capital investments. Surplus incomes are ploughed into the farms without any immediate benefit to them or other people.

But there are also advantages to having these large-scale farms. First, a limited number of job opportunities are created, especially for cattle herders and other labourers. Secondly, land enclosed in large ranches is usually much less degraded than that used by small-scale farmers, especially where slash-and-burn clearing, overgrazing and excessive cutting of timber occurs. Third, if the farms are used productively, we can expect economic benefits to Namibia and especially to the region, perhaps leading to further improvements in social conditions. Fourth, the farms can contribute to food production in the region and Namibia as a whole. Finally, much of the land now being developed into large farms is not of immediate benefit to anyone in its present form, simply because it is so remote and no water is available. One may also question if any real benefits would be achieved if these areas were opened up for small-scale farming. This is because small-scale farming, as it is presently practised in the region, is unproductive, unsustainable and serves only to keep a segment of the population living close to the limits of poverty (see page 108).

If large-scale, commercial farming is to continue in the Kavango, steps should be taken to formalize the farms, thus ridding them of their doubtful and controversial status. The farms should be properly surveyed for a start, and their owners should be given title deeds or formal leases, perhaps something like 'permissions to occupy' (PTOs). This will allow secure developments and investments to be made, and it would enable farmers to borrow money from banks or building societies. We might then start to see the kinds of improvements that are now routine – and expected – among freehold farmers elsewhere in Namibia.

