3 THE NATURAL ENVIRONMENT

Any farming system is broadly a product of interaction between farmers and their environment, which comprises their social and economic circumstances (Chapter 2) and the natural world. The system is therefore a consequence of how farmers use resources and opportunities, and how environmental factors limit what can be produced. And so, what kind of environment is available to Namibian farmers, and how does it mould their practices? How do climatic or geological features make one farm fertile and productive, but another farm less so? This chapter explores answers to these questions, especially by considering the influences of rainfall, soil and natural vegetation.

CLIMATE

Crops and natural grasses and shrubs require sunlight, heat and water, all of which are products of the weather. Sunlight and heat or temperature (actually thermal energy) is needed for photosynthesis and therefore growth. However, plants grow best when temperatures fall within specific limits. Very high temperatures lead to increased rates of water loss through evaporation and transpiration (the loss of water from a plant's leaves). Growth then slows, followed by wilting and possible death of the plant. At the opposite extreme, growth rates drop the colder it becomes. Many plant species are also sensitive to frost, growing only in places free of frost. Most tropical fruit trees fall in this category.

The role and importance of rainfall dominates all other climatic factors in Namibia, however. Amounts of rain increase in a rather smooth gradient from the Namib Desert in the west to the wettest and most tropical areas in the north-east **(Figure 8)**. Annual rainfall in eastern Caprivi averages about 650 millimetres, roughly six times higher than the 100 millimetre isohyet which marks the approximate western limit of all rain-fed farming activity. Namibian farming is thus practised in areas that receive very different rainfall. This is one important reason for the diversity of farming systems in the country. Most farming is limited to sheep and goats between the 100 and 350 millimetre isohyets, while farming activities focus more on cattle and crops in wetter areas further north and east.

The predominant effect of rainfall on farming is simple: rain determines how much water is available for plants to grow. For example, each millimetre of rain results in the production of between 1.2 and 2.3 kilograms of grass per hectare, as measured on several farms in Namibia.[1] Differences between the lowest and highest figures were mainly due to differences in soil fertility and degrees of bush density (see below). But the main point is that more rain leads to more forage, which allows higher stocking rates, faster livestock growth and production, and higher yields of meat for cattle, sheep or goat farmers. Similar benefits accrue to crop growers: more rain falling at the correct time means better plant growth, higher rates of pollination, greater seed production, and increased yields.

Rare flows down the Hoarusib River recharge reserves of water that nurture riparian trees. Farming would be much harder in the absence of the nutritious pods and leaves provided as browse by the riverine trees.

However, too much rain can cause poor growth or death because of water logging and increased fungal attacks. The nutrient value of grasses may also decline. For example, 200 millimetres could be too much for those grass species adapted to an average of 100 millimetres, while 900 millimetres might be excessive in Caprivi.

Evaporation has a counteracting effect on water availability, since the greatest volumes of water generally evaporate in areas of least rainfall where the air is driest. By contrast, evaporation rates are lowest in the most humid, tropical climates. Subtracting evaporation (as loss) from rainfall (as gain) gives us a measure of water deficit. The distribution of water deficit is broadly a mirror image of rainfall, but the highest water deficits are to be found in the south-east of Namibia, rather than the very arid Namib **(Figure 9)**. The lower deficits along the coastal belt are due to relatively moist maritime air coming on shore.

Variation in rainfall and drought

The availability of water for plant growth thus varies geographically. Likewise, there is much variation from year to year, with the result that crop, pasture and tree growth is stunted in poor years, but luxuriant in years with bumper falls. What makes life difficult for farmers is that Namibian rainfall is extremely variable and unpredictable from year to year, and from month to month. Making decisions as to when to plant rain-fed crops is thus hard, since the timing and frequency of rain is often more critical than the total amount of rain in a season. Likewise, livestock farmers have to assess how many animals their pastures can support. A succession of wet years may lead farmers to build up their herds and flocks, which they will be reluctant to reduce when conditions become more arid. Indeed, it is often said that the degradation of farms is due to continued over-stocking after farmers had optimistically increased their livestock during good years. The greatest variation in year-to-year rainfall is in the southern and western third of the country, and so farming practices that depend on regular rainfall are most precarious in these areas.

An extreme shortage of rain may be called a drought. This is a term and concept loaded with implications because droughts invoke fears of famine, and possible needs for emergency food aid, subsidies to farmers and emergency grazing, for example. But what is a drought, and how should one agree on appropriate responses to drought? The National Drought Policy and Strategy defines drought conditions to be 'so intense or protracted that they are beyond what can be reasonably dealt with in terms of normal risk management practices, and are expected to occur once in 14 years.[2] An analysis of rainfall records collected over many years can be used to determine the cut-off between 'normal rainfall' in 13 of the 14 years, and lower falls expected more rarely. **Figure 10** shows how these drought limits vary across the country. For example, years in which less than 300 millimetres falls in Caprivi would be considered as drought years, as would those with less than 150 millimetres around Windhoek.

Such limits may be helpful in defining a drought in one year, but hardships may be compounded when several dry years follow each other. The effects of low rainfall are then cumulative. This happened in the early 1990s, and livestock numbers dropped as a result (see Figure 3, page 11). Responding to the problem of drought is also complex, and requires that the nature of farming systems be taken into account. Poor rainfall may devastate one farming activity but not another. For instance, cattle require more grass than sheep, and so the same low rainfall may amount to a drought for a beef rancher but not for a neighbouring mutton producer. Should everyone get drought relief, or only those whose farming practices are appropriate to the local environment?

SOILS

It is unfortunate that the Namibian climate has generally been arid for millions of years. If conditions had been wetter, our soils would be better developed and would contain more nutrients. Rocks weather more rapidly in wet climates, leading to higher rates of soil formation and the release of more nutrients from rocks. Additional organic matter is available because of more luxuriant plant growth, higher rates of decomposition, and because fewer dead leaves and twigs are blown away or burnt. The absence of good soils has an extremely constraining influence on farming in Namibia, perhaps just as limiting as the low and variable rainfall. This is true both for crops and for the grasses and woody plants on which farm animals graze and browse.

The growth of crops and indigenous plants mainly depends on four qualities of soil: its moisture, depth, structure and nutrient content. These characteristics also have a major influence on what species are present in any one place. In arid Namibia, water-holding capacity is very important, the best soils being able to retain a good deal of moisture without becoming waterlogged. Many different nutrients are required for plant growth, especially appropriate amounts of nitrogen, phosphorus, potassium and, to a lesser extent, calcium, magnesium and sodium. Soil quality is also boosted by the

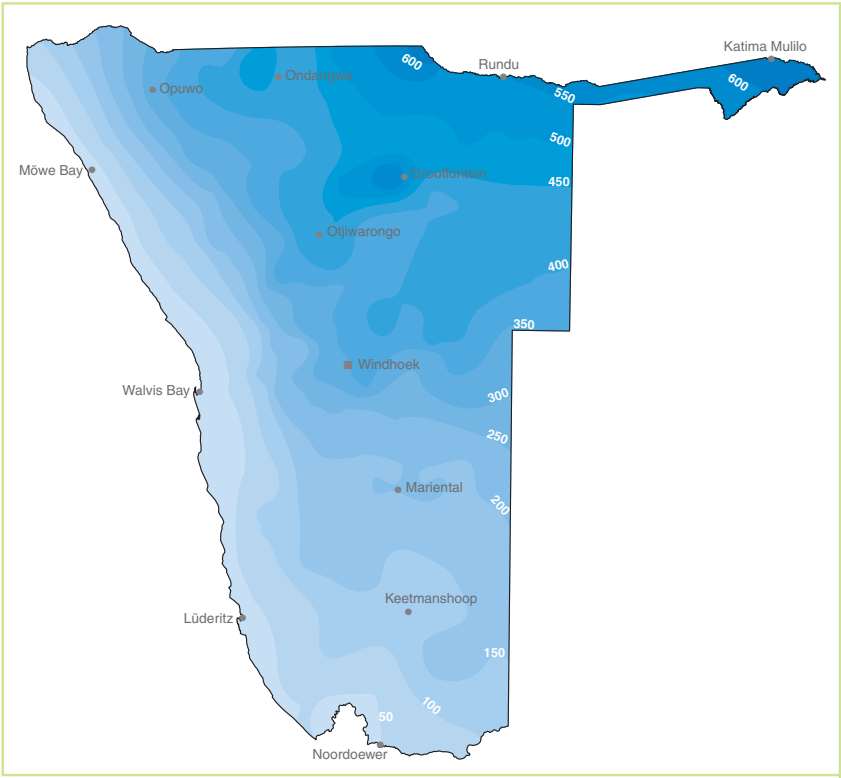


Figure 8. *Average annual rainfall varies from about 650 millimetres in Caprivi to less than 50 millimetres along the Atlantic coast. Somewhat higher falls occur around Tsumeb, Grootfontein and Otavi as a result of the highlands in that area.*[3]

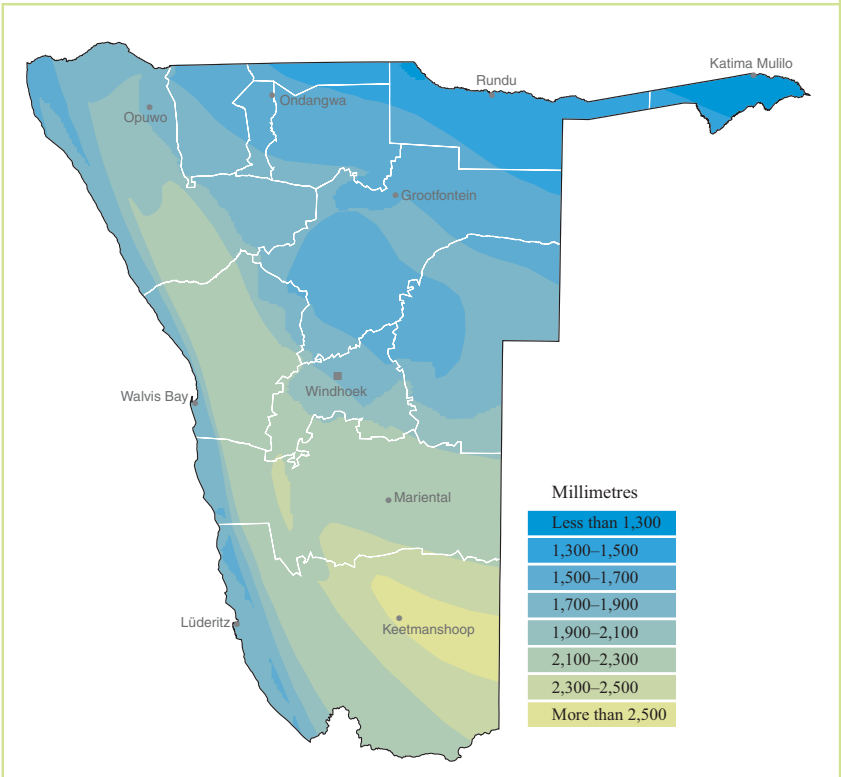


Figure 9. *The greatest shortages of water (as reflected by rainfall minus evaporation) are in the south-east of Namibia. By contrast, water deficits are lowest in Caprivi because of high rainfall and low rates of evaporation.*[4]

