LIVESTOCK - COPING WITH DROUGHT:

NAMIBIA - A CASE STUDY

by

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Introduction

In 1992/93[†] Namibia suffered its worst drought in living memory. This paper presents a case study of coping with drought in the communal areas and freehold (commercial) farms of Namibia, based largely on the experiences, information gained and lessons learned from that drought. Some emphasis is put on considering the effects of drought on the rangelands, and the options available to livestock keepers to contend with drought, but the majority of the rural population of Namibia are agro-pastoralists, hence the implications for crop production are also covered. The paper tracks the rather *ad hoc* pre-1992 drought relief practice to the impact of, and responses to, the 1992/93 drought, to the formulation of a National Drought Policy and Strategy in 1997. Finally, some policy issues and options are considered.

Country Profile

Namibia (formerly South West Africa) is situated in the south west of the continent of Africa, bordered by the Atlantic Ocean on the west, Angola and Zambia to the north, Botswana to the east and the Republic of South Africa to the south. The total land area is 824 269 sq km, which can be divided into three main topographic regions. The first is the western coastal plain of the Namib desert, occupying 12% of the total, the second is the central plateau stretching from the southern to the northern border and covering more than half the country, and the third is the semi-arid Kalahari zone lying along most of the eastern portion of the country (Isaacson, 1995). The country achieved independence from administration by the Republic of South Africa, and became Namibia, in 1990.

With a mean annual rainfall of approximately 270 mm, Namibia is rated to have the driest climate in sub-Saharan Africa. There is wide regional variation in annual rainfall, from less than 20 mm in the western Namib and coastal zones to more than 700 mm at the eastern end of the Caprivi strip. Some 97% of the country's soils have a clay content of less than 5%. Considering soils and rainfall, only about 1% of the land surface, or 820 000 hectares, is considered to have medium to high potential for rainfed and irrigated crop production (NDTF, 1997a).

Water supplies

Of Namibia's limited and erratic rainfall, an estimated 83% is lost through evaporation and 14% through transpiration, while only 2% runs off into rivers or dams, and 1% infiltrates and recharges groundwater (DWA, 1991). Given the high evaporation from dams, uncertain groundwater recharge rates, and the country's rapid population growth, it is predicted that by the year 2000 there will be only 250 cubic metres per person per annum available from surface and underground water resources (excluding perennial rivers, which are not currently exploited on a large scale). This means the country is already facing extreme water stress in the global context where 1,000 cu m per person is considered the threshold of water stress (NDTF, 1997a).

Namibia's only perennial rivers flow along parts of its northern and southern borders, and the country is almost entirely dependent upon ephemeral rivers and groundwater. Water tables have dropped significantly in some areas during the last twenty years because of water

[†] **The drought commenced in the 1992 part of the 1991/92 wet season and continued into 1993.**

extraction to supply towns and related industrial and mining activities, and farmers are also starting to experience reduction in borehole water levels (Vigne and Whiteside, 1997). The number of good rainfall seasons required to restore the water tables is unknown. Access to the country's perennial rivers on the borders is limited and depends on agreements between riparian neighbours. Nevertheless, irrigation development is seen by some as the best means of mitigating the effects of drought and, in spite of concerns expressed by economists and technicians, there is currently a strong push towards the development of large scale irrigation schemes (Vigne and Whiteside, 1997).

Economy

Four sectors dominate the economy: mining, government, wholesale and retail trade, and agriculture. Fisheries and tourism are relatively minor at present but are growing and have further growth potential. Mining accounts for some 31% of GDP and over 75% of exports. Agriculture is the largest employer and supports, directly or indirectly, 70% of the population while accounting for 9% of GDP and 14% of exports (IFAD,1997).

Land tenure

There are three broad categories of land tenure. Approximately 44% of the country is so-called "commercial" farmland with freehold tenure, 41% is allocated to communal areas, and the remaining 15% is state land including conservation areas. Under the South African administration's policy of separate development, a "homeland" system was introduced by the Odendaal Commission in 1962 to accommodate the main ethnic groupings in the country. Although the tribal names have been replaced with neutral regional names, and some boundaries have changed, these areas remain substantially intact as the present communal areas (Fig.1).

The communal areas are situated mainly in contiguous blocks in the north of the country, while the commercial areas occupy most of the centre and the south of the country. The commercial farming sector is well developed, capital-intensive and export oriented, while the traditional or communal farming sector is subsistence-based and labour intensive, with limited use of technology and external inputs. In the communal areas there are user rights rather than ownership rights, and only the cropping areas are normally allocated to individual households, while the grazing areas tend to be shared by members of a community.

Human population

Namibia's population is estimated at 1.7 million, and the population growth rate to be about 3.2% per annum. Approximately 73% of the population is rural and 27% urban, but the annual urban population growth rate of 5.4% is considerably higher than the national average. This means that by 2006, over 43% of the projected population of the country will be living in urban areas (Vigne and Whiteside, 1997).

Despite having one of the lowest overall population densities in the world (the 1.7 million people live at an average density of about 2 persons per square kilometre), Namibia suffers increasing pressure on, and consequent risks to, its land and water resources. Regionally, there are large variations in population density, with heavy concentrations reaching 100 persons per square kilometre in parts of the northern communal areas. An alternative means of assessing population density is agro-climatic population density (Binswanger and Pingali, 1988, cited

by Vigne and Whiteside, 1997), which considers the number of persons per million kilocalories of production potential, estimated at the intermediate technology level for developing countries. Using this measure, Namibia is the only country in sub-Saharan Africa that has already reached an overall density of more than 250 persons per million kilocalories of production potential. It has been projected that Botswana will not reach this density until the year 2023 and Zimbabwe until the year 2032 (Vigne and Whiteside, 1997).

Cereal production and food security

The cultivation of rainfed crops in Namibia is, of climatic necessity, regionally concentrated, and is mainly confined to the northern communal areas apart from a small but significant area of commercial maize production in the so-called maize triangle east of the Etosha National Park. Pearl millet is the most widely grown cereal in the communal areas, and maize (some irrigated) in the commercial areas. Wheat is only grown in the commercial areas and under irrigation. Maize is widely preferred as the staple food in the communal areas, but millet and sorghum are more reliable crops except in the highest rainfall zones. Less than 1% of communal area farmers have crop areas above 10ha, the accepted threshold for regular commercial production. National cereal production (roughly 5% wheat, 25% maize and 70% millet and sorghum) fluctuates considerably from year to year according to rainfall. Post independence production has varied from a low of 33 800 tonnes in the drought year of 1991/92 to a record high of 173 000 tonnes in 1996/97 (Directorate of Planning, 1998). With an estimated national demand of more than 260 000 tonnes per year (Namibia Early Warning and Food Information System, 1997), Namibia must import a significant portion of its cereal requirements, even in good years.

Through domestic production and food imports, food availability in Namibia is not a problem at the national level, and the majority of the population has reliable access to food commodities. However affordability is a problem for many households. The 1993/94 Household Income and Expenditure Survey (Central Statistics Office, 1996) revealed that in 47% of rural households food accounted for more than 60% of total expenditure, and in 12% it accounted for more than 80% of expenditure.

Low levels of agricultural productivity and aggregate production, particularly in the communal areas, pose the major constraints to agricultural and rural development (Isaacson, 1995). The southern, eastern and western parts of Namibia are generally unsuitable for agriculture other than extensive ranching. The World Bank, in its 1994 World Development Report, noted a negative average annual growth rate (-0.5%) in agricultural production in Namibia for the period 1980-1992. The food supply situation is in fact deteriorating with a negative (-2.5%) annual growth rate in per capita food production, due to the relatively high rate of population growth.

Vegetation

The principal vegetation types of Namibia are illustrated in Fig. 2. The fifteen vegetation types can be grouped into three main vegetation regions. According to this classification (Giess, 1971), savannas occupy 64% of the land area, desert vegetation 16%, and dry woodlands 20% of the country. Desert vegetation along the Namib coast varies from annual grass plains along the inland margin, and the "living fossil" *Welwitwitschia mirabilis* plants of the central area to succulents or virtual absence of vegetation in the southern Namib. The dry woodlands of the north-east are characterised by *Baikea plurijugis*, *Burkea africana* and

Pterocarpus angolensis. Savannas characterise the rest of the country in various tree, shrub and grass associations. Acacias generally predominate in the savannas but *Colophospermum mopane* dominates much of the arid north-west of the country, excluding the coastal desert.

Wildlife

Namibia's rich and diverse wildlife is one of the great assets of the country and its people. About 13% of the country is designated as National Parks, but an estimated 90% of the wildlife, particularly the larger mammals, exist outside formally proclaimed conservation areas (de Jager, 1993). Many commercial farms derive some or all of their income from hunting and/or tourism, and there is an increasing movement towards the establishment of nature conservancies in communal areas to enable local communities to benefit from their wildlife populations.