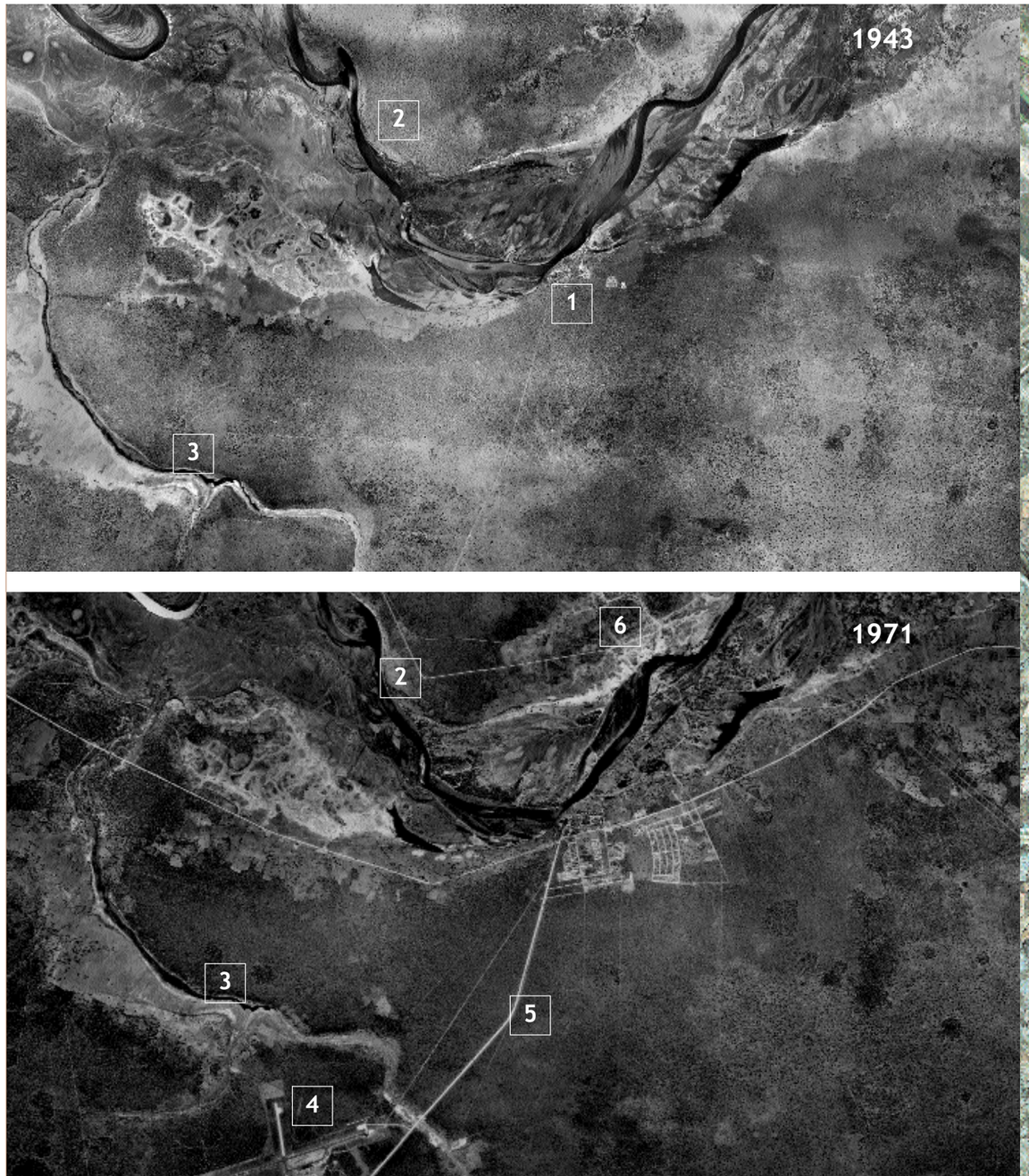
RUNDU - A GROWTH POINT

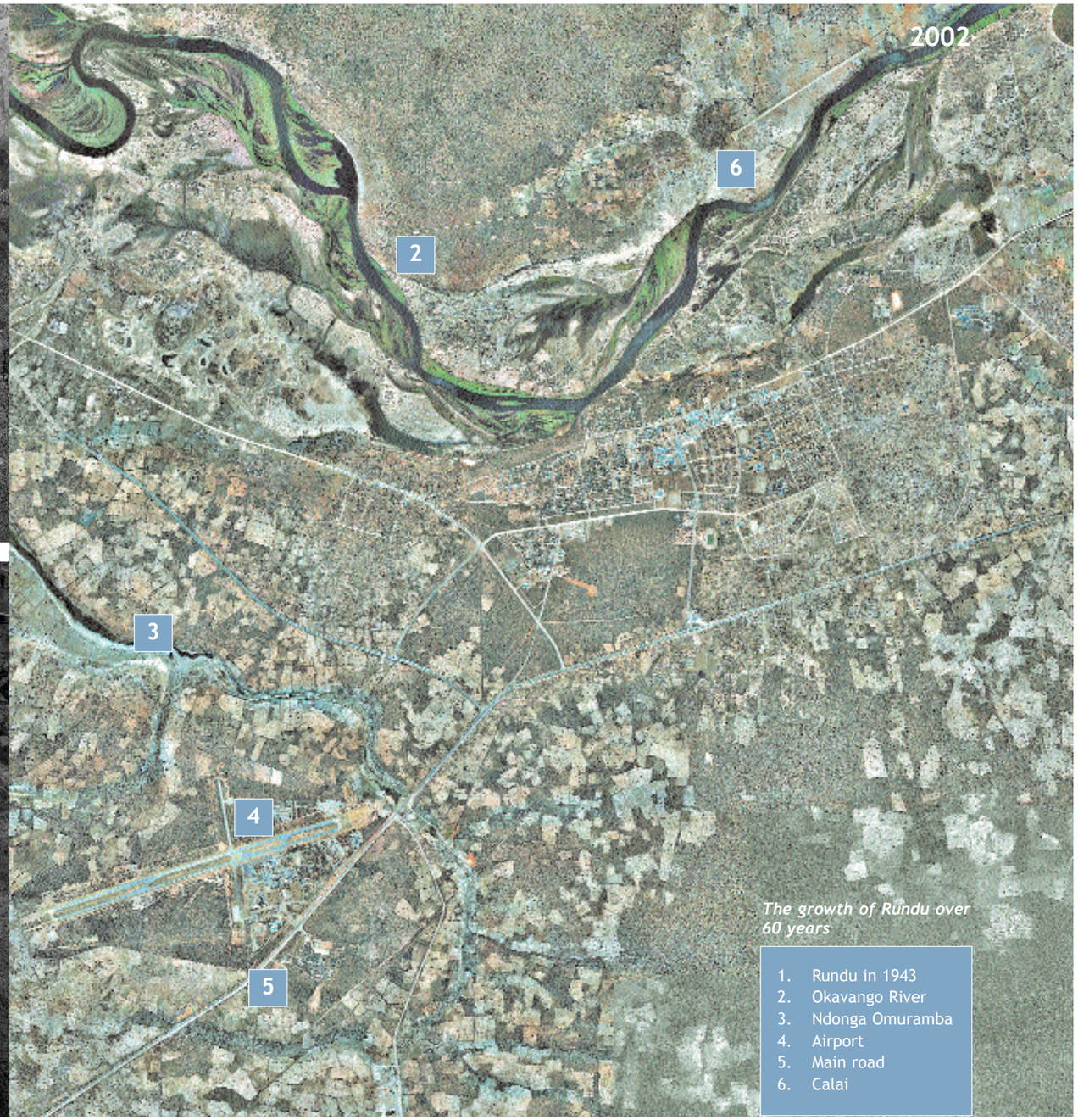
Rundu began in the early 1900s as a recruitment centre for migrant labour to work on mines and farms elsewhere in Namibia. Hopeful recruits came here from far and wide in Namibia and Angola to what was then called 'Runtu'. This is a rather dismissive term for a loose, disorganized grouping of people. The name Runtu was formally changed to Rundu in 1968, which is the Rukwangali word for a hill.