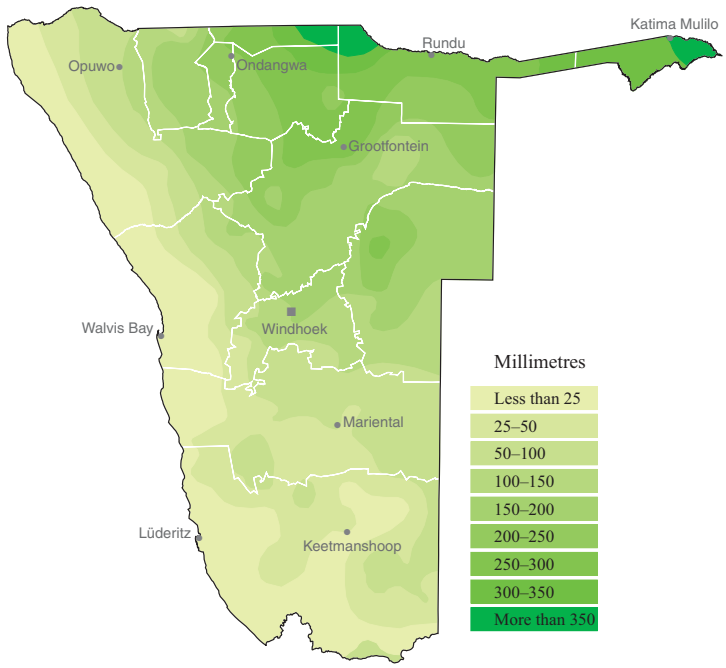


Figure 10. *One measure of drought. The map shows rainfalls which occur infrequently enough that drought conditions might be proclaimed if these or lower annual totals are received.*[5]

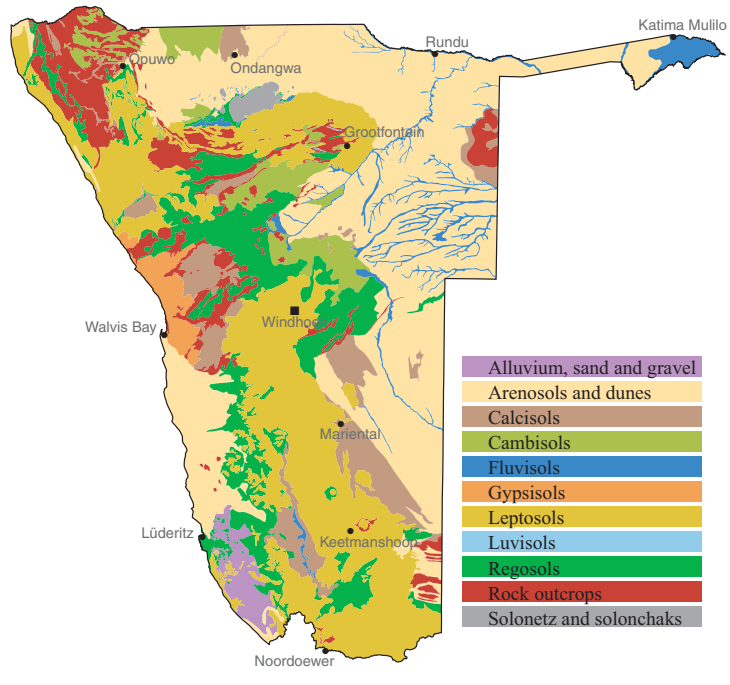


Figure 11. *The major types of soils and their distribution in Namibia.* [6]

One consequence of an arid environment is that most Namibian soils contain few nutrients. Soils in many places also retain little water, with the result that seedlings often only survive if they are irrigated or get frequent falls of rain.

presence of communities of animals (or soil fauna) that break down organic material into the nutrients that roots can absorb.

Based on soils, the country can be divided into two zones: soils derived from rocky areas in the south, central and much of the western regions; and the Kalahari Sands that dominate the eastern and northern regions **(Figure 11)**. Sedimentary sands and clays in the Cuvelai Drainage and the sands of the Namib are part of the Kalahari Sand complex.

Most rocky areas are covered by shallow layers of soil formed from the erosion of the underlying rocks. Rainwater is usually lost rapidly as a result of surface flow, seepage into cracks between the base rocks, or evaporation. Plant growth in rocky areas is thus normally sparse, and carrying capacities for livestock and wildlife are consequently low. The predominant soils in these rocky areas are known as leptosols and regosols. Although in most places there is hardly any soil to speak of, some deeper pockets accumulate in crevices and as extensive sediments in valleys. Certain of these valleys offer good soils for crop production, the most valuable being the deep luvisols in valleys of the Tsumeb-Otavi-Grootfontein 'Maize Triangle' (see page 62).

Landscapes across much of Caprivi, Kavango, Ohangwena, Oshikoto, Omaheke and eastern Hardap are flat because they are covered in Kalahari Sands deposited here as wind-blown sand dunes during drier periods. The sands are called arenosols, and they are extremely poor in nutrients. Water drains through the sandy texture easily, so little moisture is held in the surface layers where most plants have their roots. There is also little surface run-off or erosion of these porous soils. Sand, or more correctly grains of quartz, makes up the bulk of the soil, which contains limited humus or organic matter, and is intrinsically low in phosphorous. Plant growth is constrained not only by shortages of phosphorous but also by the fact that low levels of phosphorous result in deficiencies of nitrogen.

In and amongst the vast covering of Kalahari Sands are zones of other sedimentary soils, most of which were partly formed from water-borne deposits carried down by rivers long ago. From an agricultural point of view, the best of these are

the cambisols in the Cuvelai Drainage and the fluvisols that line the watercourses traversing the Kalahari Sands. Cambisols have good water-retention capacities, do not become waterlogged and have relatively high fertility. This is one important reason why so many people settled and continue to live around the *oshanas* in north-central Namibia (see Figure 5, page 15). However, soil qualities are very patchy in this landscape, requiring farmers to have a good eye to select those patches most suited to crops. Other nearby soils are too salty, alkaline or clayey, or have hard layers of clay below the surface, which makes the ground hard to plough and waterlogged after heavy rain.

Fluvisols along the larger river courses in north-eastern Namibia provide comparatively nutrient-rich soils for crop cultivation, and this is where many crops are grown in Caprivi and Kavango. Some fluvisols are flooded regularly, particularly those along the margins of the Zambezi River and on the eastern Caprivi flood plain. Maize is the predominant crop on *molapo* floodplain fields. Other fluvisols in dry *omurambas* probably last saw floodwater many decades ago.

Figure 12 provides an approximation of the potential of soils for crops. Within each zone, however, there is much fine-scale or local variation, small areas of more fertile soils being surrounded by expanses of poorer ground. Compared to arable soils elsewhere in the world, those rated best in Namibia have rather limited potential. There is, indeed, a critical need for farmers to manage their soils intensively to realize useful yields. The application of suitable fertilizers in appropriate amounts and at correct intervals is of special importance and value. Other less expensive measures include the incorporation

Stipagrostis *or bushman grass, known to some farmers as the AK47 of Namibian grasses for its reliability as a source of food for livestock.*

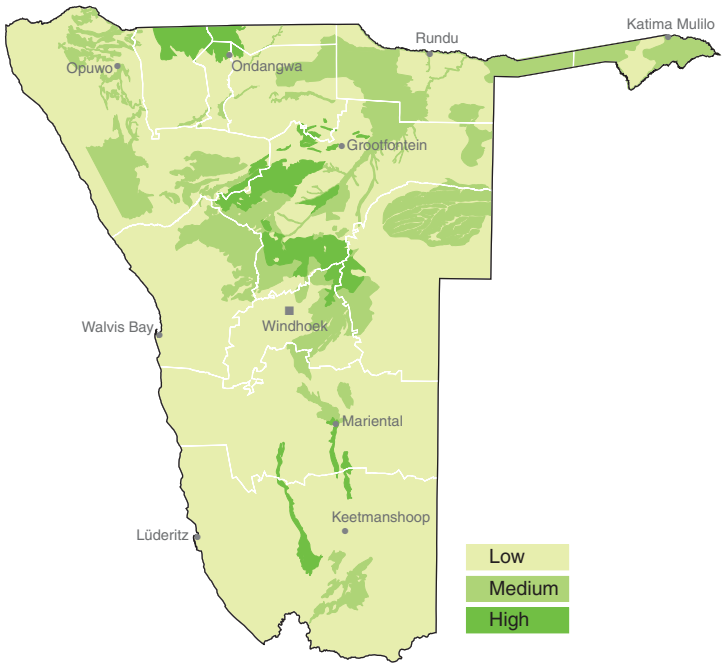
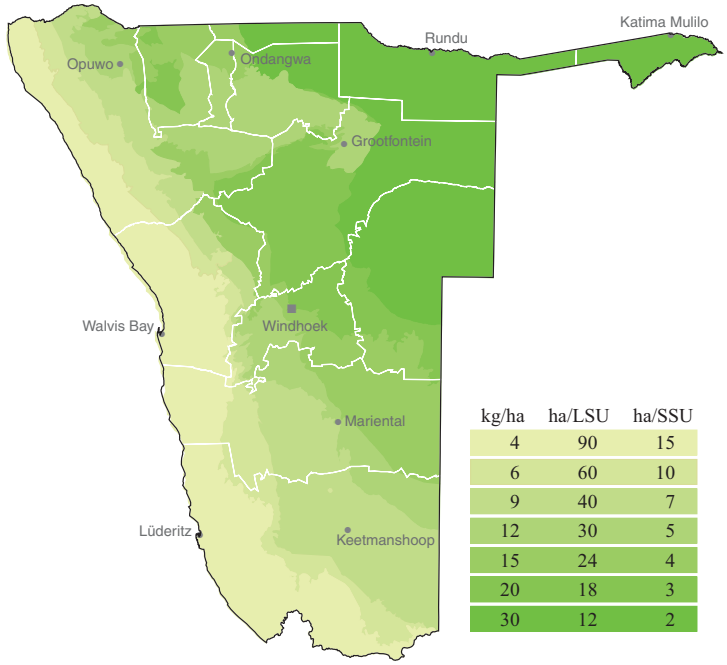