Livestock production

There are currently about 2.1 million cattle, 2.4 million sheep and 1.8 million goats in the country, in addition to smaller numbers of pigs, poultry and farmed ostriches. However, the numbers of cattle and small stock fluctuate considerably in response to high and low rainfall years. The 1997 census data showing distribution between the communal and commercial sectors are shown in Table 1. Beef production is the most important livestock related activity, followed by small stock (sheep and goat) production, and most of the output from the livestock sector is exported. The combined livestock sector contributes 70% of total agricultural output (Directorate of Planning, 1998).

Table 1 National livestock census 1997

	Cattle	Sheep	Goats	Pigs	Poultry	Ostriches
Commercial	790,699	2,112,789	547,205	10,559		46,160
Communal	1,264,717	316,539	1,273,804	6,325		565
TOTAL	**2,055,416**	**2,429,328**	**1,821,009**	**16,884**	**522,618**	**46,725**

Source: Directorate of Veterinary Services

Commercial area livestock production accounts for 65% of national agricultural output (Directorate of Planning, 1998) and comes from 52% of the farming land. This is divided into 6 337 farms (1992 data), with an average size of 5 700 ha, owned by about 4 200 individuals or agricultural enterprises. Commercial farms are the largest source of wage employment in Namibia, employing about 36 000 people. Grazing livestock are raised under extensive ranching conditions, relying on natural pasture occasionally supplemented by protein/mineral licks. Cattle are predominant in the northern parts of the country where the rangelands generally have a higher carrying capacity. Beef cattle ranching is the largest contributor to commercial farming income, and the major breeds are Brahman, Afrikaner and Simmentaler. In the commercial sector, sheep are largely concentrated in the drier south and are mostly the Karakul, bred mainly for its pelt, and the Dorper for meat production. Goats are more widely distributed and the main breeds are the Boergoat and the Angora. Ostrich farming is practised on a small scale in the drier parts of the country.

Communal area livestock production contributes 5% of total agricultural output (Directorate of Planning, 1998) and is mainly confined to the northern part of the country. The communal

areas occupy 48% of the total farming area of Namibia and hold about 62% of the total cattle population, 70% of the goats and 15% of the sheep. However livestock ownership is strongly skewed, with as many as half the rural households in some regions not owning any cattle or small stock. The indigenous Sanga is the dominant breed of cattle. Goats and, to a lesser extent, sheep are widely distributed in the communal areas; the breeds are indigenous and in the north tend also to be called Sanga.

Production systems and grazing management

The commercial areas are divided into fenced ranches. Under the South African administration, fencing and water development were subsidised in commercial areas and each ranch is further subdivided into a number of paddocks, through which some form of rotational grazing is normally practised. Compared to the communal areas, stocking rates tend to be more conservative but fire has generally been excluded, cutting for fuel or building has been minimal until recent interest in charcoal production, there are fewer browsing animals, there is less mobility in response to rainfall spatial variation, and in years of low rainfall the stocking levels have been maintained artificially high by subsidised drought feeding. In consequence, large areas of the medium to higher rainfall savannas are severely bush infested, to the detriment of the grazing potential for cattle and sheep. Over the past 10-15 years there has been a marked increase in game farming and wildlife tourism in the commercial areas, in recognition of the difficulties and consequences of farming with mono-specific (grazer) domestic stock.

The production systems in the communal areas are based on pastoralism and agro-pastoralism, and the majority of households are subsistence, rather than commercially, oriented. The outputs and objectives of livestock ownership are much more diverse than in commercial livestock production and include draft power, milk, dung, meat, cash income and capital storage as well as socio-cultural factors. Production per hectare is more important than production per head, and the communal area livestock owner's combination of objectives is met by a policy of herd maximisation rather than turnover (Sweet, 1997).

Stock numbers tend to be less evenly distributed in communal than in commercial areas. There is a tendency for high concentrations of people and livestock near to permanent water, while other areas remain under-utilised due to a lack of water. Animal numbers tend to be geared more to the quantity of reliable water than to the reliable quantity of forage, hence drought effects tend to be more severe in communal than in commercial areas.

The process of decision making and management in freehold/leasehold enterprises is relatively simple in that all the animals using the resource area tend to be under control of a single owner or manager in a clearly defined area with exclusive usership or ownership rights. However, communal areas are - by definition - shared by many livestock owners; consensus for unified action is more difficult to obtain, the boundaries and the users are less clearly defined, and the rights of the community to the grazing and water resources are not exclusive.

Range condition

The main changes in vegetation cover and/or composition which have taken place in the commercial areas over the last 30-40 years are related to the increase in bush density referred to earlier. The relative proportions of annual and perennial grasses shift with wet and dry cycles and are not only indicative of management-induced range condition.

Overgrazing is seldom considered an urgent problem by communal area livestock owners, if recognised at all. In good rainfall years there is enough grazing, and in poor rainfall years there is not; hence the condition of the rangeland is seen to be dependent upon rainfall rather than upon management or stock numbers *per se* (Sweet, 1997). Without doubt, zones of marked change in vegetation cover and composition do exist in areas of high stock concentrations around permanent water in the communal areas. However, the true status of range degradation is unclear owing to difficulties in relating animal production potential (carrying capacity) to different vegetation structures and botanical compositions, and to the confounding effects of drought. Bush encroachment is rarely problematic in the communal areas; conversely, the more typical problem is one of deforestation, especially in the more densely populated areas.

Range condition in the communal areas of Africa has tended to be evaluated from a commercial ranching perspective, hence the frequent reports of poor status and overstocking. However, there is an increasing awareness that the characterisation of qualitative states such as range condition and range degradation should be in context of the management objectives. There is, in fact, little doubt that subsistence-oriented livestock producers can profitably maintain higher stocking rates and lower successional status botanical compositions than commercial meat or milk producers (Sweet, 1997). However, stocking close to the ecological limit leaves little safety margin to absorb the shock of drought, hence communal area losses tend to exceed those in more conservatively stocked commercial farms (Behnke and Sweet, 1998).

Climate, trends and drought history

Climate and rainfall

The mean annual rainfall in Namibia is about 270 mm and ranges from less than 20 mm in the Namib desert to more than 700 mm in the Caprivi strip. The distribution and climatic classification of land areas receiving different categories of rainfall is as shown in Table 2.

Table 2 Annual rainfall distribution and climatic classification in Namibia

Rainfall (mm)	Classification	Percentage of land surface
<100	Desert	22
101-300	Arid	33
301-500	Semi-arid	37
501-700	Sub-humid	8

Source: National Drought Task Force, 1997

In Namibia, as for most of southern Africa, rainfall is highly seasonal and occurs almost entirely as a single wet season in summer. In the wetter areas the rainy season extends from October/November to April, but in the drier areas the season starts later and is shorter. The bulk of the rain falls between the months of January and March. Less than 1% of total precipitation is recorded in the June to September winter period (MAWRD, 1996).

The isohyets for mean annual rainfall are shown in Fig. 3. However there is a high coefficient of variation around the mean, particularly in the lower rainfall zones (Fig. 4). Annual rainfall distribution is skewed such that there are many more below average than above average rainfall years, and statistically the median values are more meaningful than the means, since they represent the 50% probability values (Fig.5), i.e. one can expect at least that much rain in

one out of every two years. The high seasonal variations are accompanied by high spatial variability, and the annual potential evapo-transpiration exceeds annual precipitation by ratios of up to 30:1 (not counting the desert areas), hence quasi-drought conditions are a common phenomenon throughout most of the country. The data are consistent with the observations of Caughley, Shepherd and Short (1987, cited by Galvin and Ellis, 1996) and Ellis (1994) that when rainfall is below about 400 mm/year, CVs generally exceed 0.33 and droughts may take place as often as twice per decade.

The ITCZ, El Nino and ENSO

A number of atmospheric and oceanic circulation patterns exert influence on southern African and Namibian weather. The Inter-Tropical Convergence Zone (ITCZ) is a region of pronounced convective activity where the northeast and southeast trade winds converge, causing uplift, cooling, condensation and rainfall (Tyson, 1978, Hutchinson, 1993). The ITCZ moves seasonally north and south, following the sun, and in summer dominates the elevated plateau of Namibia between 12^0 and 16^0S (Hutchinson, 1993). The interior of the country relies on the fringe effects of the pressure systems over the eastern part of south Africa as driving mechanisms for its rainfall, while the precipitation received by the coastal belt is dictated by the South Atlantic high and air movement from the south (Dyer and Marker, 1978). At best, these movements bring only the edges of the rain-bearing systems over Namibia (Hutchinson, 1993).

A feature of the southern hemispheric circulation that has long been known to have important consequences throughout the atmosphere is the see-sawing up and down of the atmospheric pressures at the eastern and western sides of the Pacific, known as the Southern Oscillation, and its associated temporal pattern known as the Walker Circulation (named after the British meteorologist Sir Gilbert Walker, who named and described the Southern Oscillation). Similarly, the El Nino/La Nina phenomena of raised/lowered sea surface temperatures in the Pacific Ocean have been known for many years, but it was not obvious that they could affect weather in much of the world (du Pisani, 1997). The link between the El Nino and the Southern Oscillation as two parts of the same phenomenon, known as ENSO, was made in 1969 by a Norwegian meteorologist, Professor Jacob Bjerknes, but it was not until the severe El Nino of 1982/83 that the extent of its influence on global weather was realised.