The administrative centre moved to Rundu from Nkurenkuru in 1936. A telegraph and phone office was opened in 1937, but it was only in 1947 that a post office was established at the small town. Rundu must have remained small for many years because even in 1970 it was reported as having only 1,539 people. Growth since then has been very rapid: 12,307 people in 1981, 29,890 in 1991, and 41,364 people in 2001. The rate of growth since 1981 has been over 6% per year. Should that rate continue, the population would double in 12 years and would amount to about 130,000 in the year 2020. Another perspective on the town's rapid expansion is given by the photographs of Rundu in 1943, 1972 and 2002 on the following pages.

The approximately 16,000 hectares of Rundu townlands are administered by Rundu Town Council and are divided into three zones. The first is the proclaimed township of 860 hectares in which freehold or title deed ownership is available for residential and industrial land. Although the townlands and Town Council were established just after independence, formal ownership was only possible after the township was proclaimed in 1999. The second area of 1,425 hectares consists of informal residential area covering the areas of Sauyemwa, Kehemu, Kasote, Ndama and Kaisosi. Finally, there is a surrounding rural area consisting largely of scattered homes, fields and open bush. The many fields in this area belong to many of the town's residents who grow crops and derive a small proportion of their livelihoods from this source. This unusual feature is not seen in many other towns.

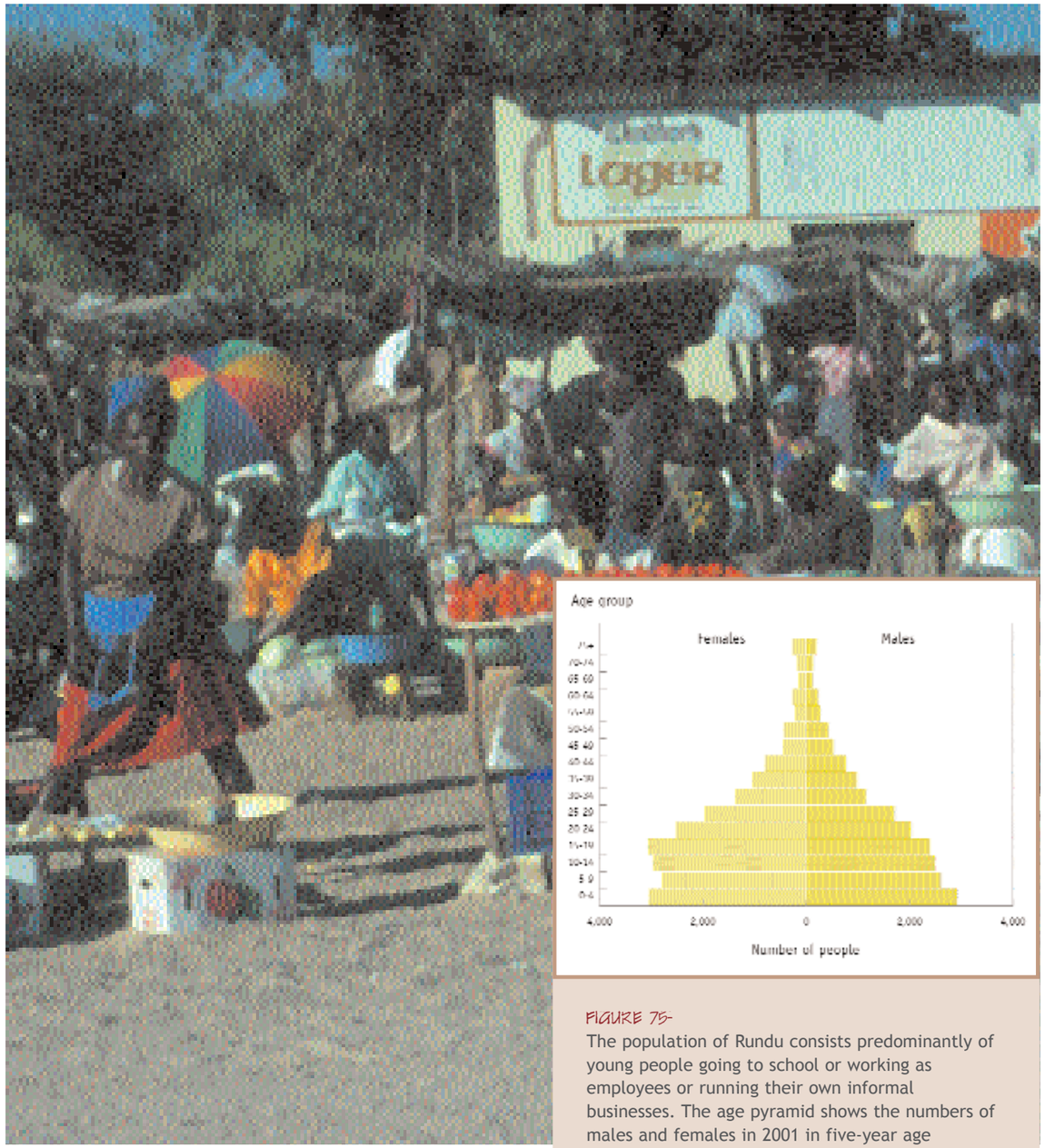
The majority of people in Rundu have moved here in recent years, mainly from rural areas in Kavango. There are also many residents who originated in Angola, since about one-