Figure 12. *An assessment of the relative suitability for crop cultivation.*[7]



kg/ha	ha/LSU	ha/SSU
4	90	15
6	60	10
9	40	7
12	30	5
15	24	4
20	18	3
30	12	2

Figure 13. *Measures of how many kilograms live mass of livestock can be supported on one hectare (ha), or the number of hectares required for each large stock unit (LSU, each equivalent to cattle of 360 kilograms) or small stock unit (SSU, a sheep or goat weighing an average of 60 kilograms).*[8]

Farmers judge the condition of pastures more on the degree to which preferred, indicator grass species have been grazed than on the total amount of grass that has been eaten. These assessments serve to prevent the permanent loss of the most valuable grasses and to spread grazing pressures across their farms.

of the residues of crops into soils rather than allowing them to be grazed, and the use of kraal manure. Some practices should also be avoided. For example, repeated disc harrowing pulverizes the structure of the soil, creating a shallow hardpan layer, and destroying the organic matter and fauna in the soil.

NATURAL VEGETATION

While agricultural conditions are most generally determined by climatic and soil characteristics, natural vegetation also has a major effect on farming systems. The clearest Namibian example is in the distinction between *Small stock* and *Cattle ranching* farming systems. Cattle are predominantly grazers and do best in areas where pastures are most abundant. The southern and western parts of the country offer little in the way of grass fodder, however, and sheep and goats therefore replace cattle in those more arid areas. The small stock browse substantially on shrubs and can thrive in areas where cattle could only be farmed at very low stocking rates or in years of exceptional rainfall. Moreover, shrubs grow and are available as fodder over long periods. They are thus a more dependable, permanent food, unlike most grasses that are largely absent if rain has not fallen recently. Similar distinctions in the availability of forage hold in areas where grass is the predominant food as a result of differences between annual and perennial grasses. Some grass communities are dominated by annual species, others by perennial grasses. Annuals grow only after rain and then die, whereas perennial species survive and are available throughout the year.

Another example is the enabling effects of trees and other plants growing along ephemeral rivers in western Namibia. The countryside away from the rivers is so arid that almost no forage is available to farm animals, but the perennial trees – through their leaves and pods – provide relatively rich sources of nutrition, especially to goats and some cattle. These rivers are often appropriately called linear oases.

Most importantly, vegetation affects livestock farming through its influence on how many animals can be supported in any one area. Following the earlier estimates of how rainfall

relates directly to plant production (see page 23), equivalent rates can be estimated for the biomass of livestock that an area of pastures can sustain. For example, on the cattle ranches in central Namibia, 300 millimetres of rain should yield enough grass to support 20 kilograms of live weight per hectare. A cow weighing 360 kilograms thus needs about 18 hectares. And at a price of N$7.50 per kilogram live weight, each hectare could produce beef worth about N$150. These figures would be lower in more arid areas or in dry years with lower grass production, and greater in wet years and higher rainfall areas of the country.

The figures would also be lower as a result of bush encroachment. Large areas of central and eastern Namibia are now covered with bush which is so abnormally dense that access to grass and stocking capacity is greatly reduced. For instance, stocking rates in heavily encroached paddocks (3,000-4,000 bushes/hectare) at Neudamm Agricultural College averaged 8.3 kilograms of live body mass per hectare. This is four times lower than the 38 kilograms body mass per hectare in camps where bush had been removed, leaving only 500 bushes/hectare.[9]

Less obvious, but often substantial effects on livestock production result from varying qualities of grass and other forage. Different grasses vary in their nutritional value. For example, perennial species in more arid areas (often called sweet grasses) generally have higher value than annual species and those growing in wetter climates (sour grasses). Trees and bushes, likewise, vary in nutritional quality. Camel thorn pods have high protein values, as do the leaves of black thorns and many other indigenous species.

Finally, indigenous plants offer a great variety of values for people who are now reaping commercial benefits from natural plants and wildlife through conservancies, tourism, and non-timber products, as described in the *Natural resources* production system (Chapter 8).

ENVIRONMENTAL FACTORS IN SUMMARY

The cumulative effects of environmental factors can be brought together in two map compilations that reflect potentials for farming conditions. The first is a map of agro-ecological zones, each zone being an area that shares similar climatic, soil and landform features. The map for Namibia has 69 such zones, but it is too detailed to be reproduced in this small book.[10] However, copies can be obtained from the Ministry of Agriculture, Water & Forestry. The second map is one of carrying capacity (**Figure 11**). This is the number of animals that can be kept sustainably in an area of natural vegetation for optimal production and without over-grazing or otherwise permanently damaging the plant communities. Excluding the extremely arid Namib Desert, carrying capacities vary a massive five-fold from 6 to 30 kilograms per hectare in Namibia.

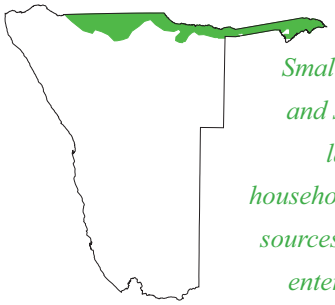
In addition to the major influences of rainfall, soils and natural plant life, several other factors affect Namibian farming. Underground water is a valuable resource. In a few places it is sufficiently abundant to make irrigated farming possible, (see page 62) but in most areas of the country water reserves are only adequate for livestock. Another major impact is from the pests and diseases of crops and livestock, for instance on restricting the potential marketing of more than two million head of livestock from the northern communal areas (see page 17).

Overall, however, the limiting effects of aridity and poor soils make farming in Namibia a difficult enterprise. Crop yields and livestock production rates are much lower than in most other countries, and it is because of low food production that Namibia has such a small and dispersed human population. The same is true for Botswana. For related reasons, more Namibians live – and farm – in the wetter parts of the country than elsewhere. The small population then has further impacts on the sizes of markets available to farmers, and on the provision of services, such as roads. The low productivity of most areas also means that farms need to be large if they are to produce enough food to make farming viable economically. And to demonstrate that point, the only small farms that have high returns are those on which crops are intensively fertilised and irrigated (Chapter 7).

Low and unpredictable falls of rain further restrict the ability of farmers to cultivate crops and supply their products reliably. Major retailers of food therefore prefer to obtain supplies from more dependable sources in South Africa. But the hazards of low rainfall have probably also helped stimulate the production of a greater range of products in Namibia. After all, farmers are often forced to consider other options when hit by droughts or other misfortunes, which might then cause them to produce new commodities. Some farmers engaged in the *Intensive agriculture* farming system (Chapter 7) may not have ventured into producing such crops as olives or flowers if they could have relied on traditional agriculture.

4

SMALL-SCALE CEREALS AND LIVESTOCK



Small fields of cereals and some vegetables, and small numbers of cattle and goats used largely for domestic consumption. Most household income is derived from non-farming sources. The farms are low input – low output enterprises, based mainly on family labour.

GEOGRAPHY OF THE SYSTEM

Many more people are engaged in this farming system than any other in Namibia, and most live in a narrow zone stretching across the north from Omusati in the west to Caprivi in the east. There were about 152,000 farming households in this zone in 2006: Omusati (40,000 households), Ohangwena (35,000), Oshikoto (23,000), Kavango (22,000), Oshana (20,000) and Caprivi (12,000 households).[1] These are the most densely populated rural areas of Namibia, and are home to about 960,000 people. There are probably about 10,000 households using this system elsewhere, mainly in the communal areas of Otjozondjupa and northern Kunene, and on some resettlement farms.

Most households are located several hundred metres from their closest neighbours so that many areas are characterized by a patchwork of smallholdings. This scattered pattern of homesteads is most prevalent in the Cuvelai drainage system, and along the Okavango River and most main roads. Elsewhere, houses are loosely clustered in small villages surrounded by farmlands and grazing areas.

Rainfall across this narrow swathe of land varies in a gradient from average annual totals of about 650 millimetres in the east to about 300 millimetres in the extreme west. The landscape is a very flat expanse of Kalahari sands across which various drainage lines carve their way. Large perennial rivers follow some of these lines, notably the Okavango, Kwando/Linyanti and Zambezi/Chobe, while others are now permanently dry, for example the Omatako. Yet others are ephemeral, especially so the *oshana* channels of the Cuvelai drainage system in the north-central regions.

The farming system is constrained by poor soil fertility in most areas. Without intense management and fertilizer applications, large areas of the Kalahari sands are not suitable for cultivation. Patches that are more fertile have generally been farmed for decades, with the result that much of their

An ox in northern Kunene (above), perhaps on its way to water, pastures or fields to be ploughed. Fences around farms in Omusati enclose the small fields that are typical of this farming system (below).

original nutrient value has been lost. Other constraints include the presence of saline soils in some areas and the high rate of water and mineral loss in soils with a high sand content.