Botswana, Lesotho, Swaziland and the Republic of South Africa appear to bear the brunt of the effects of El Nino in southern Africa. Until recently, Namibia was considered to lie largely outside its zone of influence (Hutchinson, 1993), with the ENSO accounting for only 16-20% of rainfall variability in Namibia (du Pisani, 1997). Studies had shown that temperatures in the Indian and Atlantic Oceans played a much greater role than those in the Pacific in determining the rainfall in Namibia (du Pisani, 1997). However, the recent (1997/98) catastrophic weather anomalies and extremes attributed around the world to El Nino have again focused much attention on this weather phenomenon, and the general view is now tending towards a more important role of the ENSO in Namibian weather (Hutchinson, pers. com.). In Namibia, the El Nino generally promotes dry conditions, and the La Nina wet conditions.

Drought history and drought patterns

With more than half of the country expecting less than 300 mm annual rainfall (Table 2), drought has tended to be an imprecise term in Namibia. With the median rainfalls being lower than the means, bad years are more common than good, and quasi-drought conditions somewhere in the country are more common than not. Drought tends to be declared in particular localities rather than nationally and, hence, there is not a definitive list of drought years in Namibia.

Major droughts affecting large portions of the country are said to have occurred in the 1930s and for an extended period in the 1960s, culminating in the 1970/71 season which was declared the most devastating drought experienced to date in the region. The next "disaster drought" occurred in the period 1982-1984 due to three consecutive years of poor rainfall, and the last one in 1992/93. Nonetheless, the Namibian government has continued to pay out drought relief subsidies in some part of the country every year since 1991, and a national drought was declared again in 1996. In some areas, the 1995/96 drought was considered worse than the 1992/93 one but it attracted less publicity and international attention than the 1992/93 drought in the newly independent Republic of Namibia.

Regional cycles and climatic trends

The temporal variations in rainfall at 17 sites in Namibia for the period 1934-1965 were investigated by Dyer and Marker (1978). Their results showed oscillations of 9-14 years near the coast, increasing to 17 years on the escarpment and longer still in the hinterland. This spatial variation may contribute to the lack of any apparent cycle consistency for the country as a whole. However, there is not a general consensus on weather cycles for Namibia.

In a text on climatic change and variability in southern Africa, Tyson (1987) considered most of the variability during the 20^{th} century to be random, but that real and significant non-random components are clearly identifiable, notably alternate approximately 9 year spells of predominantly wet or predominantly dry years. The spells have not always occurred at the same time or affected all areas equally, and the non-random component seldom accounts for more than 20-30% of total variance. According to Tyson (1987) other rainfall oscillations are present in the record, including a tendency for a 6 year oscillation in the north western parts of southern Africa, including Namibia.

Tyson (1987) noted no evidence of southern Africa becoming progressively drier, and Hutchinson (1993) reached the same conclusion for Namibia. However, in recent years there has been an increasing international concern about global warming and climatic change as a consequence of excessive emission of the so-called greenhouse gases. In the region of southern Africa represented by the Southern African Development Community (SADC) nations (which includes Namibia), a rate of warming of about 0.05^0C per decade has been observed during the present century (Hulme, 1996). According to the report, the last 20 years have seen a trend towards reduced rainfall and, during the early 1990s, two or three serious droughts. The decade 1986-1995 has been the warmest and driest this century in the SADC region (Hulme, 1996), and only 2 years out of the last 16 have shown above normal (mean) rainfall in Namibia (Hutchinson, pers.com).

There have been a number of studies which included modelling climatic change and its consequences on natural vegetation and agricultural production in the southern African region (e.g. Hulme, 1996) and on a global basis (e.g. Downing, 1996). However, the different

scenarios modelled produce different outcomes, and at this point in time the trends are too weak to point strongly at a particular one. Furthermore, the Hulme study notes the difficulty of modelling for climates with distinct seasonality and large inter-annual variability, as exists in southern Africa. Hence the modelling results and predictions are inconclusive at this stage, at least in the Namibian context.

Previous Drought Relief Measures

Prior to independence in 1990, Namibia was administered by the Republic of South Africa which had no definite policy or structure for dealing with drought in Namibia, but rather a series of *ad hoc* subsidies and relief measures applied as and when considered necessary. This situation continued after independence and there was no official drought policy in Namibia until 1997.

The first government-assisted drought relief measures in Namibia comprised a food-for-work scheme introduced during the drought of the 1930s, whereby white commercial farmers were paid for manual labour on road and dam construction. Subsidies on fodders, licks and access to alternative grazing areas were first introduced in the early 1960s when an outbreak of foot-and-mouth disease coincided with an extended drought, and an almost total ban was imposed for more than two years on the movement and marketing of animals in the central and northern areas of the country. During the 1960s, drought could only be declared on a whole district basis, but from the 1970s smaller blocks became eligible for assistance.

Before 1978, agricultural subsidies were granted almost exclusively to commercial farmers. After 1978, with the introduction of the Transitional Administration, drought relief subsidies for fodders and licks, destocking, and transport to alternative grazing areas were provided to commercial farmers by the Administration for Whites, while government services to the homelands were provided mainly by the "second tier" ethnic administrations operating in context of the policy of apartheid. There was not a standard definition of drought, and droughts were declared in an area on recommendation of the extension officers following appeals from the farmers. Hence the declarations of drought and the government responses to drought were localised and *ad hoc* in both sectors.

Since 1981, commercial farmers have had to be stocked at not more than 60% of the official carrying capacity in order to be eligible for drought relief subsidies. Although the subsidies were always intended for drought relief, they became permanent measures for commercial farmers until 1987, when they were discontinued. From then on until the 1992 drought, commercial farmers had to apply to the Land Bank or the Agricultural Credit Board for soft loans in emergency situations. During the 1989 drought, when about 150,000 people were severely affected in the communal areas, a National Drought Relief Committee was established, but it relied on the Council of Churches of Namibia (CCN) to register beneficiaries and to store and distribute food aid. Until independence, the burden of drought relief in communal areas fell primarily on the local NGOs (especially the churches), sometimes assisted by international NGOs. Prior to 1992 there had been no experience of dealing with a country-wide drought, and thus the Republic of Namibia inherited no institutional capacity to deal with severe drought on a large scale.

After independence, government services were re-oriented towards the needs of farmers in the communal areas but the lack of a coherent drought policy remained. The regionally devastating 1992/93 drought, which was the defining point in time for Namibia in the context of drought, struck less than two years after independence and a wide range of drought relief measures were introduced. These are described later in this paper in the section Drought Response.

Even after the 1992/93 drought and a number of subsequent analyses and post-mortems, the *ad hoc* local declarations of drought continued and the government continued disbursing large amounts of drought aid annually, without a uniformly applied definition of drought. Objective approaches to drought alleviation have tended to be confounded by political interests. A variety of figures have been reported for expenditure on drought relief, due to differences between budget requests, initial allocations, supplementary allocations, cost components and records of expenditure. The budget allocations for agricultural drought relief (water not included) over the past five years 1994/95 to 1998/99 have been N$ 40, 65, 117, 10 and 49 million respectively (Englebrecht, pers. com.). The allocations are made in the financial year following the rainfall failure; thus, for example, the 1996/97 allocation was in respect of the 1995/96 drought.

In addition to the livestock subsidies, a sliding scale scheme of compensation for maize crop failure for commercial farmers was introduced in the 1992/93 drought. The scheme has gradually been expanded to include all rainfed cash crops and to include communal area farmers with Agribank loans.

The national drought policy and strategy finalised in 1997 was not approved by Cabinet until May 1998, hence the restrictions on drought relief assistance incorporated in the policy will not be applied until 1999. Meanwhile the subsidies approved for the 1998/99 financial year (N$1.00 = US$0.17) include:

- a market incentive of N$120 and N$20 per head of large stock and small stock respectively in the northern communal areas, and N$80 and N$15 per head of large stock and small stock respectively in the southern communal areas (the northern communal area subsidies are higher to compensate for lower Meatco prices due to transport and quarantine costs).
- a leased grazing subsidy of 50% of the tariff up to a maximum of N$10 and N$2 per head of large and small stock per month, and up to a maximum of N$1 000 per farmer per month, is available in the southern communal areas.
- a restocking subsidy of N$100 and N$20 in the northern communal areas for each unit of large stock and small stock market incentive invested in a savings account until April 1999. Small scale farmers (owning less than 10 cattle or 50 small stock) who were forced by drought to sell some of their animals will qualify for the restocking subsidy according to the number of animals sold.
- a sliding scale crop compensation for maize, up to a maximum of N$250 per ha, and a fixed rate compensation of N$150 per ha for other cash crops yielding less than 0.4 tonnes per ha. Only commercial and communal area farmers with Agribank loans are eligible.