The growth of Rundu over 60 years

1. Rundu in 1943
2. Okavango River
3. Ndonga Omuramba
4. Airport
5. Main road
6. Calai



Busy markets are obvious indications of the growing informal cash economy in Kavango.

FIGURE 75-
The population of Rundu consists predominantly of young people going to school or working as employees or running their own informal businesses. The age pyramid shows the numbers of males and females in 2001 in five-year age categories.[4]

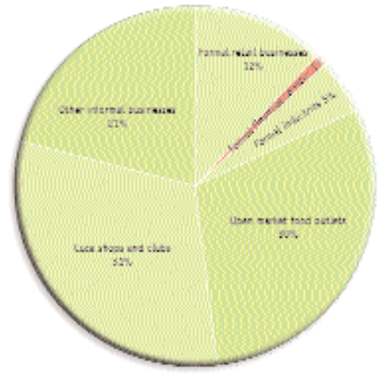


FIGURE 76-
Most businesses in Rundu are informal services that provide food, beverages or entertainment.[5]

third of people speak an Angolan language. Irrespective of origin, the main reasons for people coming to Rundu are to find a job or to go to school. The population of the town is therefore dominated by school-goers and young adults aged 20 to 40 (FIGURE 75). There were also many more young women than men in Rundu in 2001.

Most business activities in Rundu are informal, especially those providing food, beverages and entertainment (FIGURE 76). The majority of businesses were also established very recently. The results of a survey done in 1999 suggest something of a recent explosion of economic activity since 60% of formal and 55% of businesses had been started within the previous five years. Most businesses are small enterprises employing one or two people and owned by one of those people.

Rundu is the only town in Kavango, and there are no other significant towns within at least 250 kilometres: Grootfontein is 270 kilometres to the south-west, Ondangwa is 300 kilometres west, and Katima Mulilo is 500 kilometres further east. There are also no sizeable towns of note nearby in Angola. Rundu's isolation carries a number of disadvantages, but there are also advantages to be exploited. Many trade and other activities in southern Angola already emanate from Rundu, and it is easy to see how Rundu could develop into a large and really important regional centre.

Key notes

- Much of Kavango is communal land held in trust by the government for the common good and as a safety net for the poor.
- Major uses of land are for subsistence and small-scale farming (55% of the region), large-scale commercial farming (28%) and wildlife conservation (15% of the region).
- Land used for commercial, large-scale farming has increased greatly in recent years.
- 23% of Kavango is effectively owned by about 270 individuals who were allocated large farms, while another 55% of the region is used for subsistence farming by about 23,800 households.
- Land resources available to subsistence, small-scale farmers are declining.
- Land cleared for cultivation has increased at about 4% per year over the past 60 years.
- Formal recognition, perhaps through long-term leases, should be given to the large farms allocated to individuals.
- Rundu has grown at a rapid rate in recent years, and is becoming an important urban and business centre.

Key events

1937 - Telegraph and post office opened in Rundu
1940s - Almost everyone still lives along the Okavango River
1964 - Building of main gravel road from Grootfontein to Rundu
1968 - The name Runtu was formally changed to Rundu
1968 - West Caprivi Game Park proclaimed
1980s - Allocation of Mangetti farms
1989 - Khaudum, Mahango and Popa Falls Game Parks are proclaimed
1990s - Massive increase in large-scale farming
1992 - Rundu proclaimed as a formal town
1999 - Freehold ownership of land allowed in Rundu