SOCIAL ENVIRONMENT

The farming system is one of communal land where farmers have exclusive rights to small areas that usually surround their homes. The farm units are often fenced, especially by households that can afford fencing. Traditionally, poles, sticks or branches were used for fencing, but droppers and fencing wire are now used increasingly. Livestock is largely grazed on open access commonage pastures and woodlands, from which people also harvest firewood and other natural plant products. The practice of transhumance – where cattle move seasonally between grazing areas near the home and those in large expanses of unoccupied communal land – has declined in recent years, mainly because many of those open areas have been fenced off into large farms (see page 15).

Each farming unit is centered round a single household consisting of an average of 6 or 7 people. While different family members play greater or lesser roles, farming is largely a household pursuit, and it is usually difficult to pinpoint one person as 'the farmer'. Women do most of the work on arable land. Additionally, the number of people in a household has a direct bearing on the size of its farming enterprise since labour is hired only sporadically.

Demographically, the homes are skewed in two significant ways. The first is that there is a high dependency ratio, which means that a large proportion of household members are 'dependants'. These are people either younger than 15 or older than 64 years of age. On average, there is about one dependant to each person of a working age (15 to 64 years). People of more productive ages thus have to support many children and elderly folk. The high dependency ratios are due to the movement of many young adults into towns, and also to work on mines or farms far away from their homes. Rates of migration have long been higher in Omusati, Oshana, Ohangwena and Oshana than in Kavango and Caprivi.

The second is that the sex ratio is skewed, with more adult women present than men. More households are therefore headed by women than is usual. Again, this is due to migration since men are under greater social pressure to seek employment or start businesses away from their rural homes. However, increasing numbers of younger women now also leave their rural homes. It is perhaps the most entrepreneurial women and men that seek employment elsewhere.

This farming system produces a significant variety of products: three main cereals (mahangu, sorghum and maize), various vegetables, meat and milk. The great majority of farm produce is used for domestic consumption. Very little produce is therefore sold. Indeed, most cereals available in markets or shops in northern Namibia are produced by commercial growers elsewhere in Namibia or in South Africa. Angolan farmers also sell mahangu in markets in north-central Namibia.

FARM HOLDINGS

Most households plant between one and four hectares each year (**Figure 14**). The average sizes of areas cultivated in the six northern regions were: Caprivi (1.7 hectares), Kavango (1.9), Ohangwena (2.4), Oshikoto (3.6), Oshana (2.7) and Omusati (3.2 hectares) (**Figure 15**). In all six regions there are also large expanses of fields that have been left fallow, usually because

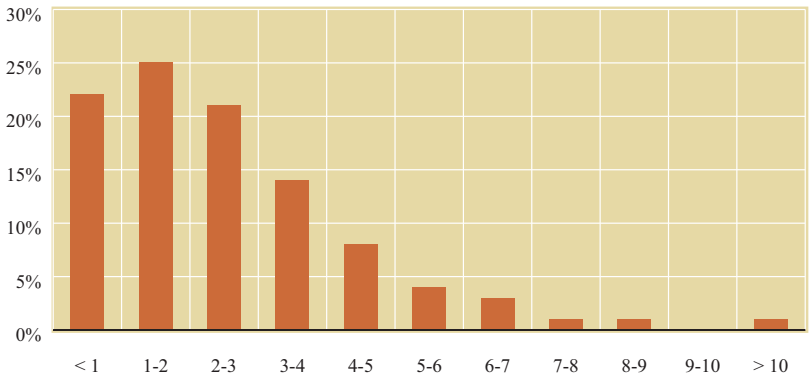


Figure 14. Most (82%) households plant less than four hectares (x axis) each year.[2]

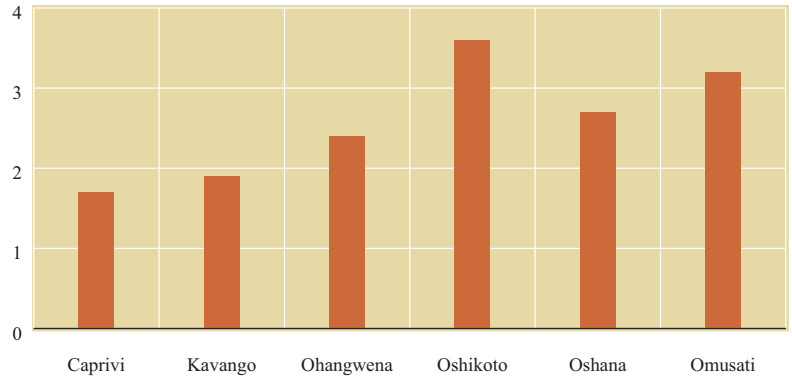


Figure 15. The smallest cultivated area (in hectares) are in the north-eastern regions where they average about half the size those in the four north-central regions.[5]

the soil is no longer fertile after several years of production. For example, for every three hectares of cultivated fields there is an additional nine hectares of old, cleared land in the four north-central regions. In Kavango and Caprivi, about 20% of all cleared land is cultivated while the rest lies fallow or abandoned.[3] Some richer households have fenced enclosures of pastures of 5 to 20 hectares around their homes and fields. These are most prevalent in north-central Namibia where they are called *uuyanda*.

Several factors affect the size of cultivated areas:

- Wealthy, influential households plant the biggest fields, which may extend over five to ten hectares, whereas the poorest farmers often plant less than one hectare. In fact, about one-fifth of all households plant less than one hectare each year.[4]
- In the most densely populated areas all better patches of soil have been cultivated and so only tiny pockets of soils not suited to crop cultivation remain available. Anyone wishing to expand their farm significantly or establish a new farm is forced to move to outlying areas. These are generally far from such essential services as water supplies, shops, schools and clinics.
- Field areas are limited by the availability of labour since most work is done manually. Most households have too few family members or cannot afford to hire casual labour to tend larger fields. Similarly, there are limits on how large an area a family can fence off or control for itself.
- Bigger areas are planted in good seasons when the rains start early.
- As shown in **Figure 15**, fields in the west are larger than those in the east, presumably to compensate for the lower rainfall in the west.

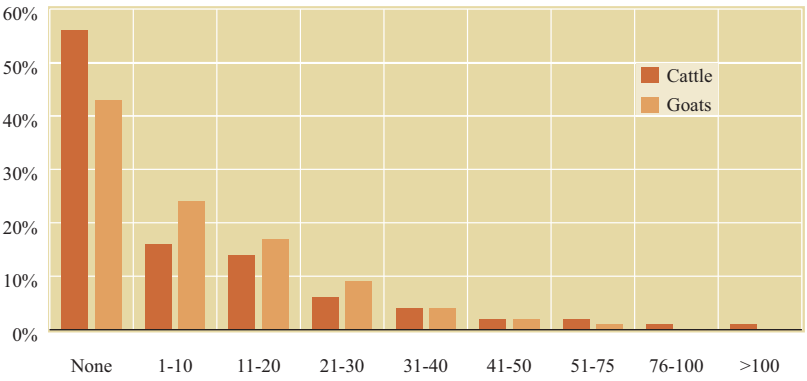


Figure 16. There is a high level of variation in livestock ownership, as shown by the percentages (y axis) of farmers having no cattle or goats, or owning herds and flocks of varying numbers of animals (x axis). A herd or flock of 30 animals would be needed to maintain a regular off-take.

Livestock farming is dominated by goats and cattle, some poultry and then smaller numbers of pigs, donkeys and a very few sheep. It is popularly believed that every farmer has livestock, but a significant number of households have none. For example, more than half of all households have no cattle, pigs, sheep or donkeys, while about two-fifths do not have goats (see the table below). About one-third of households have neither cattle nor goats. Amongst those who are livestock owners, most have fewer than 30 cattle and goats (**Figure 16**). In total, approximately 600,000 cattle and 950,000 goats are owned in this farming system.[6]

Farmers with the biggest herds of cattle are in Caprivi and Kavango. Sheep, donkeys and pigs are not kept in Caprivi, hardly so in Kavango, and then much more so in Ohangwena, Oshikoto, Oshana and Omusati. The great majority of households have less than 10 of these animals, while few people own more than 20 chickens. Again, far fewer farmers in Caprivi and Kavango have small stock and poultry than those to the west. As is true for cultivation, the wealthiest and largest households have the biggest herds and flocks.[7]

FARMING METHODS

The great majority of cultivated land is dryland, which means that crops depend on rainfall for their water requirements. New fields are usually cleared – and established ones are ploughed afresh – before the first rains. Poorer farmers hoe by hand, while more affluent households make use of ploughs drawn by donkeys, oxen or tractors. Only 4% of all households use fertilizers, while 42% boost soil fertility using limited amounts of manure, often from livestock grazing stubble after the harvest. Manure applications are much more prevalent in the north-central regions than in Kavango and Caprivi.[8] Overall, soil fertility has probably declined due to a decrease in plant biomass in these farming areas and the withdrawal of subsidies for fertilisers. Several varieties of mahangu and sorghum seed have been bred to improve production under Namibian conditions. The best known of these is Okashana-1, a mahangu cultivar that grows more rapidly than traditional varieties. Approximately equal numbers of farmers plant one of these cultivars or a mix of traditional and improved seeds (**Figure 17**).

Planting is done by hand, several seeds being planted in the same hole. The seedlings are later thinned and fields are weeded once, twice and often three times during the growing season (weeding is more frequent in the north-central regions than in Caprivi and Kavango). Labour for weeding is much the most time-consuming and important input in achieving reasonable yields. Its value becomes clear by summarising the typical labour requirements for one hectare: 13 days for manual hoeing, or 4 days using draught animal power, or 2–3 hours using a tractor; 8 days for planting; 27 days for weeding;

PERCENTAGES OF SMALL-SCALE FARMERS WITH OR WITHOUT LIVESTOCK IN THE SIX NORTHERN REGIONS.[9]

% households with:	Caprivi	Kavango	Ohangwena	Oshikoto	Oshana	Omusati	Total
No cattle	42	49	59	57	66	52	56
1-30 cattle	43	39	34	34	30	41	36
More than 30 cattle	15	12	7	9	4	7	8
No goats	84	59	34	37	37	27	43
1-30 goats	15	38	59	50	56	62	49
More than 30 goats	1	3	7	13	7	11	8
No pigs	100	86	66	57	56	43	65
Some pigs	0	14	34	43	44	57	35
No sheep	100	99	99	99	93	83	95
Some sheep	0	1	1	1	7	17	5
No donkeys	100	97	76	72	80	55	78
Some donkeys	0	3	24	28	20	45	22
No poultry	47	35	8	8	8	7	16
Some poultry	53	65	92	92	92	93	84

7 days for the harvest, and another 7 days for threshing.[10] These tasks add up to about 62 days for one person per hectare if ploughing and weeding is done manually, and a minimum of 49 days if a tractor is used for ploughing. An average field of three hectares would require 147–186 days of work. Small homes, with perhaps just one or two productive family members, are unable to provide that kind of labour and therefore only cultivate smaller fields. Of course, labour requirements are not spread evenly over the growing period, which means that large and wealthy households are better placed because more family members are available and casual labour can be hired at critical times.