- a seed voucher scheme for purchase of maize and pearl millet seed for the new planting season. Households without seed reserves will receive free seed sufficient to plant up to 2 hectares.

Drought Impact - The 1992/93 Drought

The 1992/93 drought is rated the most widespread and damaging in southern Africa this century. Although Namibia suffered less than some of the other southern African states such as Malawi, Mozambique, Zambia and Zimbabwe, the impact was still severe. In Namibia, the drought is variously known as the 1991/92 drought and the 1992/93 drought because it commenced in the 1992 part of the 1991/92 wet season and continued until 1993. The 1991/92 wet season had started well for much of the country but the rains virtually stopped in January 1992, the national cereal harvest amounted to only 29% of the previous year's total, and Namibia became faced with a generalised crop failure and a serious threat of famine (NDTF, 1993). Stock owners had been pleased with the early rains and stocking rates had been maintained or increased, but by March/April it was clear that there would be no winter grazing. Grazing conditions progressively weakened in 1992 through to the end of January 1993 when the first significant rains occurred. By this time, 47% of the farming areas were classified as most critical, 30% as critical and 23% as fair (NDTF, 1993).

The immediate impact of the drought, namely food shortage for people and scarcity of grazing for livestock and wildlife affected at least part of all 13 regions of the country and at least 625 000 of Namibia's population of 1.4 million. Some 250 000 people were classified as "vulnerable". However, with due credit to all parties involved in relief, no lives were lost to the drought. Nonetheless the total cost of the relief effort was in excess of US$60 million.

Water supplies

A major consequence of the drought was the reduction in availability of domestic water in major towns, and domestic and stock water in many parts of the country. In June 1992 the water volume in the country's major surface catchment dams stood at only 26.8% of capacity, compared to 42.2% at the same time the previous year. In rural areas many small pans and dams had failed to hold water, and water tables had dropped in wells and boreholes.

Crop production

The drought in the northern regions was more agricultural than meteorological, in that it was characterised by uneven rainfall distribution in the growing season, rather than markedly low rainfall overall. For example, in Caprivi the total rainfall was within 90% of the expected range but crop production was devastated by an almost complete cessation of rainfall from late January to early March, and collapsed to only 8% of the 1991 yield level. Almost half of the communal area farmers who planted maize in 1991/92 harvested none at all, while commercial maize farmers registered a mean harvest reduction of 36%. Millet and sorghum were less affected; harvests were reduced by 50% in Kavango and 73% in the North Central (then Ovambo) region, and only 21% of farmers harvested none (Devereaux *et. al.*, 1993). In desperation, farmers late-planted the "improved" fast-maturing variety of millet, *okashana*, but 75% of surveyed farmers who planted it reported zero yields, and only 10% claimed fair to good harvests.

Livestock and wildlife mortalities

Drought can be expected to reduce livestock holdings in two ways: directly through mortalities and indirectly and through distress sales. The possibilities for distress sales of game animals tend to be lower than for domestic stock, and in 1992/93 the extent of losses of springbok and other wildlife became a matter of concern in some areas, as there were some 6 500 reported mortalities from the commercial farms (NDTF, 1993). In general, the game animals in Namibia are more drought tolerant than those in higher rainfall areas, and mortalities due to drought were less than 0.5% in the Etosha National Park, although there were high mortalities in Mozambique, Zimbabwe and the Kruger National Park (du Plessis, pers. com.).

Whereas in the northern communal areas the drought impact was mainly on foodcrop production, elsewhere in the communal areas it was livestock which suffered most. Livestock mortalities were prevented to some extent by the combination of market incentives and fodder and lick subsidies, but nonetheless were considerable and small stock fared worse than cattle. The official records (NDTF, 1993) show national losses of only about 2 200 cattle and 12 000 small stock, 0.1% and 0.2% of the total populations respectively, but there were no records from three of the four regions comprising the northern communal areas, and the results of a post-drought nationwide survey (Devereaux *et al*, 1993) indicate that actual mortalities were considerably higher:

- As many as 80% of communal area livestock owners suffered losses
- Mortality greatly exceeded sales; communal area livestock owners were unable or unwilling to sell animals in significant numbers before they died or became unmarketable
- Cattle losses averaged 22% in communal areas and 2% on commercial farms
- Goat losses averaged 40% in communal areas and 10% on commercial farms
- Sheep losses averaged 43% in communal areas and 15% on commercial farms
- Drought mortality in communal areas reduced the median flock size of goats from 30 to 17, and of sheep from 26 to 18, leaving most flocks well below the considered minimum viability level of 30-35 head
- The drought appeared to have little effect on donkeys

The mortality differences between communal and commercial areas reflect the commercial farmers' better access to grazing and water, higher cash reserves to buy in feed or rent grazing, and greater willingness/ability to sell animals. About 25% of communal area farmers reported selling some livestock during the drought, and only half of these said they sold more than normal because of the drought (Devereaux *et al.*, 1993). In the communal areas, goats are far more widely owned than sheep, mainly because they are considered hardier but, in fact there was little difference between the mortalities of sheep and goats.

The rangelands

There is a dearth of information on the impact of the 1992/93 drought, or of any droughts, on the vegetation in Namibia. This results partly from the lack of specific studies and partly from the generally low and erratic rainfall patterns making it difficult to distinguish between drought, rainfall fluctuations and management factors (notably stocking pressures) as causal factors of vegetation change. In general, sudden changes and short term fluctuations can be attributed to rainfall, and the longer term trends to management. In arid and semi-arid

environments the relative proportions of annual and perennial grasses can change markedly in wet and dry periods.

In a review of long term experiments concerning the grass layer in the savanna regions of southern Africa, O'Connor (1985) concluded that a run of wet or dry years generates a cumulative, possibly small, change in sward composition but these cumulative composition changes can be over-ridden by the influence of one singularly wet or dry year. These patterns of change are most pronounced at the drier end of the savanna spectrum, and the existence, let alone the composition, of the perennial component is directly dependent on the mean annual rainfall. The review gives examples from the literature of high mortalities of various perennial grasses during droughts. High percentage mortalities of the perennial grasses *Stipagrostis uniplumis* and *Eragrostis rigidior* have also been recorded in a single season in Namibia (Bester, 1993) but these have tended to be short term effects and in general the Namibian vegetation is resilient to drought (Bester, pers. com.). This conclusion is in accordance with observations from other drought-prone environments.

O'Connor (1985) found no evidence that rainfall patterns alone have caused any major vegetation change in southern Africa. Compositional changes have corresponded with rainfall cycles, and all species eliminations due to drought have been of a temporary nature. Long term rainfall variability, independent of the grazing regime, has an over-riding effect on compositional trends but the cumulative effects of grazing influence the rate of rainfall-induced compositional changes (O'Connor,1985). According to Westoby *et al*. (1989), extended periods of above or below normal rainfall can reinforce short term changes until a new state is reached, and in this new state a species may become extinct or locally dominant. Bester (1993) is of the opinion that the vegetation in the communal areas of Namibia is continuously disturbed and has therefore adapted to disturbance, and so possesses an enhanced capacity to recover from disturbance. He illustrates the point with examples of rapid response of herbage yield in exclosures.

Drought frequency is the principal determinant of ecosystem stability in dry (disequilibrial) rangelands (Caughley *et al*., 1987, cited by Galvin and Ellis, 1996; Ellis and Swift, 1988). Frequent droughts cause mortality of herbivores without having much influence on vegetation, leading to the decoupling of plants and herbivores; plants generally recover rapidly from short term droughts, allowing the subsequent rapid recovery of herbivores (Galvin and Ellis, 1996).

In Namibia there has been a dramatic increase in bush density over the last 30-40 years in the commercial areas, particularly in the thornbush savanna (see Map 2). There is a general recognition that this is a management-related condition that has been exacerbated more by the 1961-63 Foot-and-Mouth Disease restrictions on livestock movements, and by years of drought subsidies (notably fodder), than by drought *per se*. Donaldson (1967) noted in the Vryburg district of South Africa that the extent of drought-induced perennial grass mortality showed a strong positive correlation with bush density. This implies that the impact of drought in Namibia is exacerbated in the bush infested areas, particularly for grazing (as opposed to browsing) animals. Van Niekerk (1980, cited by Bester, 1993) estimated the area of bush infestation in the commercial areas to be 8 million hectares; Adams, Werner and Vale (1990) put the figure at 14.4 million ha, nearly 50% of the commercial farming area of Namibia.