Mahangu, maize and sorghum – as the dominant rain fed cereals – are generally harvested four to five months after planting, usually between April and July. Harvesting is done as rapidly as possible to prevent losses to pests, especially red-billed queleas in some seasons. Flocks of tens of thousands of these birds may settle in a field and destroy a crop in a day. The harvested seed heads are threshed at home. Some households that can afford it have their grain milled at local mills, while others prefer home pounded meal.

Most households also grow small quantities of vegetables or field crops such as beans, cowpeas, bambara nuts, groundnuts, pumpkins, melons, tomatoes and spinaches and cabbages. The gardens are usually within their cereal crop fields and close to their homes where the soils benefit from household waste and more frequent weeding and watering. However, there are also many gardens along the banks of the permanent rivers in Kavango and Caprivi. Maize is also commonly grown in Caprivi in *molapo* fields along the margins of seasonally flooded river channels.

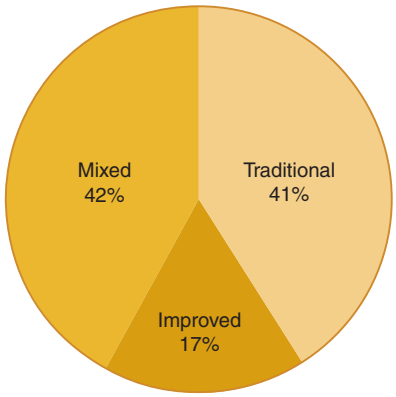


Figure 17. Percentages of farmers planting different types of mahangu seed. Improved seed types grow more rapidly than traditional ones.

The relative importance of mahangu, maize and sorghum changes across the country. Virtually every farmer plants mahangu in Omusati, Oshana, Ohangwena and Oshikoto. From there, the dominance of mahangu drops off to the east, as increasing amounts of maize are grown in Kavango and especially in Caprivi. Sorghum is also less frequently planted in Caprivi and Kavango, whereas about 80% of farmers in the four north-central regions grow sorghum, which is used mainly for beer production.

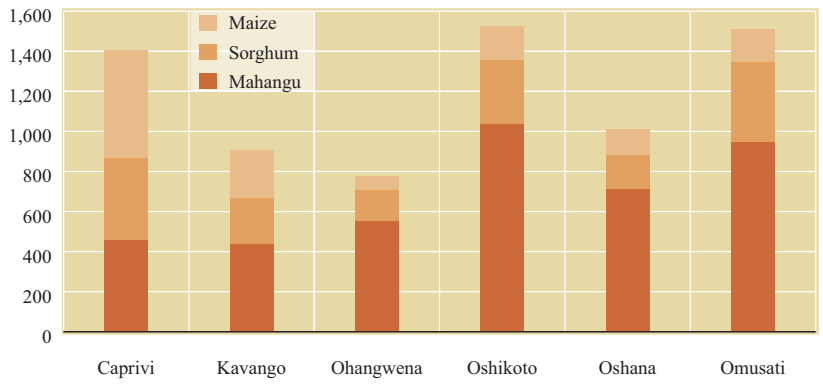


Figure 18. The average weight of maize, mahangu and sorghum (in kilograms) produced by a household each year.[11]

Maize, sorghum and mahangu contribute about equally to the average total production of cereals by each farmer in Caprivi, whereas mahangu dominates production elsewhere (**Figure 18**). Differences in total production between the regions are due to the combined effects of varying yields and the size of fields. Thus, the high rate of production in Caprivi (where fields are smallest) is largely due to good yields, whereas larger fields are probably the main reason for the higher production in Oshikoto and Omusati. The average total production in these three regions is almost double that in Kavango and Ohangwena.

Livestock generally graze and browse on their own, although young men or boys herd them if there is a chance of the animals damaging crops, or if the pastures are far from their homes. The animals return to kraals each evening, usually after being watered at a river or drinking trough at a borehole or piped watering point. Breeding is not controlled and calving rates are usually below 50%. Compared to those elsewhere in Namibia, livestock in this farming system generally suffer from high morbidity and mortality, as a result of food shortages and disease. Only cattle are vaccinated on a regular basis by veterinary officials, primarily to curb the spread of foot-and-mouth disease and lung sickness.[12]

Crop yields are low as a result of two main factors. The first is the much poorer growing conditions than in wetter climates where the soils are usually more fertile. This is probably why yields in the more tropical Caprivi are higher than those in more arid areas to the west (**Figure 19**). Rainfall is higher and maize planted in the more clayey and richer soils along floodplains does much better than in the comparatively infertile sandy soils which dominate most areas of this farming system.

The second reason is that inputs to crop production are low, a conclusion based on the fact that yields are several times lower than those on commercial farms where the soils are intensively fertilized and sometimes irrigated, and pests and weed growth are controlled (see page 61). As averages, the yields in **Figure 19** mask the fact that some small-scale farmers indeed achieve good harvests. This is obvious to anyone travelling through northern Namibia and who observes that many fields consist of scattered, stunted crops while other, nearby fields have a dense, even cover of well-tended, healthy plants, each bearing good heads of seed.

Overall off-take rates of goats and cattle are about 10%. Most animals that are slaughtered are consumed at home, and comparatively few animals are therefore sold to the Meatco abattoirs or to local bush markets.[14] Indeed, the majority of cattle and goats sold in the north-central regions come from or Kunene. A variety of factors limit marketing: the small herds and flocks, the importance of retaining livestock as capital assets, the moderate prices offered by formal markets and the difficulties in selling a few animals at a time.

Grain surpluses are kept in various storage containers, the most elaborate of which are the *omashiha* or *iigandhi* granaries of Ohangwena, Oshikoto, Oshana and Omusati. These tightly, neatly woven baskets have capacities ranging from 0.7 to 2.0 tons, and can store mahangu for up to three years. Having such long-term storage facilities is of considerable importance in an environment where the risk of crop failure is high due to inadequate rain and pest damage. Severe famines experienced over the past 150 years in these regions contributed to the development of strategies to store food for long periods.[15]

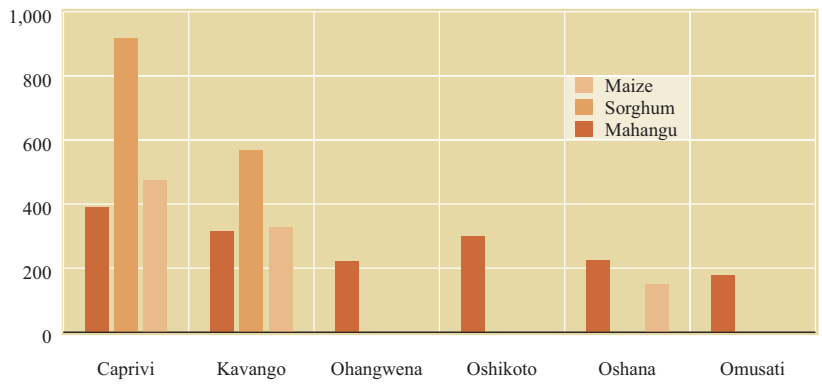
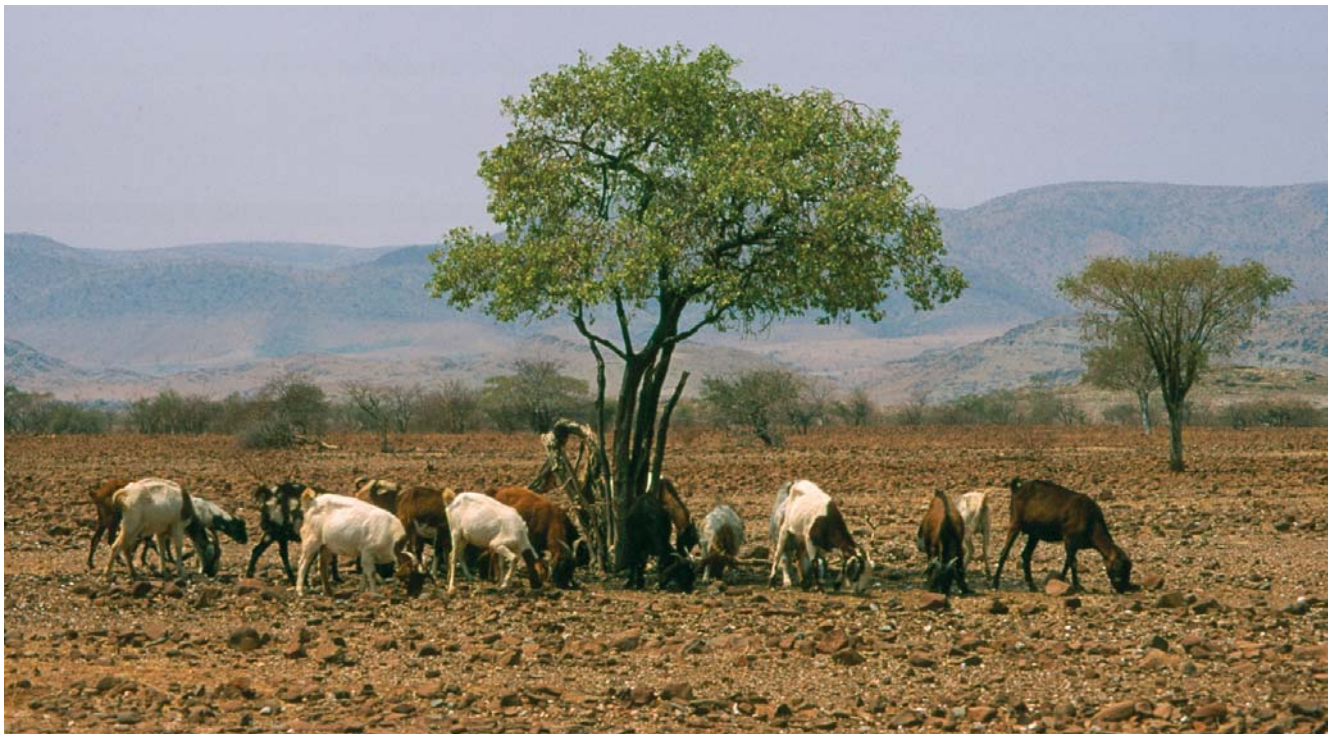


Figure 19. Average yields of mahangu, maize and sorghum measured in kilograms per hectare.[13]



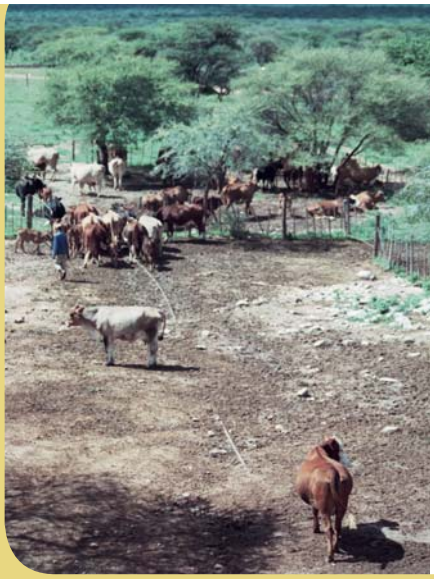
In the absence of other forage, goats make the most of fallen leaves and pods from a tree, its lower canopy already cropped by browsing.

VALUES OF FARMING

A typical farming household of six people plants three hectares of mahangu and has 30 goats and five cattle. They would harvest an average of 900 kilograms of mahangu in a year, which has a market-related value of about N$2,000. A minimum of 147 days of labour would have been spent in realising the N$2,000 of mahangu, giving a maximum daily rate of return on labour of N$13.60. Annual sales or in-kind values from slaughtering five goats and one cow would amount to no more than N$3,000. While a few hundred dollars could be added from vegetables and legumes, it is clear that the total production of such farm is extremely low, and that returns from inputs are small.

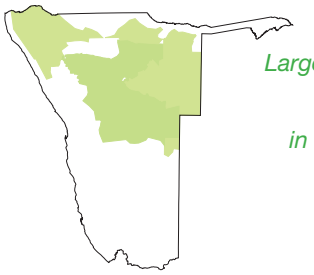
Most people would consider this farming system to be a subsistence economy, implying (a) that the majority of households have small incomes and (b) that most income is derived from farming activities. The idea that incomes are generally low is correct for many homes, but there is a high degree of variation from one house to the next. Many of the poorest Namibians are to be found here, but there is also a considerable number of very wealthy families. How many households are really poor is hard to say. One way of assessing this is to assume that homes that plant less than one hectare and/or have no livestock are at a level of severe poverty. From figures given above, that would mean that there are 40 to 50 thousand poor families. Farm produce probably represents a significant part of the total income of a poor family, but it would amount to less than N$2,000 per year. This is less than half the value of an annual social pension of N$4,440. For the remaining majority of about 110,000 homes, however, much more of their income is derived from non-farming activities, in particular from the wages and pensions of family members, and from remittances sent by family members working elsewhere. For example, an average of 73% of total household income came from non-farming activities in north-central Namibia, while 82% of income in Kavango was not from farming.[16]

Perhaps the most important point is that although the rural households engage in a variety of farming activities, most families rely largely on cash incomes. As a result, the majority of household commodities are obtained through cash purchases and not from harvested products. Other important points are that most households have several incomes, and those with the largest families have the greatest diversity of incomes and the highest total off-farm earnings. The predominant value of non-farming incomes raises the question of whether these should be viewed as farming households or not.



5

CATTLE RANCHING



Large-scale commercial cattle farming for beef production on big farms in freehold and communal land, and on open access communal land. Most beef is exported or sold to local markets.

Beef production has been an important commercial farming activity over the past 50 years. The farming system is now practiced over more than one-third of the country, and it supports the livelihoods of more than 100,000 people.

GEOGRAPHICAL FEATURES

The main purpose of this farming system is the commercial production of beef. The system covers all of Otjozondjupa, much of Kunene, Omaheke and Khomas, the southern parts of Omusati, Oshana, Oshikoto and Kavango, and eastern areas of Erongo. About 315,000 square kilometres, or 38% of Namibia, is used for cattle ranching. Much of the area in eastern Namibia is on Kalahari Sands where the trees are predominantly broad-leafed species forming a flat landscape of savanna grasslands. Among the commonest trees are burkea and silver-leaf terminalia. Vegetation to the west is savanna-like as well, but acacias and mopane dominate the tree cover. Pastures below the trees provide grazing while the trees give cattle important shade. The most arid areas in the far west have few trees away from dry rivers and streambeds. The drainage courses are lined with moderately dense ribbons of trees that supply valuable pods and leaves to livestock. However, a variety of grass species form the mainstay grazing resource for cattle throughout the area of this farming system.

Annual average rainfall varies from about 550 millimetres in the north-east to 300 millimetres in the south and 150 millimetres in the far north-west. The most arid north-western areas are grazed by cattle only intermittently, herds being moved in a roving fashion into areas where occasional falls of rain have produced grazing. Since rainfall is the main determinant of grass biomass (see page 23) and both rainfall and pasture production are moderate in most years, cattle production requires large areas of grazing. Cattle ranchers therefore either have big, fenced farms or graze their animals over large expanses of open, communal grazing.

Water is a critical resource. The great majority of cattle obtain their water from underground sources pumped into reservoirs and drinking troughs, or from thousands of small dams constructed on ephemeral rivers and streams. Because only intermittent or widely scattered surface waters were

previously available, the creation of permanent sources of water was a key step in making cattle ranching possible.

Pastures in the north-eastern areas burn frequently. This happens almost every year in many places where most fires are set by people to stimulate new grass growth. Others are fires that accidentally run away after being lit to clear water holes or fields of old growth, for example. The fires result in the loss of substantial areas of grazing, and possibly cause changes in the composition of grass communities. A major difference between freehold and communal farming areas is in the frequency of fires.[1] While communal pastures in the north-east burn often, fires on freehold farms are very infrequent because they are regarded as a threat to pastures. Any fire is thus extinguished as quickly as possible. There is also often insufficient grass to burn because of intense grazing on freehold farms.

Many of the farms are also characterized by severe bush encroachment, the highest bush densities in Namibia being found on freehold farms in northern Otjozondjupa where rainfall is higher than to the south.[2] An association between heavy grazing pressure, cattle ranching and bush encroachment seems obvious, since bush cover is much thicker on the freehold farms of this farming system than in any others. Pastures that are badly encroached have lost several times their previous productivity because of reduced grass biomass (see page 31) and cattle being unable to reach grass beneath and between impenetrable bush. Losses in beef production have been estimated to cost Namibia hundreds of millions of Namibian dollars. Black thorn, purple-pod terminalia, sickle bush and mopane are the most invasive bushes.

A range of factors and ideas have been suggested to explain how overgrazing leads to bush encroachment. However, it is the absence of fire that is probably the critical cause. Hot fires kill most young bushes, and so the continued absence of fire on freehold farms allows young bushes and shrubs to grow and multiply into thick cover. Moreover, the occasional fires that do occur are too cool to kill much of the bush because heavy grazing has removed the dense cover of grass needed to fuel hot fires. It is this last point that probably links bush encroachment most clearly to cattle ranching.

Social environment

Cattle are farmed for beef on a substantial scale in three distinct areas of land tenure. The first and most widely recognized is the extensive, freehold, titled cattle ranches that cover much of central Namibia. There are about 2,400 of these farm units. Those in areas formerly allocated to white owners have an average size of about 7,300 hectares, while farm units average less than 1,000 hectares in the former Rehoboth district. Approximately 11,000 households and 47,000 people live on, and are largely supported, by all these farms. The farm units are bigger than the registered farms. For example, among 53 owners of registered farms between Windhoek and Gobabis, 16 of them leased other farms or sections of farms, thereby enlarging their farming units from an average of 5,248 to 8,459 hectares.[4]

A second category comprises the farms that have been fenced off into exclusive ranches in communal areas, each of which ranges between approximately 1,000 and 8,000 hectares.[5] Some were demarcated by the previous government and allocated to farmers between the 1960s and 1980s to encourage commercial agriculture in communal areas. There are about 300 farms of those original farms in the Mangetti Block of Oshikoto and Kavango, and the Okamatapati and Rietfontein areas. At least 700 new farms have been established since independence in Caprivi, Kavango, Oshikoto, Omusati, Otjozondjupa and Omaheke (see page 14). There are an estimated 5,500 households and 35,000 people associated with these farms.