The primary causes of the bush increase have been determined as (Bester, 1993):

- exclusion of browsers
- exclusion of hot veld fires
- over-exploitation of the grass component
- climate/vegetation interaction

However the influence of drought on woody plant dynamics is unclear and appears inconsistent. The general trend of encroachment, mainly of *Acacia mellifera* and *Dichrostachys cinerea*, suggests that drought conditions do not normally cause significant woody plant mortality. However, localised events of die-back of these two species, particularly *A. mellifera*, have been noted in South Africa, Botswana and Namibia (Sweet, unpublished data; Bester, pers. com.). The events appear to be drought-related but the particular sequences and severities of low rainfall years to cause die-back is unclear. The die-back appears to affect *D. cinerea* plants of almost any size, but with *A. mellifera* it is mainly evident in larger (older) trees, suggesting a compounding effect of drought on age. There is also a fungus, *Phoma glomerata*, which is a major contributor to the mortality of *A. mellifera*, (e.g. Schreuder, 1988) and compounds (and confounds) the effect of drought. Observations in the Etosha National Park (du Plessis, pers. com.) indicate that 1-2 year droughts tend to suppress leaf regrowth but seldom cause tree mortality, while longer droughts do cause die-offs of shrubs and trees.

The ability of bush to compete with grasses for moisture, to withstand drought and to regenerate rapidly, coupled with the relatively low acceptability to livestock of the invasive species, notably *Acacia mellifera*, results in a gradual diminution of grazing and an increase in bush (Bester, 1993), if control measures are not practised. However, in the communal areas the cutting and browsing pressure on the woody plants tends to prevent bush encroachment. In the commercial sector, the depletion of grass is often exacerbated by an increase in stock numbers before the grass has had a chance to recover after drought, whereas in communal areas there is only a gradual increase in stock numbers. The years of provision of fodder subsidies in the commercial areas have aggravated an unstable situation by encouraging farmers to keep more animals than the range could support, and maintained rather than eased the grazing pressures during the recovery phases. During the 1992/93 drought some concern was expressed by environmentalists that the combination of fodder subsidies and the borehole drilling programme in the communal areas was also artificially sustaining livestock herds, with probable detriment to the already fragile natural resource base (Devereaux *et al.*, 1993).

Household incomes

Communal area households lost approximately a quarter of their average monthly incomes during 1992 due to crop losses, livestock mortality and reduced employment opportunities. The median monthly income across all communal regions was just N$241 (approximately US$84) in February 1993, down from N$330 (approximately US$115) in January 1992 (Devereaux *et al.*, 1993). Most of the slump was concentrated in rural settlements, with peri-urban communities suffering relatively little. The urban-rural income gap within the communal areas widened significantly during the year. Commercial farm owners also experienced a dramatic decline in their average incomes, but from a much higher initial level than that of communal farm households.

Drought Response - The 1992/93 Drought

The responses to the 1992/93 drought are considered from the contrasting positions and perspectives of the government/institutions (including donor agencies and NGOs) and the households/farmers (including communal and commercial areas).

Government/Institution Response

At independence, Namibia did not have the institutional capacity to deal with serious drought or other environmental disasters. In response to the 1992/93 drought, a National Drought Task Force (NDTF) comprised of line ministries, UN agencies and NGOs, was established in May 1992 and charged with the responsibility of running the relief operation and laying down the foundations for future drought management. The NDTF included a number of operational units which reported to the NDTF secretariat, which in turn reported to a Cabinet Committee on Drought under the chairmanship of the Prime Minister.

Table 3 The emergency budget

Item		N$
Food Aid		
Cereal including	Metric Tons	11,500,000
Tanked service water	60,000	8,400,000
Supplementary food		37,800,000
for vulnerable groups	1,800	9,072,000
Total	61,800	8,159,000
Logistics		46,872,000
Milling (60,000 mt @ N$230)		13,800,000
Internal transport, storage & handling (61,800 mt @ US$140)		24,918,000
Total		38,718,000
US$ equivalent @ N$2.88=US$1.00		12,456,000
Livestock & Crops		
Marketing, fodder & lick subsidies		40,799,000
Water		
Improvement/repair existing boreholes/wells		41,789,000
Extension of piped water systems		600,000
Tanked service water delivery & community storage tanks		28,659,000
Emergency water supply & water quality monitoring		2,734,000
Total		73,782,000
Health & Nutrition Programmes		59,454,000
GRAND TOTAL		171,228,000

Source: National Drought Task Force (1993)

A UNDP-funded FAO project to establish an Early Warning and Food Information System (EWFIS) had commenced in June 1991 but was not yet fully operational.

In May 1992 an emergency budget was prepared (Table 3) and the President launched a Special Appeal for donor support. No final accounts for the drought relief programme (DRP) have been produced but the allocation for Water was increased by N$ 3 million in 1992 and it is likely that the final expenditure exceeded US$60 million. This includes aid provided by donors and NGOs but excludes technical and other assistance.

The components of the institutional response fell into three main categories: those to alleviate nutritional stress of people and livestock, those to provide incentives for destocking, and those to facilitate post-drought recovery.

The Role of NGOs and Donor Agencies

An NGO/Donor Liaison Unit was established under the NDTF to coordinate the participation of local and international NGOs in implementation of the DRP. The government encouraged international donors to give aid direct to the NGOs to enable them to assist more effectively in dealing with the drought emergency. A large number of agencies and NGOs contributed and/or participated, as reported by the NDTF (1993). Due to its previous experience with food assistance programmes, the Food Management Logistics Unit (FMLU) of the Council of Churches of Namibia (CCN) was given the key role of storage, transport, and distribution of food aid., and later became a member of the NDTF secretariat. The UNDP, FAO and WFP also played major roles in the drought relief operations.

Free food to vulnerable groups

The core of the food aid component of the DRP was the distribution of free food only to "vulnerable" groups, namely children under 5 years old, pregnant/lactating women, the elderly and the physically or mentally handicapped. The rationale was to avoid creating a drought relief dependency syndrome. Local drought committees were responsible for registering the vulnerable groups and at first it was estimated that 650 000 Namibians (almost half the population) were "at risk", but this number was subsequently reduced to 250 000 vulnerable individuals. There were some problems of over-registration and incorrect targeting due to the following reasons (Devereaux *et. al.*, 1993):

- there were no guidelines on how to classify a village or community as "drought affected", hence all rural communities were included if they were in a region designated as drought affected
- the aid was targeted at individuals but distributed to households; there were no guidelines on how to screen out wealthier households
- female-headed households without wage incomes were excluded due to the focus on vulnerable individuals rather than on vulnerable households

Food-for-work

Poor but able-bodied adults in drought affected areas who requested food aid were to receive it through a food-for-work (FFW) scheme devised and run by the local communities themselves, through the Regional Commissioners (Governors) and development committees, assisted by NGOs. This programme was supposed to complement the Free Food programme, so that every needy person in a drought affected area would have access to food one way or the other.

Unfortunately the FFW component never really got going during the period of the actual drought. One of the problems was that the intervals between submitting projects for approval and the arrival of the food were too long, so discouraging potential participants. By March 1993 only 1 in 4 surveyed households reported that there had been any FFW projects in their community (Devereaux *et. al.*, 1993). However, where FFW projects were initiated, as many as 71% of respondents said they had taken part.

Fodder and lick subsidies

The 1992/93 drought arguably affected livestock even more severely than people, and a number of measures were introduced to support stock owners through the crisis. The most

important of these were a fodder subsidy and a livestock marketing subsidy. Less substantial, but also significant, were subsidies for mineral licks, de-worming, transport, emergency grazing, karakul pelts and subsidised loans for fodder and water expenses (Devereaux *et. al.*, 1993).

Fodder subsidies were only made available in areas declared critical for grazing. The scheme (NDTF, 1997a) provided for communal area farmers to receive a full monthly subsidy for up to 10 cattle or 50 sheep or goats, and a 50% subsidy for additional animals up to a maximum of 100 head of cattle or 500 small stock. Initially, additional subsidies for 3 head of large or small stock could be obtained for each head of large or small stock sold, contingent on proof of sale; however, this measure was later removed due to political pressure. Commercial farmers were eligible for a 50% subsidy up to a maximum of 100 head of cattle or 500 head of small stock, provided they were not stocked at more than 60% of the official carrying capacity estimate for the area. The full subsidy rates started at N$20 per head of cattle and N$4 per head of small stock, but were increased to N$40 and N$8 respectively in communal and commercial areas. On game-fenced farms in the commercial areas, wildlife species could be substituted for livestock for fodder subsidies.

In addition, there were subsidies on mineral licks, up to set monthly limits per head of large and small stock, and a one-off free issue of worm remedy for a maximum of 100 large stock or 500 small stock. The NDTF records (NDTF, 1993) show that a total of 621 commercial area stock farmers and 15 870 communal area stock farmers benefited from the fodders and licks component of the aid scheme. These figures correspond to only 15% and 16% approximately of commercial area and communal area stock farmers respectively. The household survey of Devereaux *et. al.* (1993) also found that less than 20% of communal area households in the qualifying areas received the fodder subsidy regularly throughout the programme, but the authors concluded that the income transfer value exceeded all other transfers in those regions where it was widely available, and was worth nearly twice as much as food transfers for vulnerable groups. Fully 60% of the mean cash value of all transfers (excluding water, which was not costed) was accounted for by the fodder programme. In contrast, the value of transfers through the food-for-work programme was negligible, at 1% of the total.