The third group is made up of farmers using open access grazing on communal land, most of which is in northern Kunene, eastern and northern Otjozondjupa, northern Omaheke and the Aminuis Block. Here an estimated 3,600 households and

AREAS USED FOR THE CATTLE RANCHING FARMING SYSTEM AND THE ESTIMATED NUMBER OF HOUSEHOLDS AND PEOPLE IN EACH LAND TENURE TYPE.[3]

Tenure type	Hectares	Households	People
Freehold farms	14,500,000	11,200	47,000
Exclusive communal farms	3,000,000	5,500	35,000
Open access communal	14,000,000	3,600	24,000
Total	31,500,000	20,300	106,000

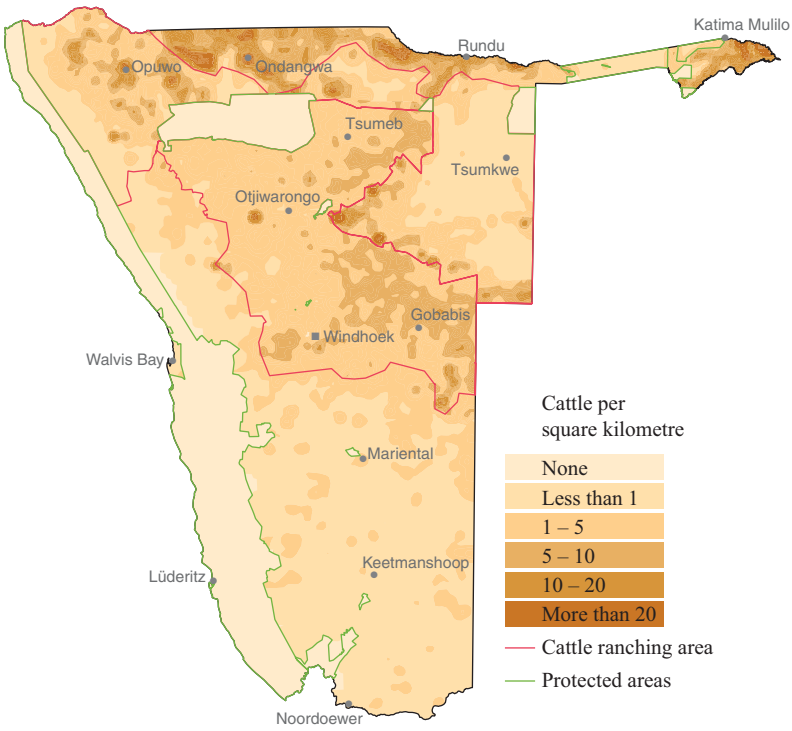


Figure 20. Approximately 1.4 million or 58% of the roughly 2.4 million Namibian cattle are within the *Cattle farming* system area. Most others are in the *Small-scale cereal and livestock* farming system (Chapter 4).

24,000 people are probably directly involved in commercial beef production. Another 8,000 households in these same open communal areas are not beef producers, and thus fit within the *Small-scale cereal and livestock* farming system (Chapter 4).

Little infrastructure is available for cattle farming in these open access communal areas. Water is supplied from boreholes, most of which are found at widely separated points close to villages. All people and all livestock share the water points, causing a concentration of overgrazing and trampling close to the water. Conditions on the exclusive ranches in communal areas are better. The originally demarcated farms were fenced and each was supplied with a borehole and reservoir. Likewise, some owners of the newer ranches have established water sources, housing for labourers and fenced off camps to manage grazing on a rotational basis. But their infrastructure does not compare with that of freehold farms. Good roads provide easy access to most of these farms, which have telephones and electrical power from the national grid or generators. Each freehold farm has a relatively dense network of water sources. For example, there were 536 water points in one area covering 286,000 hectares of freehold farms. Each water point therefore served an average of 535 hectares. Water was further available from 62 dams built across river beds. The farms were divided into grazing camps of an average size of 218 hectares.[6]

It might have been logical to distinguish three farming systems for cattle in this book: open access communal land, exclusive ranches in communal areas, and freehold farms. However, differences are fading as more farmers in communal areas fence off big ranches, farming more as commercial producers than cattle owners in open access rangelands. Well-developed marketing systems of auction pens, traders and farmers' associations now serve many of their needs, the best examples being found around the Okamatapati farms. Farmers in northern Kunene also market cattle and goats on a substantial scale.

Increasing numbers of communal farmers are thus turning to the kind of beef production traditionally expected on freehold farms. Distinctions between the categories are also being blurred in the opposite direction on freehold farms used to resettle people from communal areas. The farming

units allocated to each family are generally too small to produce beef on a substantial or economically viable scale. In this sense, therefore, many former freehold farms now function as subsistence rather than commercial units. There are approximately 90 resettlement farms within this farming system area.

FARMING PRACTICES

Open access communal land

While farmers on communal land have been herding cattle for generations, practices to produce beef commercially have started to develop only recently. The developments are occurring rapidly, a feature that contributes to the variety of ways in which cattle are farmed in these areas. Even greater diversity stems from the fact that the farmers are extremely heterogeneous, particularly in terms of household wealth, herd sizes and assets of value in farming cattle **(Figure 21)**. Some people are therefore more involved in cattle farming, and produce much more beef than others. The focus in this chapter is on those commercial beef producers who mostly own more than 50 cattle. More traditional small-scale approaches to cattle farming for domestic consumption are described in Chapter 4 on the *Small-scale cereals and livestock* farming system.

Cattle are principally grazed wherever suitable pastures and water sources are available, often on an itinerant or nomadic basis. While the grazing areas are not fenced, the herds of different farmers are usually separated by mutual agreement or by allocations and rights accorded by traditional leaders, especially in northern Kunene. However, those farmers with large herds have access to the biggest and best grazing areas as a result of the size of their herds, their social standing and their capacity – as wealthy farmers – to employ herders and transport water. They also have substantial flocks of goats, and sometimes sheep, thus farming with a diverse assemblage of livestock, unlike freehold farmers who largely specialise in either cattle or sheep (see below and Chapter 6).

Herd boys are often family members, and the size of the farming enterprise is generally related to the number of people in a household. The number of cattle may further depend on the extent of off-farm incomes and number of extended family members who contribute remittances. Cattle are often exchanged, borrowed or pooled between members of a family. For example, relatives who live elsewhere may have their animals herded with others belonging to a resident, rural family. The lending of cattle in northern Kunene is one way of maintaining kinship ties and enabling young family members to start their own herds or build them up in the event of loss due to disease or drought.

Cattle herds are managed using a variety of approaches. On the one hand, they are run rather informally, at least compared with the herds of conventional commercial beef producers. Limited efforts are made to monitor pregnancy, calving, growth rates, or the fertility of bulls and cows. Herds expand when grazing is good, but then crash when grass or water is in short supply. Locally, stocking rates are often high, causing severe overgrazing and cattle to be in poor condition. For example, the stocking rate of 4.3 hectares per large stock unit in the Ovitoto communal area near Okahandja was three times greater than on adjoining freehold farms.[8] Calving rates are seldom above 50%, and mortality rates range from 10 to 20% per year.[9]

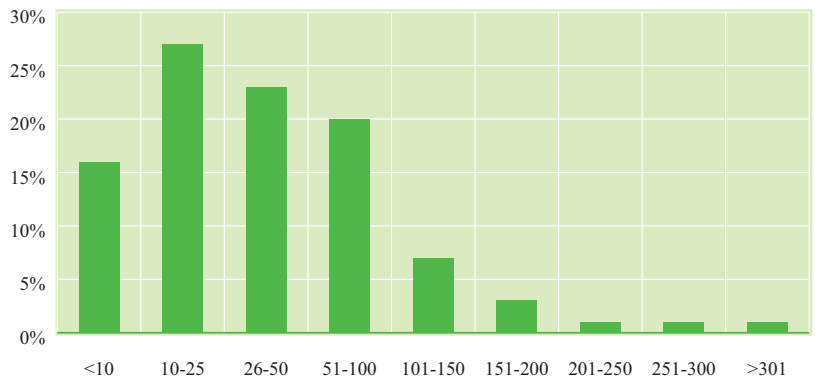


Figure 21. An example of how cattle ownership varies in communal areas. These are percentages (y axis) of farmers owning different numbers of cattle (x axis) in 2001 in eastern Otjozondjupa.[7]

Most losses are caused by disease and insufficient food, which leads to starvation and greater susceptibility to infections, particularly botulism, anaplasmosis, pasteurellosis, and black quarter. A significant number of cattle are stolen as well. The biggest cause of death in much of eastern Otjozondjupa results from cattle feeding on gifblaar (*Dichapetalum cymosum*).

However, many farmers are increasingly adopting animal husbandry practices that were rare or absent in communal areas 10 or 20 years ago. These include castrations, dehorning, vaccinations against disease and the treatment of sick animals using veterinary medicines. The composition of herds is more controlled, so that cows make up 40 to 50% of animals, oxen 20 to 40%, calves 30 to 40%, and bulls between 1 and 2% of an average herd. Supplementary licks may be provided. Local associations have been formed to support farmers. Most importantly, farmers are pursuing active methods of marketing, especially in supplying distant markets. For example, the majority of weaners exported live to South Africa are sold in the communal areas of eastern Otjozondjupa, and most cattle slaughtered at the Meatco abattoir in Oshakati come from northern Kunene. Off-take rates of cattle sold to formal and informal markets in northern Kunene amount to about 11% annually. This may not seem high, but another 10-20% of herds are lost to mortality, and unknown percentages are consumed domestically or withheld from sale for reasons of being sacred cattle.[10]

Freehold farming

Practices to produce beef in communal areas are thus changing rapidly. Those on freehold farms, by contrast, are more established as a result of decades of experimentation, the availability of findings from research and the provision of advisory services. Farmers thus have – or can get – good information on how to manage pastures and water supplies, optimise reproduction, treat diseases and market their beef, for example. Although an estimated 25% are so-called 'weekend farmers', they and the majority who farm full-time have generally been farming for many years. Furthermore, many come from farming backgrounds, having been raised as the sons and daughters of commercial beef producers. Most current farmers have had some tertiary education, often in agriculture. While labourers on freehold farms have generally had little formal education, the majority have gained much practical expertise over years of employment. Each farm employs an average of five to six labourers who live there with their families, usually consisting of four or five dependants.[11]

Freehold farms used for beef production are typically stocked with several hundred head of cattle. For example, each of the 53 farm units mentioned above had an average of 567 cattle, 42 sheep and 47 goats. Counting all the cattle and treating six head of small stock as equivalent to one large stock unit (LSU), gave an average stocking rate of 14.8 hectares per LSU. Stocking rates may be greater to the north where rainfall is higher, and lower in the more arid south and west (see page 31).