The fodder subsidies have been much discredited due to widespread fraudulent claims in 1992/3 and subsequent years, and to a recognition that they have encouraged farmers to maintain higher stocking rates than appropriate, thereby contributing to the bush encroachment problem.

Emergency grazing

The government purchased a small number of freehold farms to sustain core herds of small farmers from the communal areas. Under-utilised grazing belonging to government experimental farms or municipalities was also made available. Subsidies were provided for the lease of grazing and for transport of drought affected livestock to alternate grazing areas.

Karakul pelt subsidy

A subsidy of N$10 per pelt was provided within the drought-stricken areas, upon proof of the pelts being sold at auction. There was no limit to the number of pelts per farmer, and a total of N$2.16 million was disbursed on this subsidy (NDTF, 1993). However, it is not clear what influence the subsidy *per se* had on the drought sales.

Marketing incentive scheme

The major initiative to promote livestock sales and to reduce the grazing shortage in the communal areas was the livestock marketing incentive scheme, which was designed to encourage selective culling of mature animals and to reduce the size of the breeding herds without prejudicing recovery potential. The subsidies were N$120 per mature cow (1 calf or more) and per ox with 6 or more permanent teeth, and N$20 per mature female sheep or goat (1 lamb/kid or more).

Complete sales data are unavailable and no analysis of the actual response to the subsidies, as opposed to the response to the drought, has been conducted, but the NDTF records (NDTF, 1993) show that the number of cattle purchased and slaughtered in the northern communal areas between March 1992 and January 1993 totalled 15 695, compared to an average of about 7 000 head in the preceding years. The same records show that the numbers of cattle and small stock qualifying for subsidy at auctions in the southern areas in the same period were 12 274 and 48 236 respectively. In a survey of the communal areas, Devereaux *et. al.* (1993) found that only 49% of stock-owning households sold more animals due to the drought. They also found that 57% of those questioned thought that prices were lower than normal during the drought, and only 12% thought they were higher. This perception seems to reflect the poor condition of animals sold and, perhaps, a lack of awareness of the subsidy scheme.

Emergency water supply

The main components of the water assistance offered under the DRP fell into four categories:

- rehabilitation of disused or faulty boreholes
- provision of new boreholes
- extension of pipelines and branch lines
- provision of water tanker services, with priority given to schools, clinics and disadvantaged rural communities

Provision was originally made for the rehabilitation of 45 boreholes and the drilling and equipping 40 new ones but the demand greatly exceeded the original estimates, which had to be revised. Cabinet made additional funds available, bringing the total for emergency water to N$31 million, and the largest ever drilling programme in the country's history was embarked upon. By June 1993 the following had been achieved:

- 272 km of pipelines had been laid in rural areas
- 31 water tankers had covered a total distance of 1 million km delivering water
- 422 new boreholes had been drilled (291 successfully)
- 55 non-functional boreholes had been tackled (43 successfully rehabilitated)

Crop compensation

Private tenure farmers benefited from a fully government funded crop insurance in the form of a sliding scale crop damage compensation for maize. This subsidy, which has been maintained and broadened since 1992 to include all cash crops, has been much criticised for encouraging large scale cultivation of maize and other crops in unsuitable areas.

Replanting subsidies

Owing to the scarcity and poor condition of draft animals for ploughing in the communal areas when the rains resumed in January 1993, the government provided tractor ploughing services and subsidies for hiring private tractors. These measures were accompanied by free issue of seeds and subsidies on fertilisers and farm implements. The concern was to restore household food security as soon as possible.

Household/Farmer Response

The typical responses to the drought differed between primarily livestock-dependent and primarily crop-dependent farmers and, particularly, between communal area households and commercial farmers. The latter reflected the vastly different resource base between communal and commercial area farmers.

Communal area household responses

When crop production or household income declines, rural households can draw on a number of alternative sources of cash or food, such as livestock sales, asset sales, informal transfers and borrowing. Three related coping strategies are reductions in non-food expenditures, rationing, and demographic adjustments. When livestock survival is threatened by drought, the main options are to sell some animals, buy in feed and/or move some animals.

About 1 in 4 farmers sold some or all of their livestock over the period of the drought, and half of these reported selling more because of the drought (Devereaux *et. al.*, 1993). The same survey showed that 21% of farmers were unable to sell cattle because of their poor condition.

Selling domestic assets is a fairly drastic response to drought and indicates a failure of conventional sources of food and income to meet household subsistence needs. Only 5% of surveyed households said they had sold one or more non-animal assets to buy food, indicating either success of the free food and food-for-work programmes, or a lack of real crisis. Radios, cooking pots and bicycles were the most common items sold, but the most lucrative were cars.

Informal transfers, notably remittances from household members in waged employment, are routinely common in the communal areas of Namibia. The household survey (Devereaux *et. al.*, 1993) found a slight decrease in remittances received during the drought and attributed this to the existence of the drought relief program and to possible financial constraint of the normal donors.

More than 1 in 4 surveyed households borrowed food and/or money to buy food because of the drought; the figure was higher in rural areas (29%) than in towns (12%). In

most regions the rural borrowing was higher than the previous year, but there was no reported increase among urban residents, confirming that the drought was primarily a rural problem.

Expenditure on non-food items was expected to decline during the drought but the household survey did not show this to be the case. In fact expenditure on important items such as health, education and clothes, increased. Households reported that they spent more because prices were higher and it was concluded that household expenditure was squeezed by both falling incomes and inflation, resulting in lower consumption (Devereaux *et. al.*, 1993).

Despite relief efforts, the survey showed that across all regions some 71% of communal area households indicated that they had eaten less food than in the previous year. Even in normal times, many of the rural households consume a diversity of wild foods gathered from the bush or from rivers, and it was not possible to determine to what extent the drought prompted shifts in consumption patterns. The drought stimulated economic diversification including weaving, basket making, wood carving, hunter-gathering and off-farm employment.

Only about 9% of surveyed households reported some change in adult membership due to the drought. The outflow of adults from households was more than three times the inflow, and the search for food was the most common reason given for movement.

Communal area responses for livestock

The traditional response to drought by stock owners in the communal areas is to move their animals. Owing to the spatial variability of rainfall and the seasonal availability of surface water, seasonal movements are the norm, especially in the drier areas. In most regions of the communal areas there are localised concentrations of permanent settlement, where the crop fields are situated, and other areas of relatively light grazing pressure - due mainly to lack of water quantity or quality. It is in these latter areas that many households own or share "cattleposts" centred on hand-dug wells and, occasionally, boreholes. These areas provide the first option for drought movement of livestock from the settlement areas, and it is also in these areas that the government drills emergency boreholes. Unfortunately the drought boreholes tend not to be closed at the end of a drought and so become cattleposts or settlements, and the grazing is no longer available for drought relief, so necessitating the drilling of new boreholes where grazing can be found in the next drought.

Many stock owners in the northern communal areas move their livestock across the border into Angola, where stock concentrations are lower. However, not all regions have this option and the increasing human and animal population densities in some parts of the communal areas have greatly restricted stock mobility, especially for the smaller farmers who cannot split their herds and/or do not have the labour resources to move their livestock (Sweet, 1998).

Buying in fodder is seldom a realistic option in communal areas, where most stock owners are subsistence farmers and cannot afford to buy feed, and because in a situation of drought there is unlikely to be any spare fodder close at hand. The subsidised fodder provided by government has reduced the need for farmers to buy their own feed. Crop residues are routinely grazed by livestock in the dry season but in drought situations the stover yields as well as the grain yields tend to be reduced.

Communal area farmers are generally reluctant to sell animals in a drought for a number of reasons including:

- they are not commercially oriented and have different reasons for keeping livestock
- the majority of herd and flock sizes are small
- they don't know how long the drought will last
- by the time the drought is apparent the animals have lost condition and their sale value is reduced
- the sale points tend to be few and far between, at least in the northern communal areas, and stock lose further condition reaching the sale points.

There can also be a suspicion by communal area farmers that they are being coerced by government to de-stock. From a communal farmer perspective, livestock numbers are usually the best insurance against drought. With larger stock owners this form of insurance is often accompanied by herd splitting, either maintaining control (e.g. through herders) or distributing animals to poorer relatives to look after in return for the milk, draft and dung outputs.

Commercial farmer responses

Namibia's commercial (private tenure) farming sector is dominated by livestock and wildlife, other than in the maize triangle in the north and some irrigation from the Orange river in the south. As a consequence of the scheme introduced for commercial maize farmers in 1992, and subsequently expanded to include all rainfed cash crops, commercial farmers enjoy a compensation scheme for crop failure and therefore have a reduced incentive to pursue alternative and more sustainable forms of land use.

Commercial farmers tend to have far greater reserves of capital to draw on in times of drought than do communal area farmers, and they also tend to have better access to markets and supplies for buying in or selling out. For most commercial farmers the principal concern in drought is to avert loss of domestic stock and/or wildlife, rather than having to worry about short term household food security. As for communal areas, the main options are to buy in feed, sell animals or move animals. Also as for communal farmers, the pressure to adopt any of these options has been reduced by the government subsidies described earlier.

Freehold farmers have an additional advantage over communal farmers in that it is easier for them to obtain credit to fund drought mitigating activities, as they have collateral. Supplementary feeds are easier to locate and purchase for commercial farmers but the supplies tend to have to come from outside Namibia, making them expensive; this expense coupled with the government provision of subsidised fodder has caused feed purchase to be used mainly as a desperation measure for selected animals, including wildlife.

Commercial farmers are quick to sell stock when drought is apparent, and this is a major response to drought, however willingness to sell is dampened by tax liabilities on the sales. Commercial farmers generally recognise that early sale commands better prices, leaves more grazing for the remainder of the flocks and herds, and reduces the subsequent need for emergency sales. Wildlife tends to be more resistant than domestic stock to drought but, where wildlife are concerned, there are fewer opportunities for sale and replacement, hence survival feeding of valuable species is common in severe conditions.

A number of commercial farmers own more than one farm and, if they are not all equally drought stricken, possibilities exist for the transfer of stock. Similarly, farmers in one area are generally able to lease grazing in another, unless the drought is very widespread. Hence the movement of stock to alternate grazing is a prime strategy for dealing with localised drought.

In contrast to the communal areas, the commercial farmers' most common strategy for dealing with drought is to maintain some surplus of grazing through more conservative stocking. Maintaining emergency stocks of stored fodder is not generally a very practicable proposition in Namibia, although some farmers in the higher rainfall areas do make veld (range) hay. In lower rainfall areas, some farmers plant small areas of drought resistant fodder such as prickly pear (*Opuntia* spp.), and this is also being promoted for live fencing in communal areas.

"Cash in the bank" is an oft quoted generalised recommendation as the best drought contingency policy for farmers in drought-prone countries, but many commercial livestock farmers in Namibia are financially constrained due to recent years of rising costs but static prices coupled with on-going farm debt (Namibia Farmers Union, pers. com.), hence this is not currently a common option. Increasingly, the commercial livestock farmers are looking for means of diversification to buffer against drought, and the most common choices are tourism, off-farm income generation and borehole irrigation of fruit and vegetables.

Lessons Learned

The main lessons learned from dealing with the 1992/93 drought, and from the administration of drought subsidies in previous and subsequent years, are summarised below.

1. An effective early warning system is invaluable for timely implementation of drought mitigating and relief measures, but must be accompanied by an infrastructure for the implementation.

2. The severity of drought cannot be judged only from the reduction in total annual rainfall; the within-season distribution is important, especially for crops.

3. A more rigorous definition of drought was needed in order to distinguish between low rainfall, true drought, and drought effects induced by poor management.

4. Droughty conditions can be expected somewhere in the country in the majority of years, but it is rare for all regions to be drought stricken at the same time.

5. Farm management practices should take into account the low and erratic rainfall expected in Namibia.

6. Drought subsidies should not become regular handouts, nor should they encourage poor management practices.

7. The fodder subsidies have encouraged farmers to maintain higher stocking rates than appropriate, and have contributed to the bush encroachment problem in commercial areas.

8. The crop compensation subsidies tend to encourage commercial farmers to cultivate agronomically inappropriate crops and/or to practise cropping in unsuitable areas.

9. There is evidence of widespread abuse of the fodder subsidies through falsification of records.

10. Better targeting is needed for all drought relief subsidies.

11. Drought relief boreholes tend to remain in use after a drought and become foci for unplanned settlements, hence are no longer available for drought relief in the next drought.

12. Food-for-work programmes are difficult to initiate quickly from scratch if there is no structure already in place.

13. NGOs can play an extremely useful role in the administration of drought relief measures in communal areas.

The National Drought Policy and Strategy

Despite the experiences and subsequent analyses of the 1992/93 drought, and the clear need for a coherent drought policy in Namibia, it has taken another five years to produce a strategy. The main stimulating factors for action since 1993 have been concern over:

- dependency on drought relief
- range degradation due to fodder subsidies
- fraudulent claims for subsidies
- the frequent, high, and escalating costs to government of drought relief measures

A new National Drought Task Force was established in 1995 to draw up a long term drought management policy and strategy. Following an introductory workshop in June 1996 (DART, 1996), a number of working groups were established to produce different sections of a background report providing the context for this policy and strategy. This document, entitled "Towards a Drought Policy for Namibia" (NDTF, 1997a), together with the findings of a consultancy to investigate international best practice in drought management (Vogel, 1997), and the reports of three study tours to Botswana and Zimbabwe, Burkina Faso and Niger, and Australia, formed the basis of a second consultative workshop held in March 1997.

Based on these reports and the discussions at the workshop, the NDTF prepared a draft document elaborating a drought policy and strategy for Namibia. Following Cabinet approval, the draft was circulated widely for comment and discussed at a number of public consultative meetings around the country. A national wrap-up meeting was held in September 1997 to discuss the draft. This resulted in the finalised National Drought Policy and Strategy (NDTF, 1997b), which was approved by Cabinet in May 1998.

Policy objectives

The policy aims to shift responsibility for managing drought risk from government to the farmer, with government assistance only considered in event of extreme or "disaster" droughts. It draws a clear distinction between food security interventions to meet needs resulting from drought and those which are poverty-related (NDTF, 1997b). There are eight policy objectives stated as follows:

1. Ensure that household food security is not compromised by drought

2. Encourage and support farmers to adopt self-reliant approaches to drought risk

3. Preserve adequate reproductive capacity in livestock herds in affected areas during drought periods

4. Ensure the continuous supply of potable water to communities, and particularly to their livestock, their schools and their clinics

5. Minimise the degradation of the natural resource base during droughts

6. Enable rural inhabitants and the agricultural sector to recover quickly following drought

7. Ensure that the health status of Namibians is not threatened by the effects of drought

8. Finance drought relief programmes efficiently and effectively by establishing an independent and permanent National Drought Fund.

The policy and strategy document includes a number of specifics, particularly in relation to the continuation, modification or discontinuation of past subsidies, but many of the proposals for new initiatives are tentative and lacking in detail at this stage. The following synthesis of the contents of the policy is extracted from the policy document.

Establishment of the National Drought Fund

In order to avoid the disruptive effects of financing emergency assistance from other budget lines, to speed up the mobilisation of funds, and to accommodate funds from different sources, the government will establish a National Drought Fund to finance its obligations to food security, agriculture and water supply in disaster drought years. The Fund will be financed by annual contributions from government, by agriculture industry levies and direct contributions from farmers in normal rainfall years, and by international donors. A technical committee has been constituted to oversee the establishment of the Fund.

Definition of disaster drought

A disaster drought will be declared only when severe and rare low rainfall conditions prevail. When seasonal rainfall is lower than that prevailing in the lowest 7% of growing seasons in a particular area, a disaster drought alert will be triggered; this will occur, on

average, once in 14 years. (This is slightly more liberal than Australia, which uses a 5% level, and is in line with the Orange Free State of South Africa, which uses the 7% level).

Where a good rainy season precedes a below 7% season, the alert may not be translated into a declaration of disaster drought. Conversely, the cumulative effects of two or more years of rainfall which have been below normal but above the lowest 7% of years will also be considered. The document states that the within-season rainfall distribution pattern will also be taken into account, but does not explain how.

Food security programmes

The two programmes of vulnerable group food distribution and food-for-work will continue as the basis of support to food-insecure households, but with modifications. The free food for vulnerable groups will be replaced by a system of food vouchers exchangeable at retail outlets for designated food items. The criteria for identifying the vulnerable will be amended and more attention will be paid to correct targeting and to reducing over-registration.

Cash will replace food in the food-for-work programmes, which will become cash-for-work programmes. The remuneration rates will be set low enough to attract only the needy, but sufficient for them to meet their needs. The programmes will be maintained in non-drought years as a safety net for the poorest, and scaled up in times of drought.

The Namibian School Feeding Programme, which currently operates in over 600 schools nationwide, is considered an effective mechanism for targeting the needy and in future will be used to provide additional nutrition to school children in drought affected areas.

Livestock programmes

Fodder and lick subsidies will be terminated because they discourage farmers from building up forage reserves, and encourage farmers to retain excessive stock numbers. The livestock marketing incentive scheme will be maintained but only for disaster droughts. Subsidies for transport and for lease of emergency grazing may be considered after an independent evaluation of their impact. Consideration will be given to new assistance provisions for dairy and game farmers, zero grazing enterprises and subsidised loans to facilitate re-stocking.

Future drought assistance will only be provided to farmers implementing sustainable management practices, and private tenure farmers will only qualify if stocked at below 60% of the official (but questionable) carrying capacity estimates. The document does not indicate how sustainable range management practice will be assessed in commercial or communal areas. No official carrying capacity estimates exist for communal areas, and actual stocking rates in unenclosed range are impossible to determine, particularly at the household level.