The average composition of cattle on a freehold farm would be about 33% cows, 27% calves, 32% oxen, 6% heifers, and 2% bulls. The animals are typically divided into separate herds of about 50 to 100 head, each herd being managed as a unit and shifted together from camp to camp. The frequency of rotation depends on the condition of the grazing, especially that of grass species that indicate the degree of pressure on the pastures (both within any single camp and elsewhere on the farm). To maximize conception and fertility, each ranch would have enough bulls in a ratio of one bull per 20-30 cows, of which 75-90% would produce calves in a year. Between 10 and 15% of the older or less productive cows are replaced each year to maximize calving rates. Ideally, bulls should be placed with cows in January, February and March so that most calves are born at the roughly the same time, nine months later. The calves and their mothers can then benefit from fresh summer pastures. The performance of cows in producing calves and the growth of their calves is easier to monitor if most of the herd follows the same cycle of reproduction. The quality of a herd is increased by the addition of good genetic material from stud animals. Namibia has 198 stud breeders who have some 28,000 registered animals, mainly of Brahman, Bonsmara, Sanga (N'guni), Simmentaler and Simbra breeds.

Calf production is further improved by the provision of licks containing phosphorus, maize meal, molasses and urea or protein concentrates. Cattle are commonly vaccinated against brucellosis, vibriosis, black quarter, anthrax and botulism. The vaccinations – together with treatments for internal and external parasites – contribute to high survival, generally over 97% per year.[12] Other than licks, most cattle obtain all their nutritional requirements from natural grazing. Some farmers, however, have planted pastures of blue buffalo grass, a nutritious grass that grows on a range of types of soils. Blue buffalo grass may carry one LSU per 2-4 hectares in the higher rainfall areas of north-eastern Namibia, Beef cattle from freehold farms are largely sold either at auctions or directly to Meatco (see page 21). Approximately two thirds of farmers between Windhoek and Gobabis sell oxen

While cattle add value to Namibia's economy, their diverse shapes, sizes and colours also contribute to the beauty of open, rugged landscapes.

at an age of about 30 months, while others prefer to market weaners at 8 months, or so-called stores or tollies when they reach about 15 months. Decisions on what to sell, and when to do so, are complex. Current prices, anticipated demands, the condition of grazing, and the costs of raising animals to heavier weights all have to be considered.

Exclusive communal farms

Beef is not produced on a substantial scale on most of the approximately 1,000 large, fenced farms on communal land (see page 14). Many are now being developed, and it will take several years before cattle herds, water points and other infrastructure are established. Other farms, particularly those in Oshikoto and Omusati, serve more as capital investments than as productive farms. In due course, however, all these farms should become important contributors to Namibia's beef industry, especially once the shifting of the veterinary cordon fence opens up local and export markets for their beef. The farms should then become similar to those around Okamatapati and Rietfontein in eastern Otjozondjupa, and Omaheke where about 100 or more ranches produce beef on a substantial scale.

The owners of all the exclusive farms are typically wealthy people with significant local status. Many are civil servants, political figures or self-made businessmen who derive most of their income from non-farming activities. They seldom live on their farms and few have received any training in agriculture. In short, these are new farms owned by a new generation of entrepreneurs pursuing business enterprises new to communal land.

As might be imagined, rather little information is available on these enterprises, but some insight is to be gained from the 65 Okamatapati farms established in 1979. Most of the farms range in size between 5,000 and 7,000 hectares. In 2001, each farm supported an average of 384 cattle, 100 sheep and 65 goats.[13] Eleven farms had herds of more than 600 cattle, the highest being 925. The farmers are served by a number of auction pens, some of which were built by government while others were developed by local farmers' associations.

Other than sales at auctions in the Okamatapati area, cattle are sold on 'permit days' arranged by farmers' groups who advertise the availability of cattle to prospective buyers. Buyers who submit the highest price proposal are then invited to the location of the permit day sale to buy and load the cattle. The majority of cattle are sold as weaners, most being exported for fattening to South Africa. It is estimated that 70% of all live exports of cattle are originally bought in communal areas. The

predominant sale of weaners allows for high rates of off-take. These are currently thought to be in excess of 30%, a figure estimated to have grown from 4% in the 1940s.[14]

Cattle production and marketing

The 2004 livestock census reported a total of 2,349,081 cattle in Namibia of which there were roughly similar numbers to the north (1,165,430) and to the south (1,183,651) of the veterinary cordon fence. A total of 298,807 cattle were reported as having been formally marketed for beef production in the same year. (The 'formal market' consists of sales reported at abattoirs south of the veterinary cordon fence, at the Oshakati and Katima Mulilo abattoirs, by Namibian butchers and as live sales to South Africa.) Only 9,787 of these animals originated in the northern communal areas, which means that the remaining 289,020 cattle were from south of the cordon fence. Dividing 289,020 by the total number of cattle reported in the south gives an annual off-take for beef production of 24.4%. Equivalent calculations for previous years yield similar figures.

What of the 1,165,430 cattle counted north of the fence? Various studies indicate that the total off-take is about 10% across this broad swathe of the country, which includes an average of 16,000 cattle slaughtered each year at the Meatco abattoirs in Oshakati and Katima Mulilo.[15] The remaining animals (roughly 100,000) are used for domestic consumption or sold at informal meat markets in northern Namibia.

A variety of reasons are offered for the low off-take rates in the northern areas: irregular calving and high losses due to mortality, the lack of markets, a shortage of labour to improve management, and the value in keeping cattle as capital assets and for draught power, milk, manure, and other products. Most farmers also have very small herds from which it is difficult to produce beef commercially. The sale of one or two animals represents a substantial reduction of the herd, especially if irregular and infrequent calving and high mortality mean that the farmer can not be certain that the animals sold will be replaced easily. Finding a buyer willing to pay a reasonable selling price for such a small purchase may also not be simple. Finally, there may be little incentive to earn a few thousand Namibian dollars from one or two cattle if the perceived profit is small compared to cash earnings from wages and other incomes (see page 39). Notwithstanding these factors, greater beef production will only be achieved if cattle numbers increase or, alternatively, if higher rates of off-take are achieved by increasing calving and lowering mortality rates. The latter option is to be preferred because much of northern Namibia is already very densely stocked with cattle (see **Figure 20** on page 43).

An average of 345,000 cattle have been sold each year for formal beef production since 1990 (**Figure 22**). The great majority (92%) is exported, mainly to South Africa or Europe, while the remaining 8% is for the local Namibian market. Of all exports, 54% of cattle were exported live to South Africa, generally for fattening and subsequent slaughter, 27% were exported as carcasses or processed meat to South Africa, and 19% were sold to European markets. Very small volumes have also been exported to Botswana and Angola. The European

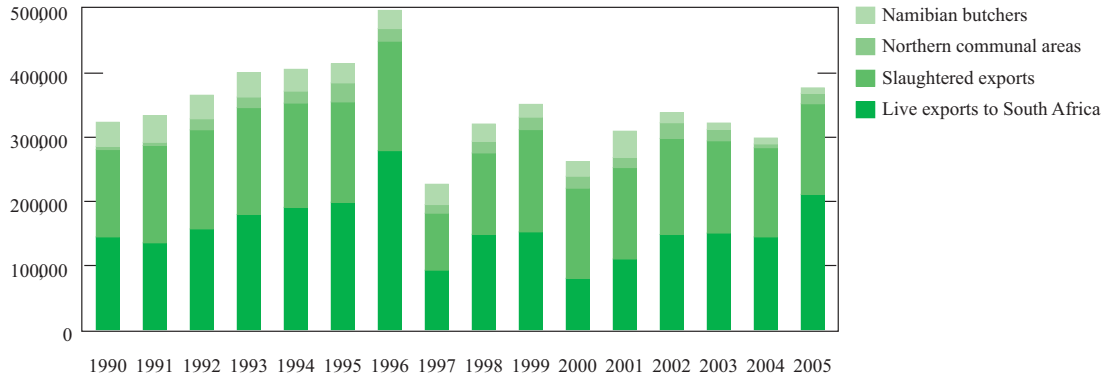


Figure 22. The number of cattle sold for beef production since 1990. The sharp increase in 1996 was due to an absence of grazing as a result of poor rain, while low production in 1997 reflects a reluctance to sell as farmers built up their herds again.

Brahman (photograph above), Afrikander, Simmentaler, Bonsmara and Sanga breeds and crossings between them form the core of Namibia's cattle population. Other breeds which occur in smaller numbers are Brown Swiss, Santa Gertrudis, Beefmaster, Charolais, Hereford, Pinsgauer and South Devon. Sanga, as the collective name for cattle indigenous to southern Africa, are gaining popularity as a pure breed, with an increasing demand for their genetic material among freehold farmers south of the veterinary cordon fence. Compared to exotic breeds, Sanga are more tolerant of heat, have higher resistance to ticks and lung sickness, are fertile, and are good mothers. As smaller animals, their food and water requirements are relatively low, which means that they cost less to maintain than other breeds. However, all the exotic breeds also serve Namibia's beef production requirements well. The breeds have been selectively bred over many years under local conditions, with the result that they generally calve regularly and frequently, have good growth rates, and produce meat of high quality.

market is dominated by sales to the United Kingdom (73% of European exports) and Norway (13%).

As is the case of sheep (see page 56), the export of live cattle to South Africa is a concern to the government. Greater value could be added if the carcasses were processed locally, jobs could be generated, and Namibia would obtain value from the hides and other by-products. While intended levies on live exports may boost these local benefits, they would also limit the growth of beef (as weaners) production by farmers in communal areas.

Namibian beef is widely held as being of high quality. Much is done to protect that reputation, not least in ensuring that all exports are certified as free of disease. The Meat Board has recently introduced the Farm Assured Namibian Meat Scheme (or FAN Meat) as an additional method of guaranteeing quality. In essence, the scheme allows all meat products to be traced from the final market destination back to the farm of origin. One aspect to be pursued in developing beef production in communal areas is the quality of meat. Many of the cattle sold to abattoirs are old and the meat of poor grades. For example, about 30% of carcasses are categorised as A or B grades in the northern communal areas, the other 70% being C grades. By contrast, 76% of carcasses sold by freehold farmers are A and B grades, the remaining 24% being C grade.

Cattle breeds: Afrikander (top left), Simbra (top right), Santa Gertrudis (middle left) Simmentaler (middle right), Sanga (bottom left) and Bonsmara (bottom right).