Crop programmes

For communal tenure farmers the distribution of free seeds for replanting after drought will be replaced by an input voucher scheme, the details for which have yet to be determined. The government will encourage and support the development of private sector seed production and distribution capacity, and will be responsible for ensuring the maintenance of an adequate reserve of seed to meet emergency needs nationally.

For commercial farmers in the freehold and communal areas, the crop failure compensation will be replaced by subsidised loans and deferral of loan repayments. The scheme will only be available for crops deemed suitable for particular regions.

Water supply schemes

Emergency water supply schemes will be based on the identification and prioritisation of needs by Water Point Committees and Regional Water Committees through established procedures, and will be designed to complement long term development goals and strategies. Rural water supply schemes will not be supported unless they meet immediate drought relief needs.

Reducing long term vulnerability to drought

Instead of financing regular large scale drought relief programmes, the government will examine ways to support individuals and communities in long term efforts aimed at the reduction of vulnerability to drought, the management of drought and the recovery from drought. The initiatives will be grouped into the two categories of:

- promoting drought mitigating technologies and practices
- creating an enabling policy environment

Promoting drought mitigating technologies and practices

On-farm risk minimisation will be supported by government attention to early maturing and high value crops, livestock breeds adapted to aridity, development of animal feeds from local products, small-scale irrigation, rainwater harvesting and improved post-harvesting technologies. In the communal areas the development of sustainable rangeland management practices will be addressed through introduction of appropriate policies on land tenure and cost sharing, and consideration will be given to the demarcation of drought reserves. The accumulation of fodder reserves will be encouraged in communal and commercial areas, and support for tackling bush encroachment will be considered.

Income diversification to reduce dependence on rain-fed agriculture is an important goal in communal and commercial areas. Support may take the form of soft loans and specific investment incentives.

In context of food security, the government will promote improved food storage and preservation, good nutritional practices and improved health and sanitation practices. Strategic food reserves should start at the household level, and be maintained by the private sector at the national level. The government will only intervene for food shortages in remote areas where the private sector is unable to meet needs.

More sustainable use of water supplies will be enhanced through better aquifer management and the development of integrated networks of ground water, ephemeral surface water, recycled water and perennial rivers. The reclamation of sewage water, desalination of brackish ground water or sea water, and rain water harvesting will be supported. The responsible use of water by farmers and households will be vigorously promoted through awareness campaigns and tariffs.

Creating an enabling policy environment

Decentralisation of decision making authority over land management and other development issues is recognised as an essential element in support of sustainable resource management, and will be pursued as a matter of urgency. In the communal areas, Land Boards will be established to grant land user rights. These will give land users control over their natural resources and enable them to develop strategies to better withstand drought.

In the long run, poverty alleviation is considered the most effective way of ensuring that food insecurity does not result from drought. Although the government has undertaken many poverty related activities since independence, it lacks a comprehensive poverty reduction strategy and hence the status of drought-related programmes such as the food/cash-for-work remains uncertain in non-drought years. Closely linked to the issue of poverty reduction is that of family planning; the government will vigorously pursue its population strategy with particular focus on the rural poor who have difficulty in accessing family planning programmes.

The policy recognises that it is critical for the tax system to be neutral with respect to responses to rainfall, and not deter farmers from destocking in times of drought or maximising their crop production profits in good years. Proposals for reform of the agricultural taxation system are to be made by a technical team.

Agricultural research, extension and training are to put more emphasis on drought resistant crops and livestock, and drought mitigating technologies and practices. The government will consider additional investment in the collection and dissemination of improved weather and market information to facilitate on-farm decision making.

Production and marketing of crops surplus to subsistence needs will be a priority focus of the government's agricultural support services. Livestock marketing in communal areas will be encouraged by providing more buying points and reducing quarantine costs through various initiatives. One of the keys to encouraging sustainable farming systems is considered to be the strengthening of crop and livestock marketing systems and linking them with improved savings and investment opportunities. The government will promote the establishment of savings facilities, but will also support poor farmers through vouchers to enable them to acquire essential agricultural inputs. The National Agricultural Credit Programme, implemented by the Agribank and aimed at communal tenure farmers, will continue to receive the support of the government.

Issues and Options

The government of Namibia has made a big step forward with the formulation of a national drought policy and strategy. However, many of the implementation details have still to be worked out. During the process of reviewing previous drought measures and formulating the present policy, a number of issues have become apparent which influence the choice of interventions for coping with drought. Some of the issues have been decided while others remain open. The main policy and implementation issues which require further consideration are described briefly below.

1. Government versus private sector responsibility

A critical, and not fully resolved, issue is to what extent the government should be responsible for drought aid to the agricultural sector, and to what extent farmers should take care of themselves. The situation is complicated by the inequality of resources available to farmers in the commercial compared to the communal sectors, such that a dualistic policy is unavoidable. There is a fairly thin line between creating a drought subsidy dependency, which can foster poor management practices, and risking economic and social collapse in event of extreme drought. Namibia has shifted its ground from the former by introducing a more rigorous and extreme definition of drought in line with other drought-prone countries, and is changing its focus towards a longer term perspective of reducing vulnerability to drought.

2. Financing of drought relief

Coupled with the issue above is the question of how the essential drought relief measures should be financed. The policy includes the establishment of a Drought Relief Fund to which contributions are expected to be made by individual farmers and international donors, in addition to levies and government contributions. In reality it is more likely that individual farmers will be more concerned with protecting themselves than contributing to a national fund. International donors tend to respond to present rather than future needs, and their contributions to a fund are uncertain. The treasury allocations to drought relief have almost invariably been considerably lower than the budget requests (e.g. the 1998/99 request was for N$ 72 million but the allocation was N$ 49 million) and only modest annual contributions to a long term fund are likely to be forthcoming. The new definition of disaster drought is based on a 7% (1 year in 14) probability for any particular locality, but the odds of a disaster drought occurring somewhere in Namibia are considerably higher. It is therefore difficult to predict the number of drought-free years there will be to build up a fund, or what the average annual requirements from the fund are likely to be.

3. Implementation of policy into practice

The operationalisation of the national drought policy will require clear strategies, procedures and responsibilities, which have yet to be defined. It will also require a firm and un-ambiguous commitment from government, including some revision of relevant legislation.

4. Maintenance of food-for-cash programmes in non-drought years

Experience in the 1992/93 drought has shown that food-for-work, or cash-for-work, programmes are difficult to mobilise quickly enough from scratch to be useful in time of drought. However, if they are to be maintained at even a low level in non-drought years, a decision has to be made as to how they should be financed and administered.

5. Emergency stock water and drought reserves

The drilling of emergency boreholes for drought relief is a readily implementable intervention attractive to funding by donors but is unsustainable if the boreholes remain open after the drought and become the foci for permanent settlements. In theory it is simple to close a borehole or remove the pump, but it seldom happens in practice. The national drought policy suggests the establishment of fenced drought reserves in communal areas but the same difficulties of closing them at the end of a drought will apply. The issue is that reserves of

water and grazing are only useful in time of drought if they have not been exploited before the drought.

6. Impact of livestock marketing incentives

It seems to have been assumed that communal farmers as well as commercial farmers respond positively to price increases through the market incentive scheme, but it has not been possible to distinguish between drought-induced sales and incentive-induced sales in either case. In commercial areas the present taxation system penalises emergency sales and, in communal areas, the possibility exists of a negative response whereby communal area farmers meet their cash requirements for household food security by selling fewer animals when prices are higher. Such a response has been documented in elsewhere in southern Africa (Doran, Low and Kemp, 1979), although not in a drought situation.

7. Link between bush density and perennial grass mortality

In a South African study (Donaldson, 1967), drought-induced perennial grass mortality was many times higher in thickly bushed camps than in de-bushed camps. If a correlation between perennial grass mortality and bush density during drought periods can be established in Namibia, there will be an added incentive to farmers and government to tackle the bush problem. However, the financial viability of alternative methods of bush control will have to be carefully considered.

8. How to accommodate rainfall variability in drought definition

The policy states that the cumulative effects of two or more low rainfall years will be considered in the declaration of a disaster drought. It also states that the within-season rainfall variability will be taken into account, but it does not say how. The 1991/92 total season rainfall in the crop-growing Caprivi region was within 70% of the long term mean, but the poor distribution made it a disaster for communal and commercial farmers alike. Rainfall distribution is an essential component of rain-fed agriculture success or failure, particularly for cropping, but it is much more difficult to quantify than total rainfall. Without a clear definition of the roles of the previous years' rainfall and the current within-season rainfall in the declaration of drought, there will be mis-understandings and inappropriate targeting of drought relief. There is no simple answer and the question requires more thought and consultation. From this arises another issue: should there be only a single definition of drought and a single set of responses, or should there be graduated responses to different degrees of drought, with distinction between crop and livestock enterprises.

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